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RESIDENTIAL PROJECT AT NERKUNDRAM, CHENNAI

DESIGN BRIEF REPORT

PROJECT: RESIDENTIAL DEVELOPMENT AT CHENNAI

CLIENT: RAMANIYAM REAL ESTATES (P) LTD.,

TITLE: STRUCTURAL DESIGN BASIS REPORT

STRUCTURAL CONSULTANT: BURO ENGINEERS (I) PVT LTD

ISSUE RECORD:

DATE	PREPARED	CHECKED	APPROVED	REVISION
19-03-2025	ARVIND	JOSHI	PJ	R0

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1.0 INTRODUCTION

This Design Brief Report (DBR) is for the Proposed Residential project at Nerkundram, Chennai for Ramaniyam Real Estates (p) LTD.,

This report provides the information on Codes of Practice, Design loading, Material Strength considered for the Design and Analysis of the building. In addition, this report includes Structural system, Foundation system, Method statement of structural analysis which will be adopted for design and analysis for the building.

LEVEL	TOWER NOMENCLATURE	DESCRIPTION
1	Block - A	2 Basement +Stilt +16 Storey + Roof + Head Room
2	Block - B (part 1& 2)	2 Basement +Stilt +16 Storey + Roof + Head Room
3	Block - C (part 1& 2)	2 Basement +Stilt +16 Storey + Roof + Head Room

Expansion Joint:

The Expansion Joint proposed between Block A, Block B and Block C, Hence those Blocks are divided into Part 1 and Part 2.

1.1 Facilities:

Basement 2: Parking, Fire Pump Room.

Basement 1: Parking, Fire Pump Room.

Stilt Floor: Parking, Electrical Room, Watchman Room, Maintenance Room, Meeting Hall.

First Floor to 16th floor: Residential units.

Terrace: Open terrace, Solar Panels, OHT, and LMR.

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1.2 Floor to floor height:

Tower A,B and C:

LEVEL	SLAB	STORY HEIGHT (m)
1	Basement 2	3.2
2	Basement 1	3.6
3	Stilt Floor	3.12
4	1st to Terrace	3.18

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2.0 CODES OF PRACTICE

The relevant Indian Standard codes below are followed.

2.1 CODES, STANDARDS & REFERENCES

All designs of structures shall comply with the requirements specified in the following.

a. Relevant Indian Standard Codes of Practice
b. National Building Code.
c. Local Building regulations.
d. Other relevant international codes where required.

All applicable latest editions of codes and standards are referred and adopted in the analysis of structures and the design and detailing of structural members. All structural elements design shall be carried out primarily based on. Indian Standards and Codes with latest revision, with amendments if any, as on date. In addition, other international codes and standards shall also be referred when required and relevant.

In the analysis, design and detailing of the building, the following Indian Standard codes of latest amendment will be used.

CODE	DESCRIPTION
IS 875(Part 1) 1987	Code of practice for Design Loads (other than earthquake) for buildings and structures – Unit weights of buildings materials and stored materials
IS 875 (Part 2) 1987	Code of practice for Design Loads (other than earthquake) for buildings and structures – Imposed Loads
IS 875 (Part 3) 2015	Code of practice for Design Loads (other than earthquake) for buildings and structures – Wind Loads
IS 875 (Part 5) 1987	Code of practice for Design Loads (other than earthquake) for buildings and structures – Special Loads and load combinations
IS 456 – 2000	Code of Practice for Plain and Reinforced Concrete
IS 1786 – 2008	Specification for High Strength Deformed bars and Wires for concrete reinforcement
IS 1343 – 2012	Code of Practice for Prestressed Concrete

IS 1893 – 2016	Criteria for earthquake resistant design of structures
IS 4326 –1993	Code of practice for Earthquake Resistant Design and Construction of Buildings
IS 3370 – 2009	Code of Practice for Concrete structures for the storage of liquids
IS 1904-1995	Code of Practice for design and construction of Foundation
IS 1080 – 1997	Code of Practice for design and construction of shallow Foundation
IS 2950 - 1998	Code of Practice for design and construction of Raft Foundation
IS 800 – 2007	Code of practice for General Construction in steel
BS 8110: 1997	Plain and reinforced concrete-code of practice (British standard)
ACI 318	Plain and reinforced concrete-code of practice (American standard)
IS 13920: 2016	Code of practice for ductile detailing of reinforced concrete structures subjected to seismic forces.
EN 1992-4 2013	Eurocode-2: Design of concrete structures. Part-4 Design of fastenings for use in concrete.
EN 1992-1 2004	Eurocode-2: Design of concrete structures. Part1: General rules and rules of building
SP 6(1)	Handbook on structural steel sections
SP24	Explanatory Handbook on Indian standard code of practice
SP34	Handbook on concrete reinforcement and detailing
IS 16700 - 2017	Criteria for Structural Safety of Tall Concrete Building

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c) **SELF-WEIGHT OF LIGHT WEIGHT WALLS (kN/m²)**

Infill walls (20mm for External wall & internal wall 15mm plastering on either side)

150mm thick Porothom wall : 2.5kN/m

Water Tank : Water height x 10

d) **Material Density**

Unit weight of materials are as per IS: 875 (Part-I) 1987.

Unit weight of concrete	-	25	KN / Cum
Unit weight of steel	-	78.5	KN / Cum.
Screed concrete	-	24	KN / Cum.
Unit weight of dry soil	-	18	KN / Cum.
Unit weight of saturated soil	-	20	KN / Cum.

e) **WINDS LOADS**

The wind pressure shall be calculated based on the basic wind speed and other provisions laid in IS 875 Part (3) - 2015

Design Wind speed $V_z = V_b x k_1 x k_2 x k_3 x k_4$

V_b ⟶ Basic Wind velocity for Chennai = 50m/s

k_1 ⟶ Risk coefficient for all general buildings = 1.00

k_2 ⟶ Terrain category 2 = 1.10

k_3 ⟶ Topography factor = 1.00

k_4 ⟶ Importance Factor for cyclonic Region = 1.00

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3.0 DESIGN OF LOADINGS

SUPERIMPOSED DEAD LOADS AND LIVE LOADS

The following are the imposed loads such as SDL and LL to be considered for the design of floor system depending on usage floor. In addition to these loads, self-weight of structural elements will be considered depending on member sizes shown in the floor plans.

a) **LIVE LOAD (kN/m²)**

Car park	3.0
Baths and Toilets	2.0
Kitchen and Utility	2.0
Living, Dining and other room	2.0
Lobby/Corridor/Staircase/ Balconies	3.0
Meter room, Electrical room, Pump room	7.50
Terrace	3.0

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Permissible reduction in imposed load on each floor is considered for design of columns and footings as per IS 875 Part (2), Along with IS 1893: 2016.

b) **SUPER IMPOSED DEAD LOADS (kN/m²)**

Super imposed Loads:

Living, Dining, Bedrooms and Corridors (50mm Floor Finish)	1.2 kN/m²
Kitchen (75 mm Floor Finish)	1.8 kN/m2
Staircase	3.6 kN/m2
Plant / Mechanical / Electrical Rooms (100 mm Floor Finish)	2.4 kN/m2
Toilets & Balcony (50 mm Floor Finish + 100 mm Sunk filling)	3.6 kN/m2
Car Parking (75mm Floor Finish)	1.8 kN/m2
Terrace (Avg 150 mm Screed)	3.6 kN/m2

*Sunken Filling Density Considered: 15kN/Cum

Based on the above,

Max. design wind speed (V_Z) ($V_b x k_1 x k_2 x k_3 x k_4$) = 42.90m/s

K_a	Area Averaging Factor	0.8
K_d	Wind Directionality Factor	0.9
K_c	Combination Factor	0.9

f) SEISMIC LATERAL FORCE

Design of lateral force under seismic condition shall be as per IS1893 – 2016. Total lateral force (base shear) of the building shall be estimated as per clause 7.2.1 of IS1893 – 2016 which provides by

Base shear Vb = Ah W

Ah is horizontal seismic coefficient and W is seismic weight of the building, Horizontal seismic coefficient depends on location of the building (Zone factor Z), usage of the building (Importance factor, I), building lateral resisting system (Response reduction factor, R) and design acceleration coefficient (Sa /g) which is based on subsoil condition and fundamental natural period (Ta).

For the proposed development is for Residential use. Considering it, the seismic weight is summation of total dead load and 25% of live load.

1) The building with ductile RC structural wall system.
2) As per IS 1893:2016 code, Chennai lies in Zone III with Zone factor Z = 0.16
3) The Design Base Shear is given by V_b = Ah x W, Where Ah = Z / 2 x I / R x S_a / g

   I = Importance Factor = 1.2

   Soil Type 2 (Medium or Stiff soils)

   R (Response reduction factor) = 4.0

   Sa/g = Average Response acceleration coefficient

   For the building height with reference to IS: 1893-2016, since the buildings are not well connected with basement walls so for the time period calculation the heights are considered Ground to roof that is 42.95 m for Block 1 and 2.

The fundamental natural period (Ta) for building,

For X and Y direction the time period is calculated

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7.6.2 The approximate fundamental translational natural period T_a of oscillation, in second, shall be estimated by the following expressions:

a) Bare MRF buildings (without any masonry infills):

$$T_a = \begin{cases} 0.075h^{0.75} & \text{(for RC MRF building)} \\ 0.080h^{0.75} & \text{(for RC-Steel Composite MRF building)} \\ 0.085h^{0.75} & \text{(for steel MRF building)} \end{cases}$$

b) Buildings with RC structural walls:

$$T_a = \frac{0.075h^{0.75}}{\sqrt{A_w}}$$

where A_w is total effective area (m^2) of walls in the first storey of the building given by:

$$A_w = \sum_{i=1}^{N_w} \left[A_{wi} \left\{ 0.2 + \left(\frac{L_{wi}}{h} \right)^2 \right\} \right]$$

c) All other buildings:

$$T_a = \frac{0.09h}{\sqrt{d}}$$

H = 42.95m (Ground to Roof)

Sl. NO	TOWER	Dimension in X Dir (m)	Dimension in Y Dir (m)	Time Period in X Dir (Sec)	Time Period in Y Dir (Sec)
1	Block- A	41.3	19.86	1.579	1.421
2	Block - B (part 1& 2)	36.94	71.53	1.617 & 1.255	1.406 & 1.401
3	Block - C (part 1& 2)	50.52	74.63	1.272 & 1.377	1.617 & 1.4

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4.1 LOAD COMBINATIONS

The various loads combinations used for design in accordance with IS 1893-2016 are as follows

1. 1.5 (DL + LL)
2. 1.2 (DL + LL + SPECX+0.3SPECY+0.3SPECZ)
3. 1.2 (DL + LL + SPECY+0.3SPECX+0.3SPECZ)
4. 1.2 (DL + LL + SPECZ+0.3SPECX+0.3SPECY)
5. 1.2 (DL + LL ± WindX)
6. 1.2 (DL + LL ± WindY)
7. 1.5 (DL + SPECX+0.3SPECY+0.3SPECZ)
8. 1.5 (DL + SPECY+0.3SPECX+0.3SPECZ)
9. 1.5 (DL + SPECZ+0.3SPECX+0.3SPECY)
10. 1.5 (DL ± WindX)
11. 1.5 (DL ± WindY)
12. 0.9DL + 1.5(SPECX+0.3SPECY+0.3SPECZ)
13. 0.9DL + 1.5(SPECY+0.3SPECX+0.3SPECZ)
14. 0.9DL + 1.5(SPECZ+0.3SPECX+0.3SPECY)
15. 0.9DL ± 1.5WindX
16. 0.9DL ± 1.5WindY

Where accidental / fire tender load case is applicable, the following load combination is considered

1.50 DL + 1.05 AL + 1.50 LL

The various service loads combinations of structure as per IS 456 are as follows

17. 1.0DL +1.0 LL
18. 1.0DL + 1.0SPECX
19. 1.0DL + 1.0SPECY
20. 1.0DL ± 1.0WindX
21. 1.0DL ± 1.0WindY
22. 1.0DL ± 1.0TEMP
23. 1.0DL + 0.8LL + 0.8SPECX
24. 1.0DL + 0.8LL + 0.8SPECY
25. 1.0DL + 0.8LL ± 0.8WindX
26. 1.0DL + 0.8LL ± 0.8WindY

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i) MATERIAL GRADES

CONCRETE ELEMENT	GRADE
Retaining Walls	M30
Water Tank,STP,UG Sump	M30
RCC Slab	M30
RCC Beams	M30
RCC Shear walls and Columns(up to 5th floor)	M40
RCC Shear walls and Columns(above 5th floor)	M35
Pile and Pile Cap	M30
Staircase	M30

on behalf of CMDA MEB panel, the detailed structural design calculations are generally reviewed and in order.

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Planning and Designs Circle,
Chepauk, Chennai-5.

ii) **REINFORCEMENT**

Reinforcement bars of grade Fe550D conform to IS 1786-2008.

5.0 COVER AND FIRE RATING

Fire rating considered - 2hrs.

Exposure condition - Moderate

Cover to reinforcement considered for various elements.

Pile and Pilecap	75 mm
Columns	40 mm
Shear Wall	30 mm
Beams (simply supported)	40 mm.
Beams (continuous)	30 mm
Slabs (simply supported)	35 mm
Slabs (continuous)	25 mm

6.0 STRUCTURAL SYSTEM

SUPER STRUCTURE

The structural system for the super structure is a conventional beam and slab system resting on columns and walls. The slab thickness considered for the design are 125mm/150mm/175mm/250mm.

Structural walls are considered as the main lateral load resisting element.

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7.0 DEFLECTION CRITERIA

7.1 Lateral Deflection (Wind)

Overall Deflection	<	Height/500
Storey Deflection	<	Storey height/500

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7.2 Lateral Deflection (Seismic)

Overall Drift	<	H / 250
Storey Drift	<	0.004 times storey height

7.3 Vertical Deflection of Beams and Slabs due to Gravity Loads

Total Deflection (DL + LL)	< Span/250
Deflection including the effects of Temperature, Creep and Shrinkage Occurring after erection of partitions and the application of finishes	< Span/350 or 20mm whichever is less

8.0 STRUCTURAL ANALYSIS

Computer-aided analysis using finite element method (FEM) shall be carried out for the design of structural elements. For 3D or 2D structural frame analysis the latest version of software ETABS shall be used.

Prokon, RCDC and verified in-house spreadsheets will be used for the design of reinforced concrete (RC) and steel elements in consideration of flexure, shear, and axial forces.

9.0 FOUNDATION

Proposed Foundation system is Pile Foundation and the Capacity of 900mm dia pile is 2400kN. The founding depth is to be 32.5m from the Existing ground level with reference to the soil investigation report GT- 2374 from Geo Marine Consultants (P) Ltd.

10.0 COMPUTER PROGRAMS

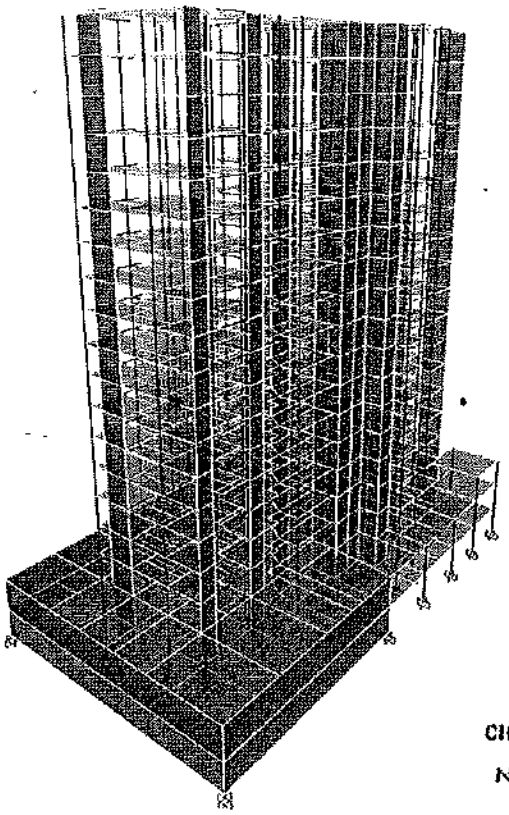
The following Software / spreadsheet to be used to carry out Structural analysis and design.

1. ETABS Ver 21.0.1 -Three-Dimensional Program, Wall design, Beam Design
2. SAFE Ver 20.0 - Combined Pile Footings.
3. In-House Spreadsheet - One way/ Two-way slab design
4. RCDC - Individual Pile Footings.

ETABS MODEL

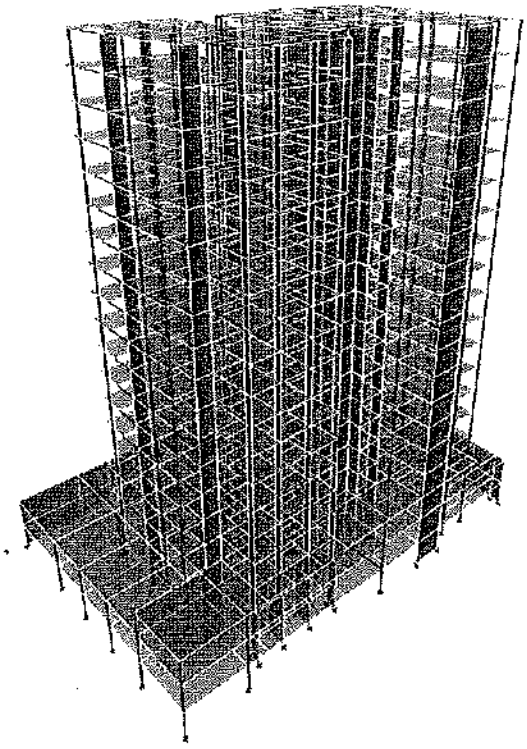
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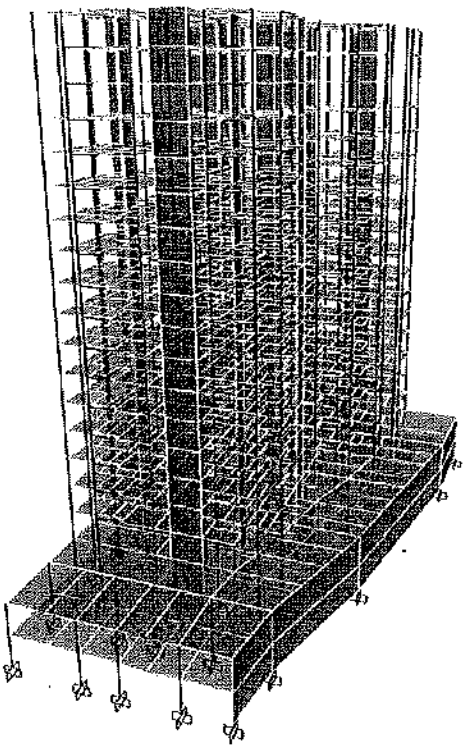
BLOCK A



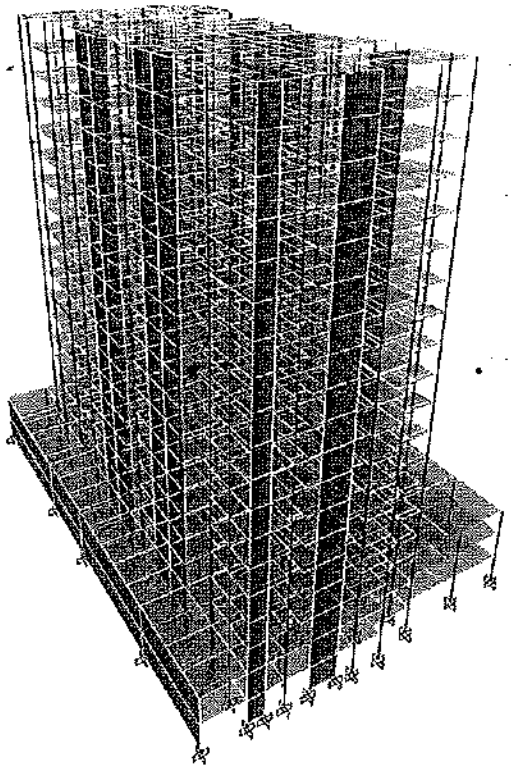
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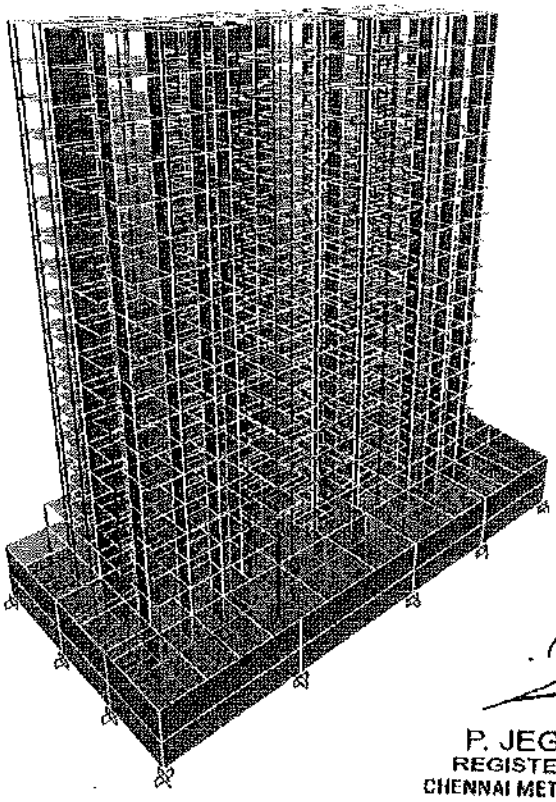
BLOCK B (Part 1 & Part 2)





BLOCK C (Part 1 & Part 2)





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1 Structure Data

This chapter provides model geometry information, including items such as story levels, point coordinates, and element connectivity.

1.1 Story Data

Table 1.1 - Story Definitions

Tower	Name	Height in	Master Story	Similar To	Splice Story	Color
T1	TERRACE	3.18	No	2nd floor	No	Magenta
T1	16th floor	3.18	No	2nd floor	No	Magenta
T1	15th floor	3.18	No	2nd floor	No	Magenta
T1	14th floor	3.18	No	2nd floor	No	Magenta
T1	13th floor	3.18	No	2nd floor	No	Magenta
T1	12th floor	3.18	No	2nd floor	No	Magenta
T1	11th floor	3.18	No	2nd floor	No	Magenta
T1	10th floor	3.18	No	2nd floor	No	Magenta
T1	9th floor	3.18	No	2nd floor	No	Magenta
T1	8th floor	3.18	No	2nd floor	No	Magenta
T1	7th floor	3.18	No	2nd floor	No	Magenta
T1	6th floor	3.18	No	2nd floor	No	Magenta
T1	5th floor	3.18	No	2nd floor	No	Magenta
T1	4th floor	3.18	No	2nd floor	No	Magenta
T1	3rd floor	3.18	No	2nd floor	No	Magenta
T1	2nd floor	3.18	Yes	None	No	Yellow
T1	1st floor	3.12	No	None	No	Gray8Dark
T1	STILT	3.6	No	BASEMENT 1	No	Blue
T1	BASEMENT 1	3.2	Yes	None	No	Green

2 Loads

This chapter provides loading information as applied to the model.

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2.1 Load Patterns

Table 2.1 - Load Pattern Definitions

Name	Is Auto Load	Type	Self Weight Multiplier	Auto Load
~LLRF	Yes	Other	0	
~SPEC WXECC	Yes	Other	0	
~SPEC WYECC	Yes	Other	0	
~SPEC WZECC	Yes	Other	0	
~SPEC-XECC	Yes	Other	0	
~SPEC-YECC	Yes	Other	0	
~SPEC-ZECC	Yes	Other	0	
Dead	No	Dead	1	
EQX	No	Seismic	0	IS 1893:2016
EQY	No	Seismic	0	IS 1893:2016
Live<3	No	Reducible Live	0	
Live>3	No	Reducible Live	0	
SDL	No	Super Dead	0	
WALL	No	Super Dead	0	
WX	No	Wind	0	User Loads
WY	No	Wind	0	User Loads

2.2 Auto Seismic Loading

IS 1893:2016 Auto Seismic Load Calculation

This calculation presents the automatically generated lateral seismic loads for load pattern EQX according to IS 1893:2016, as calculated by ETABS.

Direction and Eccentricity

Direction = X

Structural Period

Period Calculation Method = User Specified

User Period $T = 1.377\text{sec}$

Factors and Coefficients

Seismic Zone Factor, Z [IS Table 3] $Z = 0.16$

Response Reduction Factor, R [IS Table 9] $R = 4$

Importance Factor, I [IS Table 8] $I = 1.2$

Site Type [IS Table 1] = II

Seismic Response

Spectral Acceleration Coefficient, S_a/g [IS 6.4.2] $\frac{S_a}{g} = \frac{1.36}{T}$ $\frac{S_a}{g} = 0.987654$

Equivalent Lateral Forces

Seismic Coefficient, A_h [IS 6.4.2] $A_h = \frac{ZI\frac{S_a}{g}}{2R}$

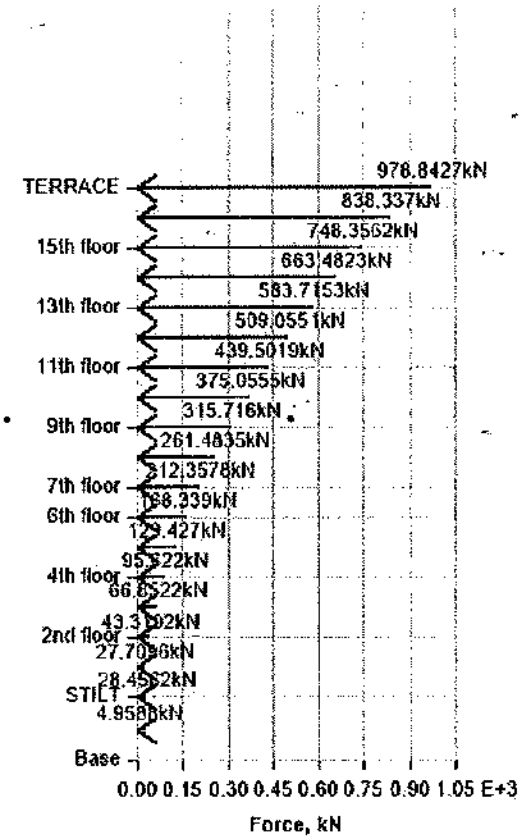
Calculated Base Shear

Direction	Period Used (sec)	W (kN)	V_b (kN)
X	1.377	273821.6464	6490.5872

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Applied Story Forces

Lateral Load to Stories - X



Story	Elevation	X-Dir	Y-Dir
	m	kN	kN
TERRACE	60.8	978.8427	0
16th floor	57.62	838.337	0
15th floor	54.44	748.3562	0
14th floor	51.26	663.4823	0
13th floor	48.08	583.7153	0
12th floor	44.9	509.0551	0
11th floor	41.72	439.5019	0
10th floor	38.54	375.0555	0
9th floor	35.36	315.716	0
8th floor	32.18	261.4835	0
7th floor	29	212.3578	0
6th floor	25.82	168.339	0
5th floor	22.64	129.427	0
4th floor	19.46	95.622	0
3rd floor	16.28	66.8522	0
2nd floor	13.1	43.3192	0
1st floor	9.92	27.7096	0
STILT	6.8	28.4562	0
BASEMENT 1	3.2	4.9588	0
Base	0	0	0

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IS 1893:2016 Auto Seismic Load Calculation

This calculation presents the automatically generated lateral seismic loads for load pattern EQY according to IS 1893:2016, as calculated by ETABS.

Direction and Eccentricity

Direction = Y

Structural Period

Period Calculation Method = User Specified

User Period $T = 1.4sec$

Factors and Coefficients

Seismic Zone Factor, Z [IS Table 3] $Z = 0.16$

Response Reduction Factor, R [IS Table 9] $R = 4$

Importance Factor, I [IS Table 8] $I = 1.2$

Site Type [IS Table 1] = II

Seismic Response

Spectral Acceleration Coefficient, S_a/g [IS 6.4.2] $\frac{S_a}{g} = \frac{1.36}{T}$ $\frac{S_a}{g} = 0.971429$

Equivalent Lateral Forces

Seismic Coefficient, A_h [IS 6.4.2] $A_h = \frac{ZI\frac{S_a}{g}}{2R}$

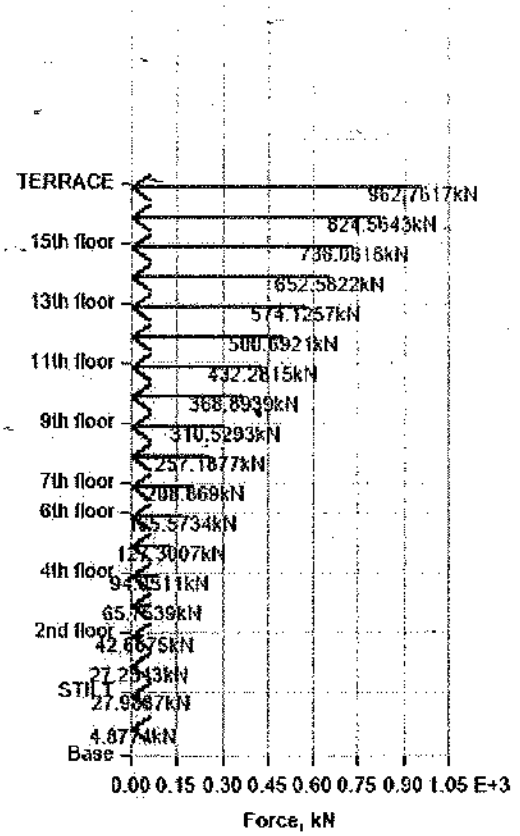
Calculated Base Shear

Direction	Period Used (sec)	W (kN)	V_b (kN)
Y	1.4	273821.6464	6383.9561

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Applied Story Forces

Lateral Load to Stories - Y



Story	Elevation	X-Dir	Y-Dir
	m	kN	kN
TERRACE	60.8	0	962.7617
16th floor	57.62	0	824.5643
15th floor	54.44	0	736.0618
14th floor	51.26	0	652.5822
13th floor	48.08	0	574.1257
12th floor	44.9	0	500.6921
11th floor	41.72	0	432.2815
10th floor	38.54	0	368.8939
9th floor	35.36	0	310.5293
8th floor	32.18	0	257.1877
7th floor	29	0	208.869
6th floor	25.82	0	165.5734
5th floor	22.64	0	127.3007
4th floor	19.46	0	94.0511
3rd floor	16.28	0	65.7539
2nd floor	13.1	0	42.6075
1st floor	9.92	0	27.2543
STILT	6.8	0	27.9887
BASEMENT 1	3.2	0	4.8774
Base	0	0	0

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2.3 Functions

2.3.1 Response Spectrum Functions

Table 2.4 - Functions - Response Spectrum - IS1893 2016

Name	Period sec	Value	Seismic Zone	I	Soil Type	R	Damping Ratio
IS1893	0	0.024	III	1.2	II	4	0.05
IS1893	0.1	0.06					
IS1893	0.55	0.06					
IS1893	0.6	0.0408					
IS1893	1	0.03264					
IS1893	1.2	0.0272					
IS1893	1.4	0.023314					
IS1893	1.6	0.0204					
IS1893	1.8	0.018133					
IS1893	2	0.01632					
IS1893	2.5	0.013056					
IS1893	3	0.01088					
IS1893	3.5	0.009326					
IS1893	4	0.00816					
IS1893	4.5	0.00816					
IS1893	5	0.00816					
IS1893	5.5	0.00816					
IS1893	6	0.00816					
IS1893	6.5	0.00816					
IS1893	7	0.00816					
IS1893	7.5	0.00816					
IS1893	8	0.00816					
IS1893	8.5	0.00816					
IS1893	9	0.00816					
IS1893	9.5	0.00816					
IS1893	10	0.00816					

Table 2.5 - Functions - Response Spectrum - User Defined

Name	Period sec	Value	Damping Ratio
Z DIR	0	0.04	0.05
Z DIR	10	0.04	

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2.4 Load Cases

Table 2.6 - Load Case Definitions - Summary

Name	Type
Dead	Linear Static
Live	Linear Static
Modal	Modal - Ritz
SDL	Linear Static
WALL	Linear Static
EQX	Linear Static
EQY	Linear Static
WX	Linear Static
WY	Linear Static
SPEC-X	Response Spectrum
SPEC-Y	Response Spectrum
Live>3	Linear Static
SPEC WX	Response Spectrum
SPEC WY	Response Spectrum
SPEC-Z	Response Spectrum
SPEC WZ	Response Spectrum

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FOUNDATION DESIGN

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Design Code	:	IS 456 : 2000 + IS 13920 : 2016	
Pilecap No	:	PC53	
Column No	:	C53	(600mm x 900mm)
Member Ref. No	:	C53	
Concrete Grade	:	M30	
Steel Grade	:	Fe550	
Clear Cover	:	50	mm
Top of pile-cap below ground	:	3.1	m
Density of Soil	=	18	kN/cum
Founding Depth	=	4	m
Pile Capacity in Compression	=	2400	kN
Pile Capacity in Tension	=	800	kN
Pile Capacity Reduction	=	0	%
Pile Overloading	=	10	%
Pile Group Overloading	=	10	%
Pile Capacity Increase for EQ	=	25	%
Pile Capacity Increase for Wind	=	25	%
Live Load Reduction	=	50	%
Consider Capacity Design	:	No	
Consider Overburden Pressure	:	No	
No. of Piles	=	2	
Pile Diameter	=	900	mm
Pilecap Offset	=	150	mm
Pile Spacing	=	2.5	x Ø
Pilecap Size	=	3450 x 1200	mm
Pilecap Depth	=	900	mm
Pile-cap Wt.	=	93.15	kN

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For design, moments along shorter direction of pile cap has been ignored

Check for Maximum Compressive Load on One Pile:

Critical Load Combination	:	[10] : (Dead) +(SDL) +(WALL) +(Live) +(Live>3) +(WY)	
Pcomb	=	6259.16	kN
Ptotal	=	Pcomb + Pilecap Wt.	
	=	6352.31	kN
Mx	=	-46.94	kNm

My	=	-66.64	kNm
P	=	Ptotal/ No. of Piles	
	=	3176.16	kN
Pmx	=	20.861	kN
Pmy	=	0	kN
Maximum Compressive load on pile	=	3197.02	kN
Allowable Compressive load on pile	=	2400 x 1.25 x 1.1	
	=	3300	kN

Check for Maximum Compressive Load on Pile Group:

Critical Load Combination	:	[1] : (Dead) +(SDL) +(WALL) +(Live) +(Live>3)	
Pcomb	=	4329.99	kN
Ptotal	=	Pcomb + Pilecap Wt.	
	=	4423.14	kN
Mx	=	0.97	kNm
My	=	-105.77	kNm
Maximum Compressive load on pile group	=	4423.14	kN
Allowable Compressive load on pile group	=	2 x 2400 x 1.1	
	=	5280	kN

Check for Tensile Load on One Pile:

No Tensile load in pile group.

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Check for Maximum Tensile Load on Pile Group:

No Tensile load in pile group.

Design for Bending:

Bottom Reinforcement Along Column-D

Critical Load Combination	:	[31] : 1.5 (Dead) +1.5 (SDL) +1.5 (WALL) +1.5 (WY)	
Pcomb	=	8695.84	kN
Ptotal	=	Pcomb + Pilecap Wt.	
	=	8835.565	kN
Mx	=	-72.76	kNm
My	=	-58.11	kNm
Ppile	=	Max Load on pile	
	=	4450.12	kN

Deff	=	840	mm
Beff	=	1200	mm
DfCol	=	0.68	m
BMux	=	Ppile x DfCol	
	=	3003.83	kNm
PtReq	=	0.89	%
AstReq (BM)	=	7443	sqmm/m
AstPrv	=	T32 @ 105 C/C	
	=	7659.52	sqmm/m

Top Reinforcement Along Column-D

There is no Tensile Force, hence Minimum Percentage of steel will be provided.

D	=	900	mm
AstReq (BM)	=	Min Pt for Top Reinforcement x D x 1000/100	
	=	0.06 x 900 x 1000/100	
	=	540	sqmm/m
AstPrv	=	T10 @ 145 C/C	
	=	541.66	sqmm/m

Bottom Reinforcement Along Column-B

There is no Compressive Force, hence Minimum Percentage of steel will be provided.

D	=	900	mm
AstReq (BM)	=	Min Pt for Bottom Reinforcement x D x 1000/100	
	=	0.2 x 900 x 1000/100	
	=	1800	sqmm/m
AstPrv	=	T16 @ 110 C/C	
	=	1827.82	sqmm/m

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Top Reinforcement Along Column-B

There is no Tensile Force, hence Minimum Percentage of steel will be provided.

D	=	900	mm
AstReq (BM)	=	Min Pt for Top Reinforcement x D x 1000/100	
	=	0.06 x 900 x 1000/100	
	=	540	sqmm/m
AstPrv	=	T10 @ 145 C/C	
	=	541.66	sqmm/m

Design for One Way Shear:

Along Column-D (Compression Case)

Critical Load Combination	:	[31] : 1.5 (Dead) +1.5 (SDL) +1.5 (WALL) +1.5 (WY)	
Pcomb	=	8695.84	kN
Ptotal	=	Pcomb + Pilecap Wt.	
	=	8835.56	kN
Mx	=	-72.76	kNm
My	=	-58.11	kNm
Ppile	=	Max Load on pile	
	=	4450.123	kN

Location of critical section is at d/2 from face of column

Section Location from column center	=	870	mm

Data for Piles

Pile No	Load (kN)	% covered	Shear (kN)
P1	4450.12	21.67	3485.93
P2	4385.44	21.67	3435.26

Design Shear Force (Vu)	=	Max. of (Shear due to P1, P2)	
	=	3485.93	kN
Deff	=	840	mm
Beff	=	1200	mm
Tv	=	Vu/(Beff x Deff)	
	=	3.46	N/sqmm
Tc	=	0.626	N/sqmm
Av	=	255	mm
Shear enhancement factor	=	2 x Deff / Av	
	=	6.59	
Enhanced shear strength (Tce)	=	3.5	N/sqmm
Tv	<	Tce, Hence Shear Reinforcement is not required	

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Along Column-D (Tension Case)

All Load Combination having Compressive Force. Thus, One way Shear is not applicable for Tensile Force.

Along Column-B (Compression Case)

One way shear check do not applicable for 2 pile pile-cap design

Along Column-B (Tension Case)

One way shear check do not applicable for 2 pile pile-cap design

Design of Face Reinforcement:

Asfr Req	=	SFR % x D x Beffsfr	
	=	0.05 x 900 x 500 / 100	
	=	225	sqmm
Asfr Prv	=	3-T10	
	=	236	sqmm

Check for Load Transfer from Column to PileCap

Critical Analysis Load Combination	=		
Critical Load Combination	:	[31] : 1.5 (Dead) +1.5 (SDL) +1.5 (WALL) +1.5 (WY)	
P	=	8695.84	kN
A2	=	0.54	sqm
A1	=	4.14	sqm
Base Area	=	4.14	sqm
A1	<	Base Area	
Modification Factor	=	SquareRoot(A1/A2) < = 2	
SquareRoot(A1/A2)	=	2.77	
Thus, Modification Factor	=	2	
Concrete Bearing Capacity	=	0.45 x Fck x Modication Factor x Column Area	
	=	14580	kN
Concrete Bearing Capacity	>	P, Hence Safe.	

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WALL DESIGN

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ETABS Shear Wall Design

IS 456:2000 Pier Design

Pier Details

Story ID	Pier ID	Centroid X (mm)	Centroid Y (mm)	Length (mm)	Thickness (mm)	LLRF
BASEMENT 1 TO ROOF	EHW8	57943.3	23332.4	3650	230	0.6

Material Properties

E_c (MPa)	f_{ck} (MPa)	Lt.Wt Factor (Unitless)	f_y (MPa)	f_{ys} (MPa)
29580.4	35	1	550	415

Design Code Parameters

Γ_s	Γ_c	IP_{MAX}	IP_{MIN}	P_{MAX}	MinEcc Major	MinEcc Minor
1.15	1.5	0.04	0.0025	0.8	Yes	Yes

Pier Leg Location, Length and Thickness

Station Location	ID	Left X_1 mm	Left Y_1 mm	Right X_2 mm	Right Y_2 mm	Length mm	Thickness mm
Top	Leg 1	56118.3	23332.4	59768.3	23332.4	3650	230
Bottom	Leg 1	56118.3	23332.4	59768.3	23332.4	3650	230

Flexural Design for P_u, M_{u2} and M_{u3}

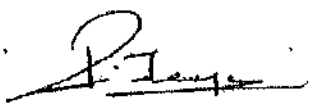
Station Location	Required Rebar Area (mm²)	Required Reinf Ratio	Current Reinf Ratio	Flexural Combo	P_u kN	M_{u2} kN-m	M_{u3} kN-m	Pier A_s mm²
Top	3966	0.0047	0.003	0.9DL+1.5SPEC WY	2676.2686	296.2542	1343.3477	839500
Bottom	3892	0.0046	0.003	0.9DL+1.5SPEC WY	2735.0137	297.5456	1310.2306	839500

Shear Design

Station Location	ID	Rebar mm²/m	Shear Combo	P_u kN	M_u kN-m	V_u kN	V_c kN	$V_c + V_s$ kN
Top	Leg 1	575	1.5DL+1.5SPEC WX	4669.4052	1982.471	-484.7602	356.0098	961.9098
Bottom	Leg 1	575	1.5DL+1.5SPEC WX	4768.3766	1896.2901	-484.7602	354.9277	960.8277

Boundary Element Check

Station Location	ID	Edge Length (mm)	Governing Combo	P_u kN	M_u kN-m	Stress Comp MPa	Stress Limit MPa
Top-Left	Leg 1	575	1.5DL+1.5SPEC WX	5405.1816	-1761.3913	9.89	7
Top-Right	Leg 1	575	1.5DL+1.5SPEC WZ	5517.6456	878.3165	8.29	7
Bottom-Left	Leg 1	575	1.5DL+1.5SPEC WZ	5620.6542	-705.5177	8.08	7
Botttom-Right	Leg 1	575	1.5DL+1.5SPEC WZ	5620.6542	810.2876	8.28	7



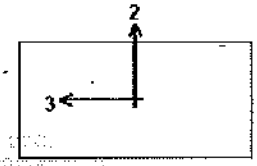
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COLUMN DESIGN

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ETABS Concrete Frame Design

IS 456:2000 Column Section Design (Summary)



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Column Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)	LLRF	Type
BASEMENT 1 TO ROOF	C46	1215	C 300X600 M35	1.5DL+1.5SPECX	0	3180	0.6	Ordinary Frame

Section Properties

b (mm)	h (mm)	dc (mm)	Cover (Torsion) (mm)
600	300	58	30

Material Properties

E_c (MPa)	f_{ck} (MPa)	Lt.Wt Factor (Unitless)	f_y (MPa)	f_{ys} (MPa)
29580.4	35	1	550	415

Design Code Parameters

γ_c	γ_s
1.5	1.15

Axial Force and Biaxial Moment Design For P_u , M_{u2} , M_{u3}

Design P_u kN	Design M_{u2} kN-m	Design M_{u3} kN-m	Minimum M_2 kN-m	Minimum M_3 kN-m	Rebar Area mm²	Rebar % %
2092.0881	52.6369	-84.8677	52.6369	41.8418	1440	0.8

Axial Force and Biaxial Moment Factors

	K Factor Unitless	Length mm	Initial Moment kN-m	Additional Moment kN-m	Minimum Moment kN-m
Major Bend(M3)	1	2580	-33.9471	0	41.8418
Minor Bend(M2)	1	2580	10.6473	0	52.6369

Shear Design for V_{u2} , V_{u3}

	Shear V_u kN	Shear V_c kN	Shear V_s kN	Shear V_p kN	Rebar A_{sv} /s mm²/m
Major, V_{u2}	50.829	108.4313	58.0792	0	665.06
Minor, V_{u3}	15.2344	114.6956	65.0396	0	332.53

Joint Shear Check/Design

	Joint Shear Force kN	Shear V_{Top} kN	Shear $V_{u,Tot}$ kN	Shear V_c kN	Joint Area cm²	Shear Ratio Unitless

	Joint Shear Force kN	Shear V_{Top} kN	Shear $V_{u,Tot}$ kN	Shear V_c kN	Joint Area cm²	Shear Ratio Unitless
Major Shear, V_{u2}	N/N	N/N	N/N	N/N	N/N	N/N
Minor Shear, V_{u3}	N/N	N/N	N/N	N/N	N/N	N/N

(1.4) Beam/Column Capacity Ratio

Major Ratio	Minor Ratio
N/N	N/N

Additional Moment Reduction Factor k (IS 39.7.1.1)

A_g cm²	A_{sc} cm²	P_{uz} kN	P_b kN	P_u kN	k Unitless
1800	14.4	3429	1107.5571	2092.0881	0.575897

Additional Moment (IS 39.7.1)

	Consider M_a	Length Factor	Section Depth (mm)	KL/Depth Ratio	KL/Depth Limit	KL/Depth Exceeded	M_a Moment (kN-m)
Major Bending (M_3)	Yes	0.811	300	8.6	12	No	0
Minor Bending (M_2)	Yes	0.811	600	4.3	12	No	0

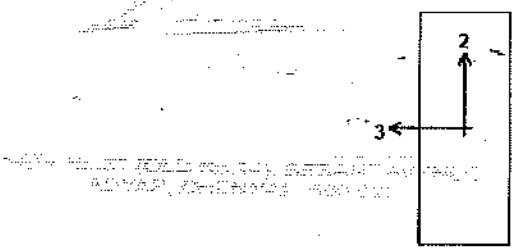
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BEAM DESIGN

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ETABS Concrete Frame Design

IS 456:2000 Beam Section Design (Summary)



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Beam Element Details

Level	Element	Unique Name	Section ID	Combo ID	Station Loc	Length (mm)	LLRF	Type
2nd floor	B139	1746	B 230X600	ENVELOPE	947.5	3790	1	Ordinary Frame

Section Properties

b (mm)	h (mm)	b_f (mm)	d_s (mm)	d_{ct} (mm)	d_{cb} (mm)
230	600	230	0	35	35

Material Properties

E_c (MPa)	f_{ck} (MPa)	Lt.Wt Factor (Unitless)	f_y (MPa)	f_{ys} (MPa)
29580.4	35	1	550	415

Design Code Parameters

γc	γs
1.5	1.15

Factored Forces and Moments

Factored M_{u3} kN-m	Factored T_u kN-m	Factored V_{u2} kN	Factored P_u kN
-2.4115	0.0064	3.7605	0

Design Moments, M_{u3} & M_t

Factored Moment kN-m	Factored M_t kN-m	Positive Moment kN-m	Negative Moment kN-m
-2.4115	0.0135	69.8457	-2.4251

Design Moment and Flexural Reinforcement for Moment, M_{u3} & T_u

	Design -Moment kN-m	Design +Moment kN-m	-Moment Rebar mm²	+Moment Rebar mm²	Minimum Rebar mm²	Required Rebar mm²
Top (+2 Axis)	-2.4251		201	0	9	201
Bottom (-2 Axis)		69.8457	267	267	0	201

Shear Force and Reinforcement for Shear, V_{u2} & T_u

Shear V_e kN	Shear V_c kN	Shear V_s kN	Shear V_p kN	Rebar A_{sv} /s mm²/m

Shear V_e kN	Shear V_c kN	Shear V_s kN	Shear V_p kN	Rebar A_{sv} /s mm²/m
3.7605	43.4708	51.98	46.8512	254.94

Torsion Force and Torsion Reinforcement for Torsion, T_u & V_{U2}

T_u kN-m	V_u kN	Core b_1 mm	Core d_1 mm	Rebar A_{svt} /s mm²/m
0.0046	3.7605	170	540	0

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SLAB DESIGN

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DESIGN OF SLAB : **TS29**

Panel Name : One longer edge discontinuous Code : 6

Clear Longer span, ly = 3300 mm

Clear Shorter span, lx = 3250 mm

ly / lx = 1.02 < 2, Hence, Twoway slab.

Effective Longer span = 3396.00 mm

Effective Shorter span = 3346.00 mm

Assume thickness of slab = 125.00 mm

Effective depth available = 96.00 mm

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Loads :

Dead Load and Imposed Load (fixed) :

Floor finish = 1.200 kN/m^2

Self weight = 3.125 kN/m^2

w_{DL} = 4.325 kN/m^2

Imposed Load (Not fixed) :

Occupancy classification as per IS: 875(Part 2) - 1987 :

Live load = 2.000 kN/m^2

w_{LL} = 2.000 kN/m^2

Total load, $w = w_{DL} + w_{LL}$ = 6.325 kN/m^2

Span Moments:

Along Shorter span: BM = $\alpha_x w l_x^2$ = 0.029 x 6.33 x 3.346^2 = 2.02 kNm M_{ux1} = 3.03 kNm

Along Longer span: BM = $\alpha_y w l_x^2$ = 0.028 x 6.33 x 3.346^2 = 1.98 kNm M_{uy1} = 2.97 kNm

Support Moments:

Along Shorter span: BM = $\alpha_x w l_x^2$ = 0.038 x 6.33 x 3.346^2 = 2.67 kNm M_{ux2} = 4.00 kNm

Along Longer span: BM = $\alpha_y w l_x^2$ = 0.037 x 6.33 x 3.346^2 = 2.62 kNm M_{uy2} = 3.93 kNm

Check for section :

Factored Max. BM, Mu = 4.00 kNm / m

For M30 grade concrete & Fe550 grade steel , Mu, lim / bd^2 = 4.139

Effective depth required = 31.11 mm < Effective depth available, OK

Along the Shorter span

A_{st} reqd at midspan :

$A_{st} = [\ 0.5 f_{ck} / f_y\ ] \{1 - \sqrt{(\ 1 - [4.6\ M_{ux1} / (f_{ck}\ bd^2)]\ )}\}\ b\ d =$ 66.79 mm^2 / m

Provide 8 mm dia bars @ 200 mm c/c As = 251.33 mm^2 / m OK

A_{st} reqd at support :

$A_{st} = [\ 0.5 f_{ck} / f_y\ ] \{\ 1 - \sqrt{(\ 1 - [4.6\ M_{ux2} / (f_{ck}\ bd^2)])}\}\ b\ d =$ 88.72 mm^2 / m

Provide 8 mm dia bars @ 200 mm c/c As = 251.33 mm^2 / m OK

Along the Longer span

A_{st} reqd at midspan :

$A_{st} = [\ 0.5 f_{ck} / f_y\ ] \{1 - \sqrt{(\ 1 - [4.6\ M_{uy1} / (f_{ck}\ bd^2)]\ )}\}\ b\ d =$ 65.60 mm^2 / m

Provide 8 mm dia bars @ 200 mm As = 251.33 mm^2 / m OK

A_{st} reqd at support :

$A_{st} = [\ 0.5 f_{ck} / f_y\ ] \{\ 1 - \sqrt{(\ 1 - [4.6\ M_{uy2} / (f_{ck}\ bd^2)])}\}\ b\ d =$ 87.05 mm^2 / m

Provide 8 mm dia bars @ 200 mm c/c As = 251.33 mm^2 / m OK

Min Ast = 0.12% Gross section area = 150 mm^2 / m

Distribution steel = 0.5 x (0.12/100) x 1000 x 125 = 75.00 mm^2 / m

Provide 8 mm dia bars @ 250 mm c/c As = 201.06 mm^2 / m OK

Max Spacing = 3d or 300 mm whichever is less = 288 mm or 300 mm

Check for deflection:

fs = 0.58 x fy x (Ast req/Ast pro) = 84.77 MPa

MF = $1/(0.225+0.00322\ fs - 0.625 \log 10\ (l/pt)) \le 2$ = 2.000

Type of Slab = Continuous

Effective Shorter span = 3346.00 mm

Basic Value = 40

Allowable l/d = 64.00

Actual l/d = 34.85 Hence OK

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GEO MARINE
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RAMANIYAM
...dreams accomodated

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PROJECT

GEOTECHNICAL INVESTIGATION FOR THE PROPOSED RESIDENTIAL BUILDING CONSISTING OF TWO BASEMENT FLOOR + STILT + SIXTEEN UPPER FLOORS AT NERKUNDRAM, CHENNAI

CLIENT

M/s RAMANIYAM REAL ESTATES (P) LTD.,
RAMANIYAM CORPORATE OFFICE,
NO-1735, 2ND MAIN ROAD,
GANDHI NAGAR, ADYAR,
CHENNAI-6000 020.

TITLE

GEOTECHNICAL INVESTIGATION REPORT

REPORT NO.: GT- 2374

GEO MARINE CONSULTANTS PVT.LTD. CHENNAI-41

DATE	REVISON	DESCRIPTION		AUTHORISED SIGNATORY
10/10/2022	FIRST SUBMISSION	SUBMISSION OF GEOTECHNICAL REPORT	SIGN	
			DATE	10/10/2022
			DESIGNATION	**MANAGING DIRECTOR**
			NAME	**DR. C.V.PRASAD**

Road 19/10/22

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GEOMARINE

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REPORT TEXT

CHAPTER-1

INTRODUCTION

1.0 PROJECT INFORMATION MATRIX:

NATURE OF PROJECT	: **PROPOSED RESIDENTIAL BUILDING**
STRUCTURE	: **2 BASEMENT + STILT + 16 FLOORS**
PROJECT OWNER	: **M/s RAMANIYAM REAL ESTATES (P) LTD**
PROJECT LOCATION	: **NERKUNDRAM, CHENNAI**
JOB CODE	: **GT-2374**

1.1 SCOPE OF WORK:

1.1.1 FIELD WORK:

- Conducting nine soil investigation bore holes of 150 mm diameter in Soil & Overburden. In case of rock formation NX Diameter with Core barrel shall be adopted to progress the drilling up the termination depth.
- Conducting Standard Penetration Test (SPT) within the borehole at:
  - Every 1.0m depth interval up to 6.0m.
  - From 6.0m to 12.0m, SPT is conducted at every 1.5m depth interval
  - From 12.0m to 20.0m SPT is conducted at every 2.0m depth interval
  - Beyond 20.0m SPT is conducted at every 2.5m depth interval till the termination depth.
  - Depth of investigation ranges from 30.0m to 33.0m below the existing ground level.
- Collection of disturbed soil samples at SPT location and undisturbed samples from the clayey strata with SPT-value greater than 2 to less than 15 if met within the investigation depth
- Collection of water samples if groundwater table met within the investigation depth

1.1.2 LABORATORY WORK:

- Natural Moisture Content
- Atterberg's limits
- Grain Size Analysis
- Consolidation test on undisturbed samples if applicable
- Chemical Analysis test on soil and water samples to give pH, Chlorides and Sulphates

1.2 STRUCTURE OF THE REPORT:

- Contents
- Introduction
- Investigation Methodology & Test Results
- Sub-Surface Stratification
- Foundation System
- Recommendation
- Annexure

CHAPTER-2

INVESTIGATION METHODOLOGY & TEST RESULTS

2.0 PREAMBLE:

Nine soil investigation boreholes were put as per the planning of the engineer in-charge and these locations are shown in Fig.2.0.The equipment used and the methodology adopted to carry out the fieldwork is described below.

2.1 METHODOLOGY OF FIELD WORK:

2.1.1 EQUIPMENT USED AND METHOD OF DRILLING:

All the boreholes were sunk by conventional rotary drilling rigs. For borehole Methodology followed for boring conformed to IS: 1892 -2000. Boring was progressed by the cutting action of rotating bit with water circulation and stabilizing the side of the boreholes by using casing pipes/bentonite slurry up to required depth to prevent collapse of sidewall. Boring was continued by normal boring process using MS soil cutter in soil. However Tungsten Carbide (TC) bit drilling was resorted to drill in highly weathered rock stratum where the normal boring process became slow. Diamond Core (DC) bit drilling was adopted in moderately weathered rock formations where penetration using TC bit was became slow.

2.1.2 STANDARD PENETRATION TESTS:

This is a field test to determine "Penetration Resistance of Stratum at the Test Depth". This has been conducted in the boreholes generally up to refusal depth using procedures described in IS: 2131- 2002. In this test, split spoon sampler (50.8 mm OD and 35 mm ID) has replaced driving bit. Sampler is then driven by dropping 63.5 kg hammer on top of driving collar with free fall of 75 cm. The length of sampler is 60 cm.

The tests were conducted at the depth intervals indicated in Chapter-1 (Sec.1.1.1).

2.1.3 COLLECTION OF SOIL SAMPLES:

2.1.3.1 DISTURBED SAMPLES:

The SPT-samples collected were used as disturbed soil samples. These samples were used for visual and physical identification and for conducting laboratory classification tests as per I.S.1498-1970.

2.1.3.2 UNDISTURBED SAMPLES:

From the soft to stiff clay layer, representative undisturbed samples were collected. These samples were used primarily to establish the compressibility parameters to estimate the settlements of shallow foundation system wherever applicable.

2.1.4 COLLECTION OF GROUND WATER SAMPLES:

One representative water sample from each borehole was collected after 24 hours of completing the borehole if water table met within the investigated depth.

NOTE ON GROUNDWATER TABLE RECORD:

- Groundwater table observation in geotechnical report is predominantly to arrive at foundation design criteria and shall not be construed as design guidelines for the design of dewatering systems
- The groundwater level indicated in the bore logs is specific to the duration of investigation and intensity of the monsoon rains during the time of investigation. Hence, the level shall be taken as guidelines only to plan the investigation for the dewatering system
- No foundation excavation or basement excavations if anticipated within the groundwater table zone shall be carried out without implementing groundwater lowering schemes

2.2 LABORATORY TESTING:

2.2.1 ON COARSE GRAINED SOIL:

On the representative samples, sieve analysis tests were conducted to arrive at grain size distribution. These tests were conducted as per I.S.2720 (part 4)-1985 and the results are presented in Tables-2.1 to 2.9. The graphical representation of grainsize distribution curve for the representative samples in each bore is presented in Fig. 2.13 to 2.21.

2.2.2 ON FINE GRAINED SOIL:

On the SPT sample index property tests were conducted to estimate consistency. These test results are presented in Tables-2.1 to 2.9. The graphical representation of hydrometer analyses curve for the representative samples in each bore is presented in Fig. 2.22 to 2.45.

2.2.3 CHEMICAL ANALYSIS TESTS:

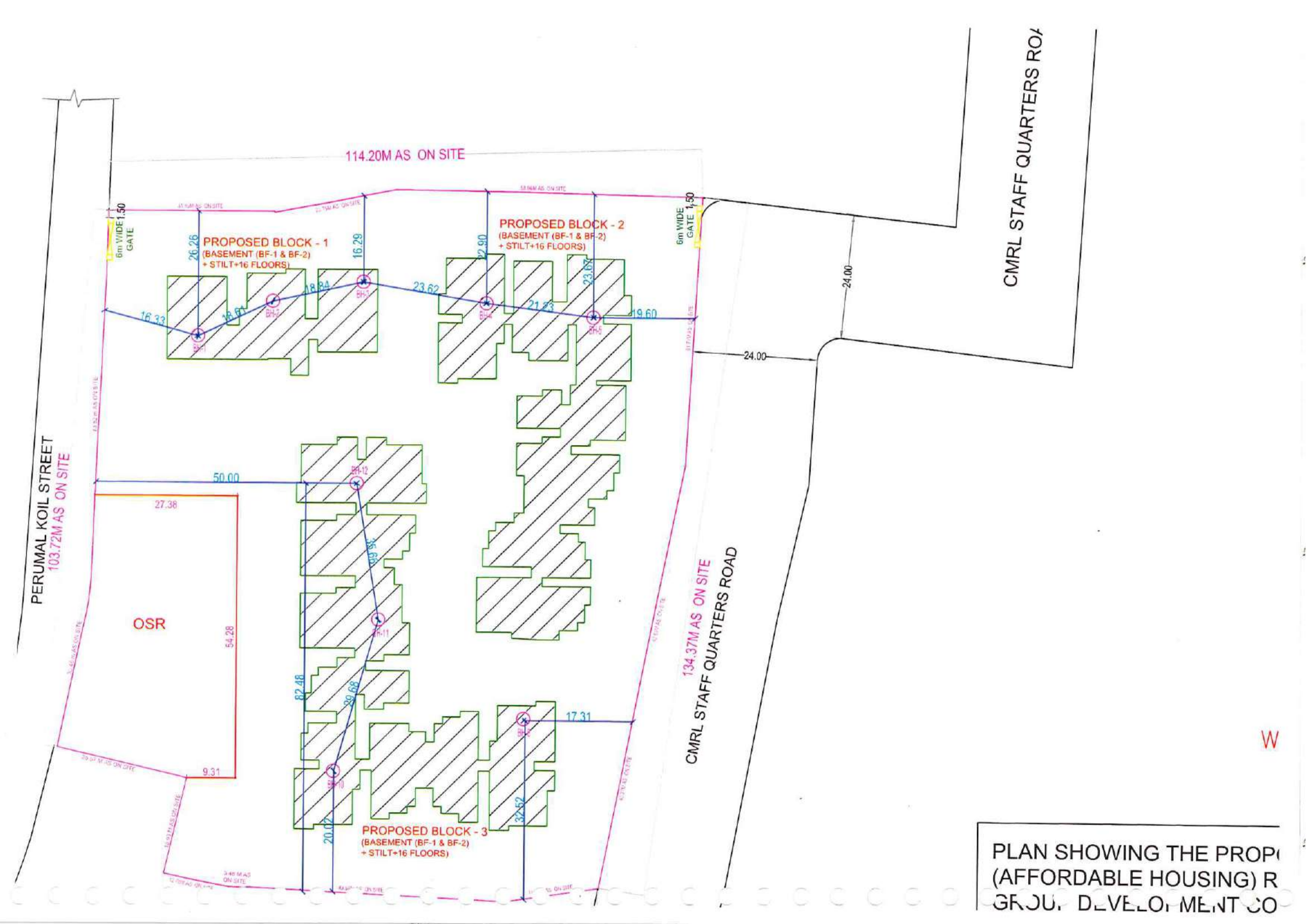
On representative soil and water samples chemical analysis tests were conducted to estimate pH, Chloride and Sulphates and these results are presented in Table - 2.10.

2.3 SUMMARY:

The locations of the field investigation boreholes are shown in site plan given in Fig.2.0. The average sub soil profiles encountered at each location along with their classification and engineering properties are presented in Figs.2.1 to 2.9.

Further, the cross sectional variation of the sub surface profile through different bore holes in vertical and horizontal direction longitudinally or transversely are presented in Figs.2.10 to 2.12

SITE PLAN


114.20M AS ON SITE
PROPOSED BLOCK - 1
(BASEMENT (BF-1 & BF-2)
+ STILT+16 FLOORS)
PROPOSED BLOCK - 2
(BASEMENT (BF-1 & BF-2)
+ STILT+16 FLOORS)
PROPOSED BLOCK - 3
(BASEMENT (BF-1 & BF-2)
+ STILT+16 FLOORS)
6m WIDE GATE 1.50
6m WIDE GATE 1.50
CMRL STAFF QUARTERS ROA
CMRL STAFF QUARTERS ROAD
PERUMAL KOIL STREET
103.72M AS ON SITE
134.37M AS ON SITE
OSR
27.38
54.28
9.31
50.00
24.00
24.00
26.26
16.29
16.33
18.84
23.62
22.90
23.62
21.23
19.60
82.48
29.68
17.31
32.52
20.02
BH-1
BH-2
BH-3
BH-4
BH-5
BH-10
BH-11
BH-12
W
PLAN SHOWING THE PROP
(AFFORDABLE HOUSING) R
GROU DEVELOPMENT CO

SOIL PROFILES

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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-01						
SHEET	1	OF	4				
PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING			DIA OF BORE HOLE	150mm ✓ / NX		
LOCATION	Block-1	MACHINE No.	HR-01	CHAINAGE (m)	-	BORE START DATE	24/05/2022
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	25/05/2022
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	2

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
1	24/05/2022	11	00	SC	-	-												
		To																
		11	05				2	8	8	16	1.00	1	SS	-1.0				**Filled Up** **Brown Silty Sand With Brick Pats Mix**
		11	20								1.45					L1	1.5	
		To		SC	-	-												
2		11	25				3	4	5	9	2.00	2	SS	-2.0				
		11	40								2.45							
		To		SC	-	-												Brown,Moist,Stiff,**Silty CLAY (CL-ML) & Silty CLAY (CI)** Clay of Low & Medium Plasticity
3		11	44				-	-	-	-	3.00	3	UDS	-3.0				
		12	05															
		To		SC	-	-												
4		12	09				8	13	15	28	4.00	4	SS	-4.0		L2	4.0	
		12	25								4.45							
		To		SC	-	-												
5		12	09				15	20	15	35	5.00	5	SS	-5.0				
		12	60								5.45							
		To		SC	-	-												
6		12	54				18	25	20	45	6.00	6	SS	-6.0				Brown,Moist,Poorly Graded,Pred. Find Grains @ Parts & Pred. Medium Grains @ Parts,Medium Dense & Dense, **Poorly Graded SAND - Silty SAND (SP-SM) & Silty SAND (SM)**
		14	00								6.45							
		To		SC	-	-												
7		14	06															
							12	20	25	45	7.50	7	SS	-7.5				
											7.95							
8		14	25															
		To		SC	-	-												
		14	29															
9							12	8	9	17	9.00	8	SS	-9.0		L3	9.0	
											9.45							
		14	55															Brown,Grey,Moist,Poorly Graded,Pred. Medium Grains,Fine & Medium Grains, Medium Dense,**Poorly Graded SAND - Silty SAND (SP-SM)**
10		To		SC	-	-												
		14	59															

CS - Core Sample	DS - Disturbed Sample	LOGGED	K. Sivasankaran	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	24/05/2022	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	A. Vinoth	WATER TABLE (m) 4.30	
WS - Wash Sample	DB - Diamond Bit	DATE	16/06/2022	CASING DEPTH (m) 0.00	

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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-01		
SHEET	2	OF	4
DIA OF BORE HOLE	150mm ✓	NX	
BORE START DATE	24/05/2022		
BORE END DATE	25/05/2022		
TOTAL DRILL DAYS	2		

PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING						
LOCATION	Block-1	MACHINE No.	HR-01	CHAINAGE (m)	-		
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N	-	
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E	-	

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Legend	Layer Data: No	Depth	Geotechnical Description
11	24/05/2022	15	20	SC	-	-	19	13	8	21	10.50	9	SS	-10.5				Brown,Grey,Moist,Poorly Graded,Pred. Medium Grains,Fine & Medium Grains, Medium Dense,**Poorly Graded SAND - Silty SAND (SP-SM) & Silty SAND (SM)**
		To									10.95							
		15	23															
12							3	4	5	9	12.00	10	SS	-12.0		L4	12.0	
											12.45							
		15	47															
13		To		SC	-	-												
		15	52															
14							2	5	6	11	14.00	11	SS	-14.0				Black,Dark Grey,Moist,Stiff,**Silty CLAY (CH)** Clay of High Plasticity
											14.45							
		16	30															
15		To		SC	-	-												
		16	33															
16							1	3	4	7	16.00	12	SS	-16.0		L5	16.0	
											16.45							
		17	05															
17		To		SC	-	-												Black,Dark Grey,Moist,Medium Stiff,**Silty CLAY (CI)** Clay of Medium Plasticity
		17	09															
18							3	6	4	10	18.00	13	SS	-18.0		L6	18.0	
											18.45							
		17	37															
19		To		SC	-	-												Black,Dark Grey,Moist,Stiff,**Silty CLAY (CI)** Clay of Medium Plasticity Shells Mix @ 20.0m Sample
		17	42															
20							4	6	8	14	20.00	14	SS	-20.0				
											20.45							

CS - Core Sample	DS - Disturbed Sample	LOGGED	K. Sivasankaran	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	24/05/2022	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	A. Vinoth	WATER TABLE (m) 4.30	
WS - Wash Sample	DB - Diamond Bit	DATE	16/06/2022	CASING DEPTH (m) 0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-01						
SHEET	3	OF	4				
PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING			DIA OF BORE HOLE	150mm ✓	NX	
LOCATION	Block-1	MACHINE No.	HR-01	CHAINAGE (m)	-	BORE START DATE	24/05/2022
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	25/05/2022
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	2

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
21		09	20	SC	-	-												Black,Dark Grey,Moist,Stiff,Silty CLAY (CI) Clay of Medium Plasticity
		To																
22		09	30															
							5	13	8	21	22.50	15	SS	-22.5		L7	22.5	
23											22.95							
		10	20	SC	-	-												Grey,Moist,Poorly Graded, Fine to Coarse Sand With Gravels,Medium Dense,Clayey Silty SAND (SC) With Lenses of Fissile Clay
24		To																
		10	32															
25	25/05/2022						13	23	27	50	25.00	16	SS	-25.0		L8	25.0	
											25.45							
26		11	25	SC	-	-												Grey,Brown,Moist,Hard,Fissile Silty CLAY (CH)/ Soft Shale Texture Fissile Clay of High Plasticity
		To																
27		11	30															
							27	45	39	84	27.50	17	SS	-27.5		L9	27.5	
28											27.95							
		12	20	SC	-	-												Grey,Yellow Grey,Moist,Poorly Graded, Fine & Medium Grains Sands,Very Dense,Silty SAND (SM)
29		To																
		12	46															
30							15cm Penet for 57Blows			>100	30.00	18	SS	-30.0		L10	30.0	
											30.15							Grey,Fine Grains Structure,Fissile Texture,Hard,Lithified SHALE Rock of Gondwana Formation

CS - Core Sample	DS - Disturbed Sample	LOGGED	K. Sivasankaran	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	25/05/2022	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	A. Vinoth	WATER TABLE (m)	4.30	
WS - Wash Sample	DB - Diamond Bit	DATE	16/06/2022	CASING DEPTH (m)	0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-01						
SHEET	4	OF	4				
PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING			DIA OF BORE HOLE	150mm	✓	
					NX	✓	
LOCATION	Block-1	MACHINE No.	HR-01	CHAINAGE (m)	-	BORE START DATE	24/05/2022
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	25/05/2022
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	2

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
31	25/05/2022	14	05	DB	-	-												Grey,Fine Grains Structure,Fissile Texture,Hard,Lithified **SHALE Rock of Gondwana Formation upto 31.0m Beyond 31.0m.** Grey,Moist,Sub Fissile to Fissile Texture,Hard,**Fissile CLAY/ Soft SHALE of Gondwana Formation**
32		To 14	35															
33		15	35	SC	-	-	33	11cm Penet for 58Blows		>100	33.00 / 33.26	19	SS	-33.0		L11	33.3	
34		To 16	10															
35																		
36																		
37																		
38																		
39																		
40																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	K. Sivasankaran	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	25/05/2022	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	A. Vinoth	WATER TABLE (m) 4.30	
WS - Wash Sample	DB - Diamond Bit	DATE	16/06/2022	CASING DEPTH (m) 0.00	

Borehole terminated at 33 m depth below E.G.L

FIG.2.1 Sub Soil Profile at BH-01 Location

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-02		
SHEET	1	OF	4
DIA OF BORE HOLE	150mm ✓ / NX		
BORE START DATE	20/05/2022		
BORE END DATE	23/05/2022		
TOTAL DRILL DAYS	3		

PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING				
LOCATION	Block-1	MACHINE No.	HR-01	CHAINAGE (m)	-
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E -

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
0	20/05/2022	14	00	SC	-	-												
		To																
		14	12															
1		14	37				7	12	15	27	1.00 / 1.45	1	SS	-1.0				
		To		SC	-	-												
		14	41															
2		15	00				8	11	12	23	2.00 / 2.45	2	SS	-2.0				Brown,Moist,Very Stiff,**Silty CLAY (CL & CI)** Clay of Low & Medium Plasticity
		To		SC	-	-												
		15	38															
3		15	30				6	11	11	22	3.00 / 3.45	3	SS	-3.0				
		To		SC	-	-												
		15	38															
4		15	55				9	12	10	22	4.00 / 4.45	4	SS	-4.0		L1	4.0	
		To		SC	-	-												Brown,Moist,Poorly Graded,Pred. Fine Grains Sand,**Silty SAND (SM) With Little & Non Plastic SILT**
		15	59															
5		16	17				4	10	27	37	5.00 / 5.45	5	SS	-5.0		L2	5.0	
		To		SC	-	-												
		16	22															
6		16	50				6	9	25	34	6.00 / 6.45	6	SS	-6.0				Brown,Moist,Poorly Graded,Fine & Medium Grains Sand,Dense,**Silty SAND (SM) & Clayey Silty SAND (SC)**
		To		SC	-	-												
7		16	56															
		17	20				8	11	12	23	7.50 / 7.95	7	SS	-7.5		L3	7.5	
8		To		SC	-	-												
		17	24															
9	21/05/2022	11	05				6	8	10	18	9.00 / 9.45	8	SS	-9.0				Grey,Moist,Poorly Graded,Fine & Medium Grains Sand,Pred. Fine Grains Sand,Medium Dense,**Poorly Graded SAND - Silty SAND (SP-SM) & Silty SAND (SM)**
		To		SC	-	-												
10		11	10															

CS - Core Sample	DS - Disturbed Sample	LOGGED	K. Sivasankaran	PROJECT SITE DETAILS		REMARKS	
SS - Split Spoon Sample	SC - Soil Cutter	DATE	21/05/2022	GROUND LEVEL (m)	0.00		
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	A. Vinoth	WATER TABLE (m)	4.30		
WS - Wash Sample	DB - Diamond Bit	DATE	17/06/2022	CASING DEPTH (m)	0.00		

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-02						
SHEET	2	OF	4				
PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING					DIA OF BORE HOLE	150mm ✓ / NX
LOCATION	Block-1	MACHINE No.	HR-01	CHAINAGE (m)	-	BORE START DATE	20/05/2022
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	23/05/2022
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
11	21/05/2022	11	29	SC	-	-	3	11	16	27	10.50 / 10.95	9	SS	-10.5				Grey,Moist,Poorly Graded,Fine & Medium Grains Sand,Pred. Fine Grains Sand,Medium Dense,**Poorly Graded SAND - Silty SAND (SP-SM) & Silty SAND (SM)**
		To																
		11	34															
12							3	6	9	15	12.00 / 12.45	10	SS	-12.0		L4	12.0	
		11	56															
13		To		SC	-	-												
		11	59															
14							4	7	7	14	14.00 / 14.45	11	SS	-14.0				Black,Dark Grey,Moist,Stiff,**Silty CLAY (CL) With Sand Lenses & Silty CLAY (CH)** Clay of Low & High Plasticity
		12	25															
15		To		SC	-	-												
		12	29															
16							-	-	-	-	16.00	-	UDS	-16.0		L5	16.0	
		12	54															
		To		SC	-	-												
17		13	00															
18							3	3	5	8	18.00 / 18.45	12	SS	-18.0				Black,Moist,Stiff,**Silty CLAY (CI)** Lean Clay of Medium Plasticity
		14	00															
19		To		SC	-	-												
		14	10															
20							4	8	12	20	20.00 / 20.45	13	SS	-20.0		L6	20.0	
																		Black,Moist,Very Stiff,**Silty CLAY (CI)** Lean Clay of Medium Plasticity

CS - Core Sample	DS - Disturbed Sample	LOGGED	K. Sivasankaran	PROJECT SITE DETAILS		REMARKS	
SS - Split Spoon Sample	SC - Soil Cutter	DATE	21/05/2022	GROUND LEVEL (m)	0.00	*(F) - Sample Failed	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	A. Vinoth	WATER TABLE (m)	4.30		
WS - Wash Sample	DB - Diamond Bit	DATE	17/06/2022	CASING DEPTH (m)	0.00		

GEOMARINE
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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-02		
SHEET	3	OF	4
DIA OF BORE HOLE	150mm ✓	NX	

PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING					BORE START DATE	20/05/2022
LOCATION	Block-1	MACHINE No.	HR-01	CHAINAGE (m)	-		
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	23/05/2022
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
21		10	40															
		To		SC	-	-												Black,Moist,Very Stiff,**Silty CLAY (CI)** Lean Clay of Medium Plasticity
22		10	49															
							11	17	19	**36**	22.50	15	SS	-22.5		L7	22.5	
23											22.95							
		11	27															
24		To		SC	-	-												
		11	55															
25	23/05/2022						13	19	25	**44**	25.00	16	SS	-25.0				Grey,Green Shades,Moist,Pred. Fine Grain Sand Mix,Dense,**Clayey Silty SAND (SC)**
											25.45							
26		12	35															
		To		SC	-	-												
27		12	49															
							27	10cm Penet for 60Blows		**>100**	27.50	17	SS	-27.5		L8	27.5	
											27.75							
28																		
		14	06															Brown Yellow,Moist,Poorly Graded, Fine & Medium Grains Sand, Very Dense,**Silty SAND (SM)**
29		To		SC	-	-												
		14	28															
30							47	5cm Penet for 55Blows		**>100**	30.00	18	SS	-30.0		L9	30.0	
											30.20							Grey,Moist,Fine Grain Structure,Fissile Texture,**Fissile Silty CLAY (CH)**

CS - Core Sample	DS - Disturbed Sample	LOGGED	K. Sivasankaran	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	23/05/2022	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	A. Vinoth	WATER TABLE (m) 4.30	
WS - Wash Sample	DB - Diamond Bit	DATE	17/06/2022	CASING DEPTH (m) 0.00	

GEOMARINE
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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-02						
SHEET	4	OF	4				
PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING			DIA OF BORE HOLE	150mm	✓	
					NX		
LOCATION	Block-1	MACHINE No.	HR-01	CHAINAGE (m)	-	BORE START DATE	20/05/2022
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	23/05/2022
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
31	23/05/2022	15 To 15	15 To 45	SC	-	-												
32																		Grey,Moist,Fine Grain Structure,Fissile Texture,Fissile Silty CLAY (CH) Partly Lithified SHALE Rock & Beyond 30.5m/31.0m Soft SHALE Gondwana Formation
33							21	45	18	63	33.00 / 33.45	19	SS	-33.0		L10	33.5	
34																		
35																		
36																		
37																		
38																		
39																		
40																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	K. Sivasankaran	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	23/05/2022	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	A. Vinoth	WATER TABLE (m)	4.30	
WS - Wash Sample	DB - Diamond Bit	DATE	17/06/2022	CASING DEPTH (m)	0.00	

Borehole terminated at 33 m depth below E.G.L

FIG.2.2 Sub Soil Profile at BH-02 Location

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-03						
SHEET	1	OF	4				
PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING			DIA OF BORE HOLE	150mm ✓ / NX		
LOCATION	Block-1	MACHINE No.	HR-01	CHAINAGE (m)	-	BORE START DATE	18/05/2022
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	19/05/2022
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	2

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
0	18/05/2022	11	00	SC	-	-												
		To																
		11	02															
1							7	11	13	24	1.00	1	SS	-1.0				
		11	10								1.45							
		To		SC	-	-												
		11	12															
2							8	13	18	31	2.00	2	SS	-2.0				
		11	21								2.45							Brown,Moist,Very Stiff to Hard,**Silty CLAY (CL) & Silty CLAY (CH)**
		To		SC	-	-												Clay of Low & High Plasticity
		11	30															@ 1.0m Sand & Pred. Silt Mixture
3							9	15	18	33	3.00	3	SS	-3.0				
		11	42								3.45							
		To		SC	-	-												
		11	50															
4							2	11	11	22	4.00	4	SS	-4.0				
		12	04								4.45							
		To		SC	-	-												
		12	06															
5							16	27	23	50	5.00	5	SS	-5.0		L1	5.0	
		12	18								5.45							
		To		SC	-	-												
		12	20															
6							22	20	20	40	6.00	6	SS	-6.0				
		12	31								6.45							
		To		SC	-	-												
		12	34															
7							10	16	16	32	7.50	7	SS	-7.5				Brown,Moist,Poorly Graded,Fine & Medium Gains Sand,Dense,**Silty SAND (SM) & Poorly Graded SAND - Silty SAND (SP-SM)**
		12	48								7.95							
8		To		SC	-	-												
		12	50															
9							19	18	12	30	9.00	8	SS	-9.0				
		14	05								9.45							
		To		SC	-	-												
10		14	08															

CS - Core Sample	DS - Disturbed Sample	LOGGED	O.Venugopal	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	18/05/2022	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m) 4.30	
WS - Wash Sample	DB - Diamond Bit	DATE	22/06/2022	CASING DEPTH (m) 0.00	

GEOMARINE
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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-03		
SHEET	2	OF	4
DIA OF BORE HOLE	150mm ✓ / NX		
BORE START DATE	18/05/2022		
BORE END DATE	19/05/2022		
TOTAL DRILL DAYS	2		

PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING						
LOCATION	Block-1	MACHINE No.	HR-01	CHAINAGE (m)	-		
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N	-	
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E	-	

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
10							3	2	2	4	10.50	9	SS	-10.5		L2	10.5	Brown,Moist,Poorly Graded,Fine & Medium Gains Sand,Dense,Silty SAND (SM) & Silty SAND (SP-SM)
											10.95							
11		14 20 To 14 24		SC	-	-												Black,Dark Grey,Moist,Very Soft,Silty CLAY With Lenses of SAND (Cl) Clay of Medium Plasticity
12							3	6	10	16	12.00	10	SS	-12.0		L3	12.0	
											12.45							
13		14 36 To 14 40		SC	-	-												
14							2	6	8	14	14.00	11	SS	-14.0				Black,Dark Grey,Moist,Stiff to Very Stiff,Silty CLAY (CH) Clay of High Plasticity
											14.45							
15	18/05/2022	14 54 To 15 00		SC	-	-												
16							2	5	5	10	16.00	12	SS	-16.0		L4	16.0	
											16.45							
17		15 15 To 15 20		SC	-	-												Black,Dark Grey,Moist,Stiff,Silty CLAY (CH) Clay of High Plasticity
18							5	8	9	17	18.00	13	SS	-18.0		L5	18.0	
											18.45							
19		15 38 To 15 46		SC	-	-												Black,Moist,Very Stiff,Silty CLAY (CH) With Shells Mix Clay of High Plasticity
20							9	13	19	32	20.00	14	SS	-20.0		L6	20.0	
											20.45							Green,Brown Shades,Moist,Hard,Silty CLAY (CH) With Sand Mix at Times

CS - Core Sample	DS - Disturbed Sample	LOGGED	D.Venugopal	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	18/05/2022	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m) 4.30	
WS - Wash Sample	DB - Diamond Bit	DATE	22/06/2022	CASING DEPTH (m) 0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-03		
SHEET	3	OF	4
DIA OF BORE HOLE	150mm ✓ / NX		
BORE START DATE	18/05/2022		
BORE END DATE	19/05/2022		
TOTAL DRILL DAYS	2		

PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING						
LOCATION	Block-1	MACHINE No.	HR-01	CHAINAGE (m)	-	CO-ORDINATES	N -
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary				E -
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite				

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
21	18/05/2022	Total drilling time 0hr 20mins		SC	-	-												
22							15	27	29	56	22.50 / 22.95	15	SS	-22.5				Green,Brown Shades,Moist,Hard,**Silty CLAY (CH) With Sand Mix at Times** Clay of High Plasticity
23																		
24		Total drilling time 0hr 28mins		SC	-	-												
25							19	20	20	40	25.00 / 25.45	16	SS	-25.0		L7	25.0	
26	19/05/2022	Total drilling time 0hr 20mins		SC	-	-												Yellow,Grey & Brown Shades,Moist, Poorly Graded,Fine & Medium Grains Sand,Dense,**Clayey Silty SAND (SC)**
27							45	10cm Penet for 50Blows		>100	27.50 / 27.75	17	SS	-27.5		L8	27.5	
28																		
29		Total drilling time 0hr 50mins		SC	-	-												Yellow,Grey & Brown Shades,Moist, Poorly Graded,Fine & Medium Grains Sand With Traces of Coarse Sand,Very Dense,**Clayey Silty SAND (SC)**
30							40	10cm Penet for 50Blows		>100	30.00 / 30.25	18	SS	-30.0		L9	30.0	
																		Brown,Moist,Fine Grains Structure, Fissile Texture,Hard,**Fissile SILTY CLAY (CH)/Soft SHALE of Gondwana**

CS - Core Sample	DS - Disturbed Sample	LOGGED	D.Venugopal	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	19/05/2022	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m) 4.30	
WS - Wash Sample	DB - Diamond Bit	DATE	22/06/2022	CASING DEPTH (m) 0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-03						
SHEET	4	OF	4				
PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING			DIA OF BORE HOLE	150mm ✓ / NX		
LOCATION	Block-1	MACHINE No.	HR-01	CHAINAGE (m)	-	BORE START DATE	18/05/2022
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	19/05/2022
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	2

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
31	19/05/2022	14 To 14	05 50	SC	-	-												
32																		Brown,Moist,Fine Grains Structure, Fissile Texture,Hard,Fissile SILTY CLAY (CH)/Soft SHALE of Gondwana Formation
33							45	8cm Penet for 50Blows		>100	33.00 / 33.23	19	SS	-33.0		L10	33.3	Lithified Shale Rock @ Locations
34																		
35																		
36																		
37																		
38																		
39																		
40																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	O.Venugopal	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	19/05/2022	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m)	4.30	
WS - Wash Sample	DB - Diamond Bit	DATE	22/06/2022	CASING DEPTH (m)	0.00	

Borehole terminated at 33 m depth below E.G.L

FIG.2.3 Sub Soil Profile at BH-03 Location

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-04		
SHEET	1	OF	4
DIA OF BORE HOLE	150mm ✓ / NX		
BORE START DATE	12/05/2022		
BORE END DATE	14/05/2022		
TOTAL DRILL DAYS	3		

PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING						
LOCATION	Block-2	MACHINE No.	HR-01	CHAINAGE (m)	-	CO-ORDINATES	N - / E -
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary				
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite				

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
1	12/05/2022	10	50	SC	-	-												
		To																
		10	54				4	8	11	19	1.00	1	SS	-1.0				
		11	08								1.45							
		To		SC	-	-												
		11	12															
2							4	6	8	14	2.00	2	SS	-2.0				Brown,Moist,Very Stiff & Stiff at Times, **Silty CLAY (CI & CL)** Clay of Medium & Low Plasticity
		11	25								2.45							
		To		SC	-	-												
		11	28															
3							8	8	9	17	3.00	3	SS	-3.0				
		11	51								3.45							
		To		SC	-	-												
		11	53															
4							4	5	5	10	4.00	4	SS	-4.0		L1	4.0	
		12	15								4.45							Brown,Moist,Poorly Graded,Fine Grain Sands,Loose,**Fine Sandy SILT (ML)** Sandy Silt of No Plasticity
		To		SC	-	-												
		12	17															
5							8	16	18	34	5.00	5	SS	-5.0		L2	5.0	
		16	00								5.45							
		To		SC	-	-												
		16	02															
6							16	18	20	38	6.00	6	SS	-6.0				
		16	15								6.45							
		To		SC	-	-												Brown,Light Green at Times,Moist, Poorly Graded,Fine & Medium Grains Sand Fraction,Dense & Medium Dense, **Silty SAND (SM) & Poorly Graded SAND - Silty SAND (SP-SM)**
		16	17															
7							12	14	16	30	7.50	7	SS	-7.5				
		16	32								7.95							
		To		SC	-	-												
		16	34															
9							3	4	5	9	9.00	8	SS	-9.0		L3	9.0	
		16	51								9.45							Black,Dark Grey,Moist,Stiff,**Silty CLAY (CH)** Clay of High Plasticity
		To		SC	-	-												
10		16	55															

CS - Core Sample	DS - Disturbed Sample	LOGGED	D.Venugopal	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	12/05/2022	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m) 4.00	
WS - Wash Sample	DB - Diamond Bit	DATE	22/06/2022	CASING DEPTH (m) 0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-04		
SHEET	2	OF	4

PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING					DIA OF BORE HOLE	150mm ✓ / NX
LOCATION	Block-2	MACHINE No.	HR-01	CHAINAGE (m)	-	BORE START DATE	12/05/2022
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	14/05/2022
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Layer Data: Geotechnical Description
11	12/05/2022	17	10	SC	-	-	3	4	5	9	10.50 / 10.95	9	SS	-10.5				
		To																
12		17	14				3	5	6	11	12.00 / 12.45	10	SS	-12.0				
13		08	55	SC	-	-												
		To																
14		09	00				2	5	5	10	14.00 / 14.45	11	SS	-14.0				
15		09	25	SC	-	-												Black,Dark Grey,Moist,Stiff,Silty CLAY (CH) & Silty CLAY (Cl) Clay of Medium & High Plasticity @18.0m Shells Mixture
		To																
16	13/05/2022	09	30				2	4	5	9	16.00 / 16.45	12	SS	-16.0				
17		10	00	SC	-	-												
		To																
18		10	06				2	5	8	13	18.00 / 18.45	13	SS	-18.0				
19		10	45	SC	-	-												
		To																
20		10	51				9	13	21	34	20.00 / 20.45	14	SS	-20.0		L4	20.0	Green,Moist,Hard,Silty CLAY (CH) With Sand Mix Clay of High Plasticity

CS - Core Sample	DS - Disturbed Sample	LOGGED	D.Venugopal	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	13/05/2022	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m) 4.00	
WS - Wash Sample	DB - Diamond Bit	DATE	22/06/2022	CASING DEPTH (m) 0.00	

GEOMARINE
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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-04		
SHEET	3	OF	4
DIA OF BORE HOLE	150mm ✓		
	NX		
BORE START DATE	12/05/2022		
BORE END DATE	14/05/2022		
TOTAL DRILL DAYS	3		

PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING						
LOCATION	Block-2	MACHINE No.	HR-01	CHAINAGE (m)	-		
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N	-	
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E	-	

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
21	13/05/2022	11	35	SC	-	-												Green,Moist,Hard,**Silty CLAY (CH) With Sand Mix** Clay of High Plasticity
		To																
22		11	50				18	20	35	**55**	22.50	15	SS	-22.5		L5	22.5	
23											22.95							
24		Total drilling time 0hr 15mins		SC	-	-												
25							26	35	35	**70**	25.00	16	SS	-25.0				Grey,Yellow Shades at Times,Hard, **Silty CLAY (CH) & Silty CLAY (CI) With Sand Mix** Clay of Medium & High Plasticity
											25.45							
26		15	15															
		To		SC	-	-												
27		15	35															
28							33	41	7cm Penet for 50Blows	**>100**	27.50	17	SS	-27.5		L6	27.5	
											27.90							
29	14/05/2022	08	55															Grey,Moist,Fine Grain Sand Mix,Hard, **Sandy Silty CLAY (CL)/ Compressed in Nature/Cemented** Sandy Clay of Low Plasticity
		To		SC	-	-												
30		09	55				50	12Cm Penet for 50Blows		**>100**	30.00	18	SS	-30.0		L7	30.0	
											30.27							Brown,Moist,Fine Grains Structure, Fissile Texture,Hard,**Fissile SILTY CLAY (CH)/Soft SHALE of Gondwana**

CS - Core Sample	DS - Disturbed Sample	LOGGED	D.Venugopal	PROJECT SITE DETAILS		REMARKS	
SS - Split Spoon Sample	SC - Soil Cutter	DATE	14/06/2022	GROUND LEVEL (m)	0.00		
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m)	4.00		
WS - Wash Sample	DB - Diamond Bit	DATE	22/06/2022	CASING DEPTH (m)	0.00		

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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-04						
SHEET	4	OF	4				
PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING			DIA OF BORE HOLE	150mm	✓	
					NX		
LOCATION	Block-2	MACHINE No.	HR-01	CHAINAGE (m)	-	BORE START DATE	12/05/2022
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	14/05/2022
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
31	14/05/2022	10 To 12	48 To 20	SC	-	-												Brown,Moist,Fine Grains Structure, Fissile Texture,Hard,Fissile SILTY CLAY (CH)/Soft SHALE of Gondwana Formation Lithified Shale Rock @ Locations
32																		
33							60	7Cm Penet for 50Blows		>100	33.00 | 33.23	19	SS	-33.0		L8	33.3	
34																		
35																		
36																		
37																		
38																		
39																		
40																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	D.Venugopal	PROJECT SITE DETAILS		REMARKS	
SS - Split Spoon Sample	SC - Soil Cutter	DATE	14/05/2022	GROUND LEVEL (m)	0.00		
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m)	4.00		
WS - Wash Sample	DB - Diamond Bit	DATE	22/06/2022	CASING DEPTH (m)	0.00		

Borehole terminated at 33 m depth below E.G.L

FIG.2.4 Sub Soil Profile at BH-04 Location

GEOMARINE
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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-05		
SHEET	1	OF	4
DIA OF BORE HOLE	150mm ✓	NX	
BORE START DATE	02/05/2022		
BORE END DATE	05/05/2022		
TOTAL DRILL DAYS	4		

PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING						
LOCATION	Block-2	MACHINE No.	Hydraulic Auto Trip Hammer	CHAINAGE (m)	-		
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N	-	
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E	-	

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
1	02/05/2022	14	11	SC	-	-												
		To																
		14	18															
		14	42				3	4	5	9	1.00	1	SS	-1.0				
		To		SC	-	-					1.45							Brown,Moist,Medium Stiff & Stiff,Silty CLAY (CI) Clay of Medium Plasticity
2		14	49															
		15	17				2	3	3	6	2.00	2	SS	-2.0				
		To		SC	-	-					2.45							
3		15	23															
		15	44				2	6	6	12	3.00	3	SS	-3.0		L1	3.0	
		To		SC	-	-					3.45							Brown Grey,Moist,Poorly Graded,Fine & Medium Grains Sand,Medium Dense, Silty SAND (SM) With Clay Binder of Little Plasticity
4		15	50															
		16	12				2	1	5	6	4.00	4	SS	-4.0		L2	4.0	
		To		SC	-	-					4.45							Brown,Moist,Poorly Graded,Fine & Medium Grains Sand,Loose,Silty SAND (SM) With Clay Binder of Little Plasticity
5		16	17															
		16	37				5	7	8	15	5.00	5	SS	-5.0		L3	5.0	
		To		SC	-	-					5.45							
6		16	41															
		17	18				5	6	7	13	6.00	6	SS	-6.0				
		To		SC	-	-					6.45							
7		17	23															Brown,Grey,Moist,Poorly Graded,Fine & Medium Grains Sand,Medium Dense, Silty SAND (SM) & Poorly Graded SAND - Silty SAND (SP-SM)
							5	7	8	15	7.50	7	SS	-7.5				
8	03/05/2022	09	05								7.95							
		To		SC	-	-												
		09	11															
9							2	2	2	4	9.00	8	SS	-9.0		L4	9.0	
		09	34								9.45							Grey,Moist,Poorly Graded,Fine & Medium Grains Sand,Loose,Silty SAND (SM)
		To		SC	-	-												
10		09	40															

CS - Core Sample	DS - Disturbed Sample	LOGGED	Karthik Prabhu	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	03/05/2022	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m) 4.00	
WS - Wash Sample	DB - Diamond Bit	DATE	22/06/2022	CASING DEPTH (m) 0.00	

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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-05		
SHEET	2	OF	4
DIA OF BORE HOLE	150mm ✓ / NX		
BORE START DATE	02/05/2022		
BORE END DATE	05/05/2022		
TOTAL DRILL DAYS	4		

PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING						
LOCATION	Block-2	MACHINE No.	Hydraulic Auto Trip Hammer	CHAINAGE (m)	-		
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N	-	
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E	-	

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
							5	4	3	7	10.50	9	SS	-10.5				
11		10	17	SC	-	-					10.95							Grey,Moist,Poorly Graded,Fine & Medium Grains Sand,Loose,Silty SAND (SM) & Silty SAND (SP-SM)
		To																
		10	25															
12							1	0	0	0	12.00	10	SS	-12.0		L5	12.0	
											12.45							
		11	12															
13		To		SC	-	-												Black,Dark Grey,Moist,Very Soft,Silty CLAY (CH) Clays of High Plasticity
		11	18															
14							1	1	1	2	14.00	11	SS	-14.0		L6	14.0	
											14.45							
		12	06															
15	03/05/2012	To		SC	-	-												
		12	13															
16							1	1	1	2	16.00	12	SS	-16.0				
											16.45							
		12	40															
17		To		SC	-	-												Black,Dark Grey,Moist,Very Soft,Silty CLAY (CI) & Silty CLAY (CH) Clay of Medium & High Plasticity
		12	52															
18							2	2	2	4	18.00	13	SS	-18.0				
											18.45							
		14	20															
19		To		SC	-	-												
		14	31															
20							2	5	6	11	20.00	14	SS	-20.0		L7	20.0	
											20.45							Grey Green,Moist,Stiff,Silty CLAY (CH) Clay of High Plasticity

CS - Core Sample	DS - Disturbed Sample	LOGGED	Karthik Prabhu	PROJECT SITE DETAILS		REMARKS	
SS - Split Spoon Sample	SC - Soil Cutter	DATE	03/05/2012	GROUND LEVEL (m)	0.00		
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m)	4.00		
WS - Wash Sample	DB - Diamond Bit	DATE	22/06/2022	CASING DEPTH (m)	0.00		

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-05		
SHEET	3	OF	4
DIA OF BORE HOLE	150mm ✓	NX	
BORE START DATE	02/05/2022		
BORE END DATE	05/05/2022		
TOTAL DRILL DAYS	4		

PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING						
LOCATION	Block-2	MACHINE No.	Hydraulic Auto Trip Hammer	CHAINAGE (m)	-		
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N	-	
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E	-	

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
21		15	40															
		To		SC	-	-												
22		15	51															
23	03/05/2022						4	6	9	15	22.50	15	SS	-22.5				Grey Green,Moist,Stiff,**Silty CLAY (CH) & Silty CLAY (CI)** Clay of Medium & High Plasticity
											22.95							
24		16	36															
		To		SC	-	-												
25		16	48				8	14	16	30	25.00	16	SS	-25.0		L8	25.0	
											25.45							
26		09	23															Brown Grey,Moist,Fine Grain Sand Mix,Hard, **Sandy Silty CLAY (CL)/ Compressed in Nature/Cemented** Sandy Clay of Low Plasticity
		To		SC	-	-												
27		10	04															
28	04/05/2022						25	30	33	63	27.50	17	SS	-27.5		L9	27.5	
											27.95							
		11	09															
29		To		SC	-	-												Brown,Grey Brown,Moist,Fine Grain Structure,Fissle & Sub Fissile Texture, **Fissile Silty CLAY (CH)/ Soft SHALE** Gondwana Formation
		11	53															
30							18	22	30	52	30.00	18	SS	-30.0				
											30.45							

CS - Core Sample	DS - Disturbed Sample	LOGGED	Karthik Prabhu	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	04/05/2022	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m) 4.00	
WS - Wash Sample	DB - Diamond Bit	DATE	22/06/2022	CASING DEPTH (m) 0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-05		
SHEET	4	OF	4
DIA OF BORE HOLE	150mm ✓ / NX		
BORE START DATE	02/05/2022		
BORE END DATE	05/05/2022		
TOTAL DRILL DAYS	4		

PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING						
LOCATION	Block-2	MACHINE No.	Hydraulic Auto Trip Hammer	CHAINAGE (m)	-		
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N	-	
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E	-	

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Layer Data: Geotechnical Description
31	04/05/2022	14	27	SC	-	-												
32		To					16	22	30	52	32.50	19	SS	-32.5				Brown,Grey Brown,Moist,Fine Grain Structure,Fissle & Sub Fissile Texture, **Fissile Silty CLAY (CH)/ Soft SHALE** Gondwana Formation
33		15	24								32.95							
34	05/05/2022	09	11	SC	-	-												
35		To					20	25	27	52	35.00	20	SS	-35.0				
		11	37								35.45				L10	35.5		
36																		
37																		
38																		
39																		
40																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	Karthik Prabhu	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	05/05/2022	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m)	4.00	
WS - Wash Sample	DB - Diamond Bit	DATE	22/06/2022	CASING DEPTH (m)	0.00	

Borehole terminated at 35 m depth below E.G.L

FIG.2.5 Sub Soil Profile at BH-05 Location

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-08		
SHEET	1	OF	3
DIA OF BORE HOLE	150mm ✓ / NX		
BORE START DATE	03/06/2022		
BORE END DATE	07/06/2022		
TOTAL DRILL DAYS	3		

PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING						
LOCATION	Block-3	MACHINE No.	HR-01	CHAINAGE (m)	-	CO-ORDINATES	N - / E -
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary				
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite				

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
0	03/06/2022	12	15	SC	-	-												
		To																
		12	16															
1		12	33				4	6	10	16	1.00 / 1.45	1	SS	-1.0				
		To		SC	-	-												
		12	34															
2		12	50				5	6	9	15	2.00 / 2.45	2	SS	-2.0				Brown,Brown Grey,Moist,Stiff,**Silty CLAY (CI) & Silty CLAY (CH)** Clay of Medium & High Plasticity
		To		SC	-	-												
		12	51															
3		14	18				-	-	-	-	3.00	3	UDS	-3.0				
		To		SC	-	-												
		14	19															
4		14	40				7	4	10	14	4.00 / 4.45	4	SS	-4.0		L1	4.0	
		To		SC	-	-												Brown Grey,Moist,Poorly Graded,Fine & Medium Grains Sand Fraction,Medium Dense,**Silty SAND (SM) With Clay Binder of Little Plasticity**
		14	41															
5		15	00				11	15	26	41	5.00 / 5.45	5	SS	-5.0		L2	5.0	
		To		SC	-	-												
		15	02															
6		15	30				11	12	16	28	6.00 / 6.45	6	SS	-6.0				
		To		SC	-	-												Brown,Brown Grey,Moist,Poorly Graded,Fine & Medium Grains Sand Fraction,Medium Dense & Dense,**Silty SAND (SM) & Poorly Graded SAND - Silty SAND (SP-SM)**
7		15	31															
		15	50				12	14	17	31	7.50 / 7.95	7	SS	-7.5				
8		To		SC	-	-												
		15	52															
9		16	21				6	10	8	18	9.00 / 9.45	8	SS	-9.0		L3	9.0	
		To		SC	-	-												Black,Dark Grey,Moist,Very Stiff,**Silty CLAY (CI)** Lean Clay of Medium Plasticity
10		16	26															

CS - Core Sample	DS - Disturbed Sample	LOGGED	Hariharan	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	03/06/2022	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	Nandhini J	WATER TABLE (m) 4.00	
WS - Wash Sample	DB - Diamond Bit	DATE	27/06/2022	CASING DEPTH (m) 0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-08						
SHEET	2	OF	3				
PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING			DIA OF BORE HOLE	150mm ✓ / NX		
LOCATION	Block-3	MACHINE No.	HR-01	CHAINAGE (m)	-	BORE START DATE	03/06/2022
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	07/06/2022
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
							5	6	8	14	10.50	9	SS	-10.5		L4	10.5	Black,Dark Grey,Moist,Very Stiff,Silty CLAY (CI) Lean Clay of Medium Plasticity
11		10	05	SC	-	-					10.95							
		To																
		10	06															
12							4	4	6	10	12.00	10	SS	-12.0				
											12.45							
		10	48															
13		To		SC	-	-												
		10	49															
14							3	4	4	8	14.00	11	SS	-14.0				Black,Dark Grey,Moist,Stiff,Silty CLAY (CH) Clays of High Plasticity
											14.45							
		11	18															
15	04/06/2022	To		SC	-	-												
		11	19															
16							-	-	-	-	16.00	12	UDS	-16.0				
		11	59															
		To		SC	-	-												
17		12	00															
18							8	10	13	23	18.00	13	SS	-18.0		L5	18.0	
											18.45							
		12	39															
19		To		SC	-	-												Brown Grey,Moist,Very Stiff,Silty CLAY (CH) With Fine Sand Lenses Clays of High Plasticity
		12	40															
20							13	14	14	28	20.00	14	SS	-20.0				
											20.45							

CS - Core Sample	DS - Disturbed Sample	LOGGED	Hariharan	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	04/06/2022	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	Nandhini J	WATER TABLE (m) 4.00	
WS - Wash Sample	DB - Diamond Bit	DATE	27/06/2022	CASING DEPTH (m) 0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-08		
SHEET	3	OF	3
DIA OF BORE HOLE	150mm ✓	NX	

PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING					BORE START DATE	03/06/2022
LOCATION	Block-3	MACHINE No.	HR-01	CHAINAGE (m)	-		
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	07/06/2022
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Legend	Layer Data: No	Depth	Geotechnical Description
21		14	40	SC	-	-												
		To																
22		14	42				8	10	16	26	22.50	15	SS	-22.5				Brown Grey,Moist,Very Stiff,**Silty CLAY (CH) With Fine Sand Lenses** Clays of High Plasticity
23											22.95							
24	04/06/2022	15	40	SC	-	-												
		To																
25		15	41				28	15cm Penet for 61Blows		>100	25.00	16	SS	-25.0		L6	25.0	
											25.30							
26		16	32	SC	-	-												Brown Grey,Moist,Hard,Fine Grain Sand Mix,**Sandy Silty CLAY (CL)/ Compressed in Nature/Cemented** Sandy Clay of Low Plasticity
		To																
27		16	34				17	15cm Penet for 62Blows		>100	27.50	17	SS	-27.5		L7	27.5	
											27.80							
28																		
29	07/06/2022	10	15	SC	-	-												Brown Grey,Moist,Poorly Graded,Fine & Medium Grains Sand,Very Dense, Clayey **Silty SAND/ Silty SAND (SM) With Binder**
		To																
30		11	15				35	10cm Pent for 50Blows		>100	30.00	18	SS	-30.0		L8	30.0	
											30.25							
																L9	30.3	Brown,Moist,Fine Grains Structure, Fissile Texture,Hard,**Fissile SILTY CLAY (CH)/Soft SHALE of Gondwana**

CS - Core Sample	DS - Disturbed Sample	LOGGED	HARHARAN/G.VENUGOPAL	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	07/06/2022	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	Nandhini J	WATER TABLE (m)	4.00	
WS - Wash Sample	DB - Diamond Bit	DATE	27/06/2022	CASING DEPTH (m)	0.00	

Borehole terminated at 30 m depth below E.G.L

FIG.2.6 Sub Soil Profile at BH-08 Location

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-10		
SHEET	1	OF	3
DIA OF BORE HOLE	150mm ✓ / NX		

PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING					BORE START DATE	01/06/2022
LOCATION	Block-3	MACHINE No.	HR-01	CHAINAGE (m)	-		
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	02/06/2022
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	2

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Legend	Layer Data: No	Depth	Geotechnical Description
0	01/06/2022	08	00															
		To		SC	-	-												
		08	09															
1							4	12	13	25	1.00 / 1.45	1	SS	-1.0				Brown Grey,Moist,Very Stiff,Silty CLAY (CL) Clay of Low Plasticity
		08	30															
		To		SC	-	-												
		08	39															
2							3	5	7	12	2.00 / 2.45	2	SS	-2.0		L1	2.0	
		08	54															
		To		SC	-	-												Grey,Brown Grey,Moist,Stiff,Silty CLAY (CL) Clay of Low Plasticity
		08	59															
3							4	7	10	17	3.00 / 3.45	3	SS	-3.0		L2	3.0	
		09	15															
		To		SC	-	-												Grey,Moist,Very Stiff,Silty CLAY (CH) Clay of High Plasticity
		09	17															
4							12	19	23	42	4.00 / 4.45	4	SS	-4.0		L3	4.0	
		09	39															
		To		SC	-	-												
		09	43															
5							12	15	19	34	5.00 / 5.45	5	SS	-5.0				
		10	40															
		To		SC	-	-												
		10	44															
6							6	6	20	26	6.00 / 6.45	6	SS	-6.0				
		11	05															
		To		SC	-	-												Brown,Moist,Poorly Graded,Fine & Medium Grains Sand,Medium Dense & Dense,Silty SAND (SM) & Poorly Graded SAND - Silty SAND (SP-SM)
		11	08															
7							9	15	28	43	7.50 / 7.95	7	SS	-7.5				
		11	28															
		To		SC	-	-												
		11	32															
9							5	26	22	48	8.00 / 9.45	8	SS	-9.0		L4	9.0	
		12	00															
		To		SC	-	-												Black,Moist,Hard,Silty CLAY (CL) With Sand Lenses Clay of Low Plasticity
10		12	04															

CS - Core Sample	DS - Disturbed Sample	LOGGED	K.Sivasankaran	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	01/06/2022	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m) 3.80	
WS - Wash Sample	DB - Diamond Bit	DATE	22/06/2022	CASING DEPTH (m) 0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-10		
SHEET	2	OF	3
DIA OF BORE HOLE	150mm ✓ / NX		
BORE START DATE	01/06/2022		
BORE END DATE	02/06/2022		
TOTAL DRILL DAYS	2		

PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING						
LOCATION	Block-3	MACHINE No.	HR-01	CHAINAGE (m)	-	CO-ORDINATES	N - / E -
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary				
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite				

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Legend	Layer Data: No	Depth	Geotechnical Description
																L5	10.5	Black,Moist,Hard,Silty CLAY (CL) With Sand Lenses Clay of Low Plasticity
11	01/06/2022	12 To 12	30 37	SC	-	-	4	6	7	13	10.50 / 10.95	9	SS	-10.5				
12							5	5	5	10	12.00 / 12.45	10	SS	-12.0				
13		14 To 14	00 09	SC	-	-												
14							-	-	-	-	14.00	11	UDS	-14.0				Black,Dark Grey,Moist,Stiff,Silty CLAY (CI) & Silty CLAY (CH) & Silty CLAY (CL) Clays of Low, Medium & High Plasticity
15		14 To 14	35 42	SC	-	-												
16							4	5	4	9	16.00 / 16.45	12	SS	-16.0				
17		15 To 15	25 30	SC	-	-												
18							2	3	4	7	18.00 / 18.45	13	SS	-18.0		L6	18.0	
19	02/06/2022	10 To 10	00 20	SC	-	-												Black,Dark Grey,Moist,Medium Stiff, Silty CLAY (CH) Clays of High Plasticity
20							10	14	17	31	20.00 / 20.45	14	SS	-20.0		L7	20.0	
																		Green Red,Moist,Hard,Silty CLAY (CH) Clays of High Plasticity

CS - Core Sample	DS - Disturbed Sample	LOGGED	K.Sivasankaran	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	02/06/2022	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m) 3.80	
WS - Wash Sample	DB - Diamond Bit	DATE	22/06/2022	CASING DEPTH (m) 0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-10		
SHEET	3	OF	3
DIA OF BORE HOLE	150mm ✓ / NX		
BORE START DATE	01/06/2022		
BORE END DATE	02/06/2022		
TOTAL DRILL DAYS	2		

PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING						
LOCATION	Block-3	MACHINE No.	HR-01	CHAINAGE (m)	-		
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N	-	
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E	-	

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Layer Data: Geotechnical Description
21	02/06/2022	11	00	SC	-	-												
		To																
22		11	20				10	20	22	42	22.50	15	SS	-22.5		L8	22.5	Green Red,Moist,Hard,**Silty CLAY (CH)** Clays of High Plasticity
											22.95							
23		12	00	SC	-	-												
		To																
24		12	10															Pale Green,Moist,Hard,**Silty CLAY (CI)** Lean Clay of Medium Plasticity
																L9	25.0	
25							50	10cm Penet for 50Blows		>100	25.00	16	SS	-25.0				
											25.25							
26		Total drilling time 0hr 16mins		SC	-	-												
27																		
								10cm Penet for 50Blows		>100	27.50	17	SS	-27.5				Green,Brown,Moist,Poorly Graded, Fine & Medium Grains Sand,Very Dense, **Silty SAND (SM) With Binder**
28											27.60							
29		Total drilling time 0hr 25mins		SC	-	-												
30							45	10cm Penet for 50Blows		>100	30.00	18	SS	-30.0		L10	30.0	
											30.25							Brown,Moist,Fine Grains Structure, Fissile Texture,Hard,**Fissile SILTY CLAY (CH)/Soft SHALE of Gondwana**

CS - Core Sample	DS - Disturbed Sample	LOGGED	K.Sivasankaran	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	02/06/2022	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m) 3.80	
WS - Wash Sample	DB - Diamond Bit	DATE	22/06/2022	CASING DEPTH (m) 9.00	

Borehole terminated at 30 m depth below E.G.L

FIG.2.7 Sub Soil Profile at BH-10 Location

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-11						
SHEET	1	OF	4				
PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING			DIA OF BORE HOLE	150mm ✓ / NX		
LOCATION	Block-3	MACHINE No.	HR-01	CHAINAGE (m)	-	BORE START DATE	30/05/2022
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	31/05/2022
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	2

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
1	30/05/2022	08	50	SC	-	-												
		To																
		09	00				9	11	16	27	1.00	1	SS	-1.0				
		09	17								1.45							
		To		SC	-	-												
2		09	23				7	13	17	30	2.00	2	SS	-2.0				
		09	40								2.45							
		To		SC	-	-												Brown,Moist,Poorly Graded,Fine & Medium Grains Sand,Medium Dense & Dense,Silty SAND (SM)
3		09	42				10	18	23	41	3.00	3	SS	-3.0				
		10	00								3.45							
		To		SC	-	-												
4		10	03				11	17	20	37	4.00	4	SS	-4.0				
		10	15								4.45							
		To		SC	-	-												
5		10	17				19	44	33	77	5.00	5	SS	-5.0		L1	5.0	
		10	35								5.45							Brown,Moist,Poorly Graded,Fine & Medium Grains Sand,Very Dense, Poorly Graded SAND - Silty SAND (SP-SM)
		To		SC	-	-												
6		10	37				17	20	20	40	6.00	6	SS	-6.0		L2	6.0	
		10	55								6.45							
		To		SC	-	-												
7		10	57															Brown,Moist,Poorly Graded,Fine & Medium Grains Sand,Medium Dense & Dense,Silty SAND (SM) & Poorly Graded SAND - Silty SAND (SP-SM)
8		11	14				12	14	15	29	7.50	7	SS	-7.5				
		To		SC	-	-					7.95							
		11	17															
9							3	5	21	26	9.00	8	SS	-9.0		L3	9.0	
		11	32								9.45							Black,Dark Grey,Very Stiff,Silty CLAY (CH) With Sand Lenses Clay of Medium Plasticity
		To		SC	-	-												
10		11	35															

CS - Core Sample	DS - Disturbed Sample	LOGGED	K.Sivasankaran	PROJECT SITE DETAILS		REMARKS	
SS - Split Spoon Sample	SC - Soil Cutter	DATE	30/05/2022	GROUND LEVEL (m)	0.00		
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m)	3.80		
WS - Wash Sample	DB - Diamond Bit	DATE	23/08/2022	CASING DEPTH (m)	0.00		

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-11						
SHEET	2	OF	4				
PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING			DIA OF BORE HOLE	150mm ✓		
					NX		
LOCATION	Block-3	MACHINE No.	HR-01	CHAINAGE (m)	-	BORE START DATE	30/05/2022
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	31/05/2022
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	2

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
10							2	3	3	6	10.50	9	SS	-10.5		L4	10.5	Black,Dark Grey,Very Stiff,Silty CLAY (CH) With Sand Lenses Clay of Medium Plasticity
											10.95							
11		11 To 12	55 00	SC	-	-												Black,Dark Grey,Moist,Medium Stiff, Silty CLAY (CH) Clays of High Plasticity
12							4	4	6	10	12.00	10	SS	-12.0		L5	12.0	
											12.45							
13		12 To 12	23 27	SC	-	-												
14							2	4	6	10	14.00	11	SS	-14.0				
											14.45							
15	30/05/2022	12 To 12	49 54	SC	-	-												
16							3	5	6	11	16.00	12	SS	-16.0				Black,Dark Grey,Moist,Stiff,Silty CLAY (CH) Clay of High Plasticity With Shells Mix @ 12.0m
											16.45							
17		13 To 13	25 35	SC	-	-												
18							3	6	7	13	18.00	13	SS	-18.0				
											18.45							
19		14 To 14	25 39	SC	-	-												
20							5	7	13	20	20.00	14	SS	-20.0		L6	20.0	
											20.45							Green Black,Moist,Very Stiff,Silty CLAY (CH) Clays of High Plasticity

CS - Core Sample	DS - Disturbed Sample	LOGGED	K.Sivasankaran	PROJECT SITE DETAILS		REMARKS	
SS - Split Spoon Sample	SC - Soil Cutter	DATE	30/05/2022	GROUND LEVEL (m)	0.00		
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m)	3.80		
WS - Wash Sample	DB - Diamond Bit	DATE	23/06/2022	CASING DEPTH (m)	0.00		

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-11		
SHEET	3	OF	4
DIA OF BORE HOLE	150mm ✓	NX	
BORE START DATE	30/05/2022		
BORE END DATE	31/05/2022		
TOTAL DRILL DAYS	2		

PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING				
LOCATION	Block-3	MACHINE No.	HR-01	CHAINAGE (m)	-
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E -

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Legend	Layer Data: No	Depth	Geotechnical Description
21	31/05/2022	09 To 09	05 25	SC	-	-												Green Black,Moist,Very Stiff,**Silty CLAY (CH)** Clays of High Plasticity
22							9	19	22	41	22.50	15	SS	-22.5		L7	22.5	
23											22.95							
24		10 To 10	15 40	SC	-	-												
25							13	21	27	48	25.00	16	SS	-25.0				Grey Green,Grey,Moist,Hard,**Silty CLAY (CH)** Clays of High Plasticity & Partly Fissile Texture Observed Clay of High Plasticity
26											25.45							
27		11 To 11	20 29	SC	-	-												
28							23	15cm Penet for 58Blows		>100	27.50	17	SS	-27.5		L8	27.5	
29		12 To 12	17 37	SC	-	-					27.80							Brown,Moist,Poorly Graded,Fine to Coarse Sand With Traces of Gravels,Very Dense,**Silty SAND (SM) With Binder**
30							39	15cm Penet for 58Blows		>100	30.00	18	SS	-30.0		L9	30.0	
											30.30							Grey,Moist,Fine Grian Structure,Sub Fissite & Fissile Texture,Hard,**Fissile CLAY (CH)/ Soft SHALE of Gondwana**

CS - Core Sample	DS - Disturbed Sample	LOGGED	K.Sivasankaran	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	31/05/2022	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m) 3.80	
WS - Wash Sample	DB - Diamond Bit	DATE	23/08/2022	CASING DEPTH (m) 0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-11						
SHEET	4	OF	4				
PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING			DIA OF BORE HOLE	150mm ✓ / NX		
LOCATION	Block-3	MACHINE No.	HR-01	CHAINAGE (m)	-	BORE START DATE	30/05/2022
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	31/05/2022
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	2

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
31	31/05/2022	14	00	SC	-	-												Grey,Brown Shades at Times,Moist, Fine Grian Structure,Sub Fissile & Fissile Texture,Hard,Fissile CLAY (CH)/ Soft SHALE of Gondwana Formation
32		To																
33		14	35				10cm Penet for 58Blows			>100	33.00 / 33.10	19	SS	-33.0		L10	33.1	
34																		
35																		
36																		
37																		
38																		
39																		
40																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	K.Sivasankaran	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	31/05/2022	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m) 3.80	
WS - Wash Sample	DB - Diamond Bit	DATE	23/06/2022	CASING DEPTH (m) 0.00	

Borehole terminated at 33 m depth below E.G.L

FIG.2.8 Sub Soil Profile at BH-11 Location

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-12		
SHEET	1	OF	4
DIA OF BORE HOLE	150mm ✓	NX	
BORE START DATE	26/05/2022		
BORE END DATE	28/05/2022		
TOTAL DRILL DAYS	3		

PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING						
LOCATION	Block-3	MACHINE No.	HR-01	CHAINAGE (m)	-		
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N	-	
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E	-	

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
0	26/05/2022	11	05	SC	-	-												
		To																
		11	12															
1							9	12	15	27	1.00	1	SS	-1.0				Brown,Moist,Very Stiff,**Silty CLAY (Cl)** Lean Clay of Medium Plasticity
		11	35								1.45							
		To		SC	-	-												
		11	45															
2							-	-	-	-	2.00	2	UDS	-2.0		L1	2.0	
		12	05															
		To		SC	-	-												
		12	15															
3							3	7	8	15	3.00	3	SS	-3.0				Brown,Brown Grey,Moist,Stiff,**Silty CLAY (Cl) & Silty CLAY (CL)** Lean Clay of Medium Plasticity
		12	35								3.45							
		To		SC	-	-												
		12	40															
4							3	3	5	8	4.00	4	SS	-4.0				
		12	56								4.45							
		To		SC	-	-												
		12	58															
5							13	18	26	44	5.00	5	SS	-5.0		L2	5.0	
		14	00								5.45							
		To		SC	-	-												
		14	03															
6							9	18	23	41	6.00	6	SS	-6.0				
		14	16								6.45							
		To		SC	-	-												
		14	20															Brown,Moist,Poorly Graded,Fine & Medium Grains Sands,Medium Dense & Dense,**Silty SAND (SM)**
7							7	15	15	30	7.50	7	SS	-7.5				
											7.95							
8		14	40															
		To		SC	-	-												
		14	44															
9							3	5	9	14	9.00	8	SS	-9.0		L3	9.0	
											9.45							
		15	05															
		To		SC	-	-												Black,Dark Grey,Moist,Stiff,**Silty CLAY (CH)** Clay of High Plasticity
10		15	09															

CS - Core Sample	DS - Disturbed Sample	LOGGED	K.Sivasankaran	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	26/05/2022	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m) 3.60	
WS - Wash Sample	DB - Diamond Bit	DATE	23/06/2022	CASING DEPTH (m) 0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-12		
SHEET	2	OF	4
DIA OF BORE HOLE	150mm ✓ / NX		
BORE START DATE	26/05/2022		
BORE END DATE	28/05/2022		
TOTAL DRILL DAYS	3		

PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING						
LOCATION	Block-3	MACHINE No.	HR - 02	CHAINAGE (m)	-	CO-ORDINATES	N -
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary				E -
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite				

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Legend	Layer Data: No.	Depth	Geotechnical Description
10							8	8	7	15	10.50	9	SS	-10.5		L4	10.5	Black,Dark Grey,Moist,Stiff,Silty CLAY (CH) Clay of High Plasticity
											10.95							
11		15	32	SC	-	-												Grey,Moist,Poorly Graded,Fine to Coarse Grains Sand Fraction With Gravels,Medium Dense,Silty SAND (SM) With Clay Binder
		To																
		15	37															
12							-	-	-	-	12.00	10	UDS	-12.0		L5	12.0	
		16	08															
13		To		SC	-	-												
		16	14															
14							3	5	6	11	14.00	11	SS	-14.0				
											14.45							
		16	43															
15	26/05/2022	To		SC	-	-												
		16	49															
16							5	5	5	10	16.00	12	SS	-16.0				Black,Dark Grey,Moist,Stiff,Silty CLAY (CH) Clay of High Plasticity
											16.45							
		17	15															
17		To		SC	-	-												
		17	19															
18							3	5	6	11	18.00	13	SS	-18.0				
											18.45							
		17	46															
19		To		SC	-	-												
		17	55															
20							8	7	15	22	20.00	14	SS	-20.0		L6	20.0	
											20.45							Black,Dark Grey,Moist,Very Stiff,Silty CLAY (CH) Clays of High Plasticity

CS - Core Sample	DS - Disturbed Sample	LOGGED	K.Sivasankaran	PROJECT SITE DETAILS		REMARKS	
SS - Split Spoon Sample	SC - Soil Cutter	DATE	26/05/2022	GROUND LEVEL (m)	0.00		
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m)	3.60		
WS - Wash Sample	DB - Diamond Bit	DATE	23/06/2022	CASING DEPTH (m)	0.00		

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-12						
SHEET	3	OF	4				
PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING					DIA OF BORE HOLE	150mm ✓ / NX
LOCATION	Block-3	MACHINE No.	HR-01	CHAINAGE (m)	-	BORE START DATE	26/05/2022
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	28/05/2022
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
21	27/05/2022	06 To 06	35 49	SC	-	-												Black,Dark Grey,Moist,Very Stiff,Silty CLAY (CH) Clays of High Plasticity
22							21	16	20	36	22.50	15	SS	-22.5		L7	22.5	
23											22.95							
24		07 To 07	30 42	SC	-	-												Grey,Pale Grey,Moist,Hard,Silty CLAY (CH) Clays of High Plasticity
25							13	17	28	45	25.00	16	SS	-25.0		L8	25.0	
26											25.45							
27		08 To 08	12 22	SC	-	-												Grey Brown,Moist,Poorly Graded,Fine & Medium Grains Sand,Dense,Clayey Silty SAND (SC)
28							29	52	57	109	27.50	17	SS	-27.5		L9	27.5	
29											27.95							
30		09 To 09	20 55	SC	-	-												Grey Brown,Moist,Hard,Silty CLAY (CI) Lean Clay of Medium Plasticity
							27	12cm Penet for 57Blows		>100	30.00	18	SS	-30.0		L10	30.0	
											30.27							Grey,Moist,Fine Grian Structure,Sub Fissile & Fissile Texture,Hard,Fissile CLAY (CH)/ Soft SHALE of Gondwana

CS - Core Sample	DS - Disturbed Sample	LOGGED	K.Sivasankaran	PROJECT SITE DETAILS		REMARKS	
SS - Split Spoon Sample	SC - Soil Cutter	DATE	27/05/2022	GROUND LEVEL (m)	0.00		
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m)	3.80		
WS - Wash Sample	DB - Diamond Bit	DATE	23/06/2022	CASING DEPTH (m)	0.00		

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-12						
SHEET	4	OF	4				
PROJECT NAME	PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING			DIA OF BORE HOLE	150mm ✓ / NX		
LOCATION	Block-3	MACHINE No.	HR-01	CHAINAGE (m)	-	BORE START DATE	26/05/2022
STRUCTURE	2 Basement + Stilt + 16 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	28/05/2022
JOB CODE	GT-2374	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

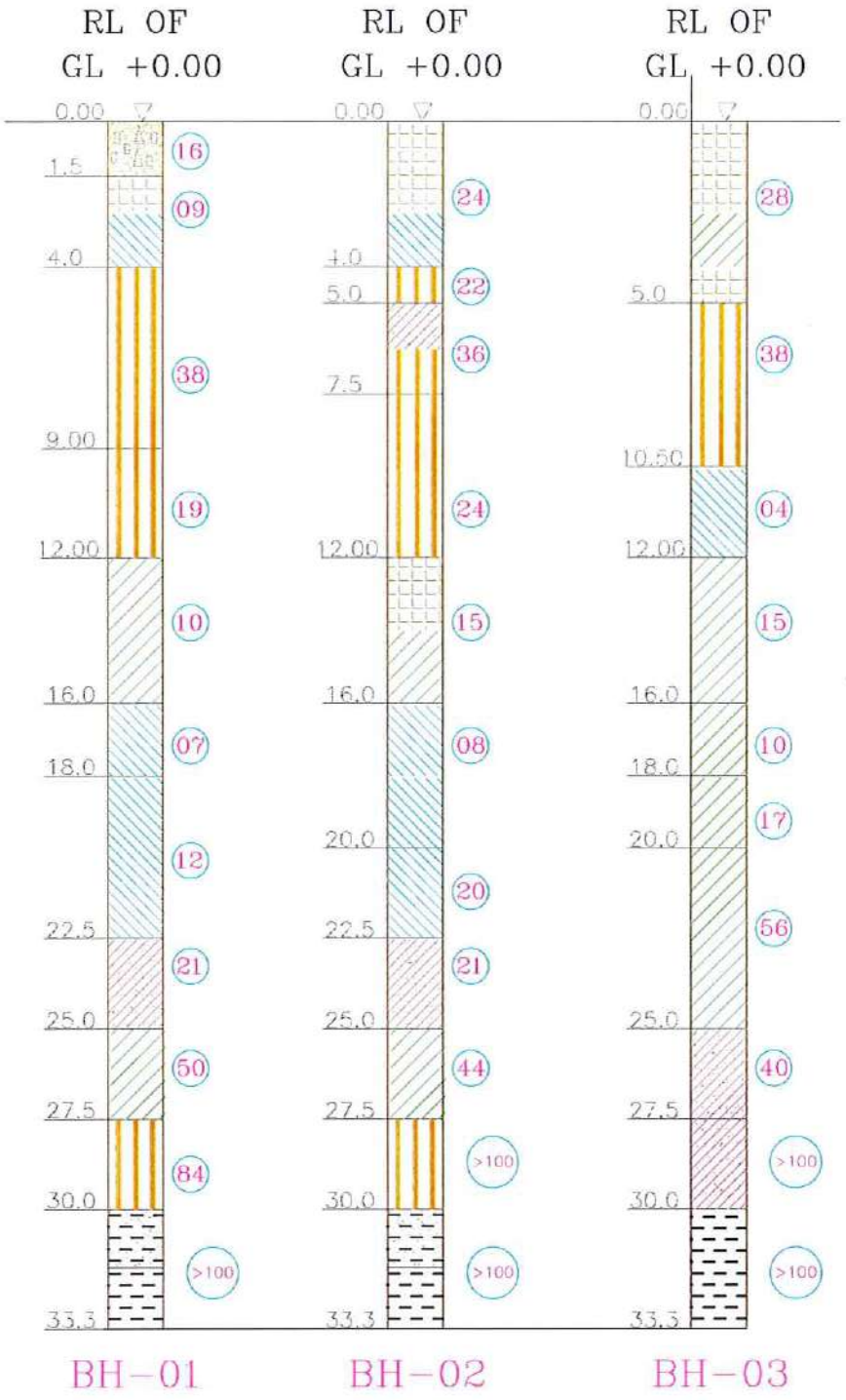
Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
31	28/05/2022	Total drilling time 1hr 10mins		SC	-	-												Grey,Moist,Fine Grian Structure,Sub Fissile & Fissile Texture,Hard,Fissile CLAY (CH)/ Soft SHALE of Gondwana Formation Lithified SHALE Rock at Times (Between 31.0m & 33.0m)
32																		
33							15cm Penet for 57Blows			>100	33.00 33.15	19	SS	-33.0		L11	33.0	
34																		
35																		
36																		
37																		
38																		
39																		
40																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	K.Sivasankaran	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	28/05/2022	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m) 3.80	
WS - Wash Sample	DB - Diamond Bit	DATE	23/06/2022	CASING DEPTH (m) 0.00	

Borehole terminated at 33 m depth below E.G.L

FIG.2.9 Sub Soil Profile at BH-12 Location

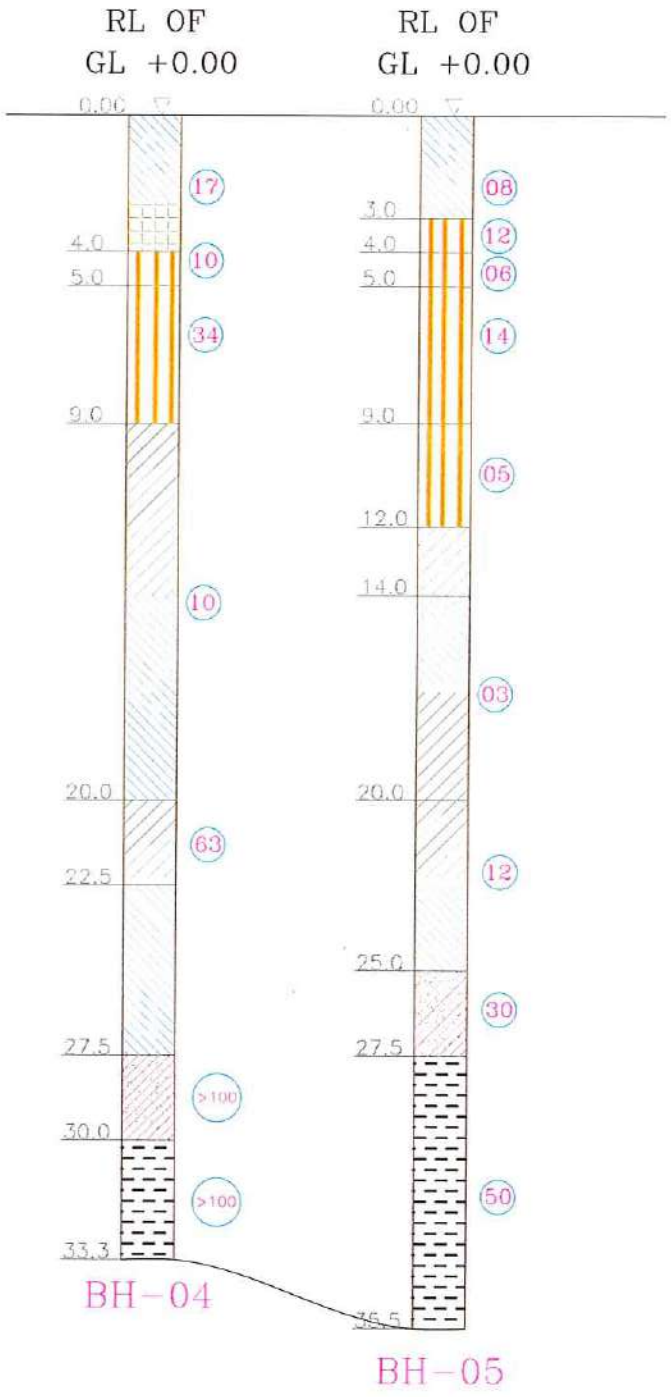
CROSS SECTION PROFILE



LEGEND

- SILTY SAND (SM)
- SILTY CLAY (CI)
- SILTY CLAY (CH)
- SANDY SILTY CLAY (CL)
- CLAYEY SILTY SAND (SC)
- Lithified SHALE Rock of Gondwana Formation
- Fissile CLAY/ Soft SHALE of Gondwana Formation

FIG.No.2.10 CROSS SECTIONAL VARIATION OF SUB SOIL PROFILE THROUGH BH-01,02&03



LEGEND

SILTY SAND (SM)

SILTY CLAY (CI)

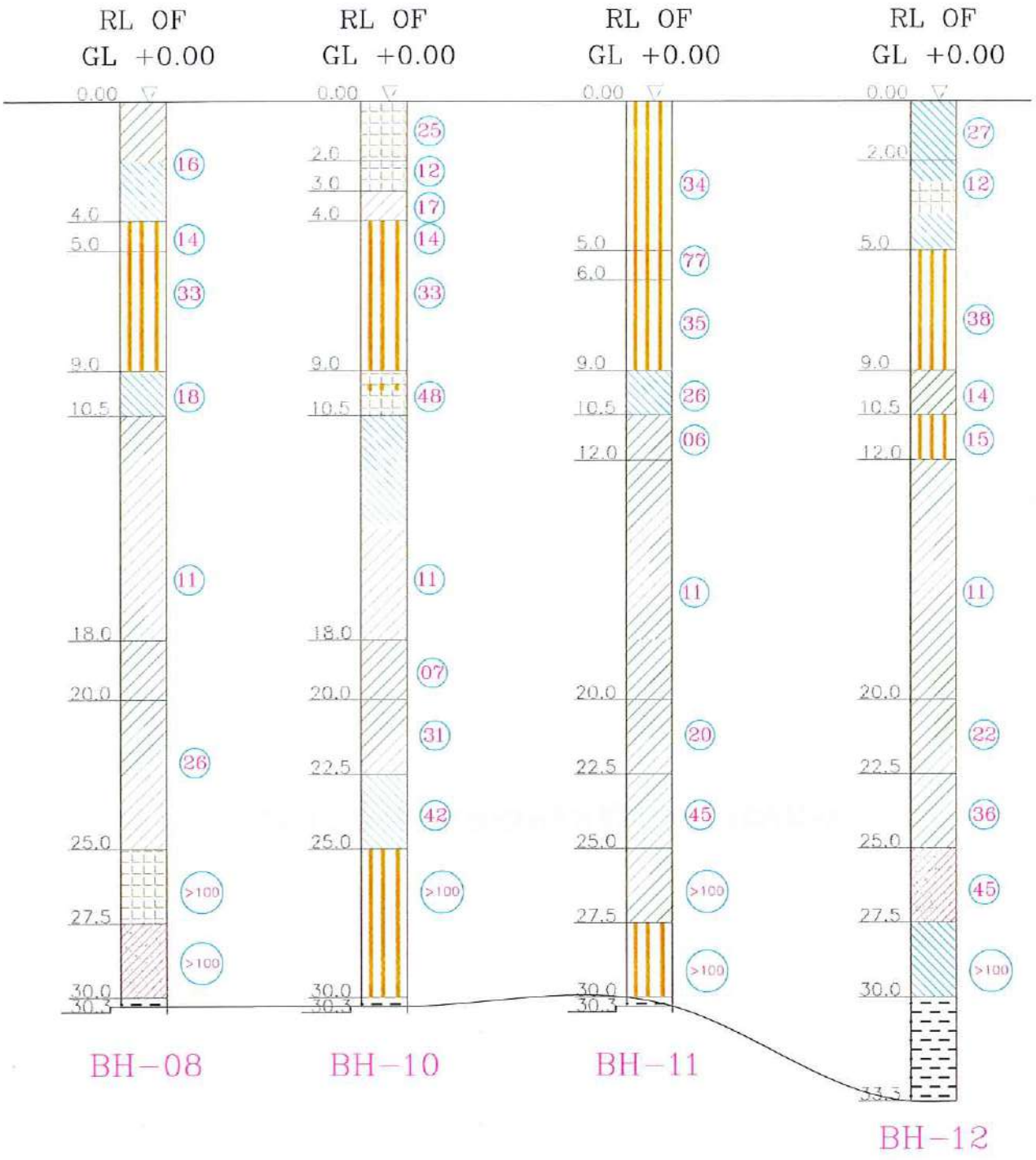
SILTY CLAY (CH)

SANDY SILTY CLAY (CL)

CLAYEY SILTY SAND (SC)

Fissile CLAY/ Soft SHALE of Gondwana Formation

FIG.No.2.11 CROSS SECTIONAL VARIATION OF SUB SOIL PROFILE THROUGH BH-04&05



LEGEND

- SILTY SAND (SM)
- SILTY CLAY (CI)
- SILTY CLAY (CH)
- SANDY SILTY CLAY (CL)
- CLAYEY SILTY SAND (SC)
- Fissile CLAY/ Soft SHALE of Gondwana Formation
- Lithified SHALE Rock of Gondwana Formation

FIG.No.2.12 CROSS SECTIONAL VARIATION OF SUB SOIL PROFILE THROUGH BH-04&05

GRAIN SIZE DISTRIBUTION CURVE

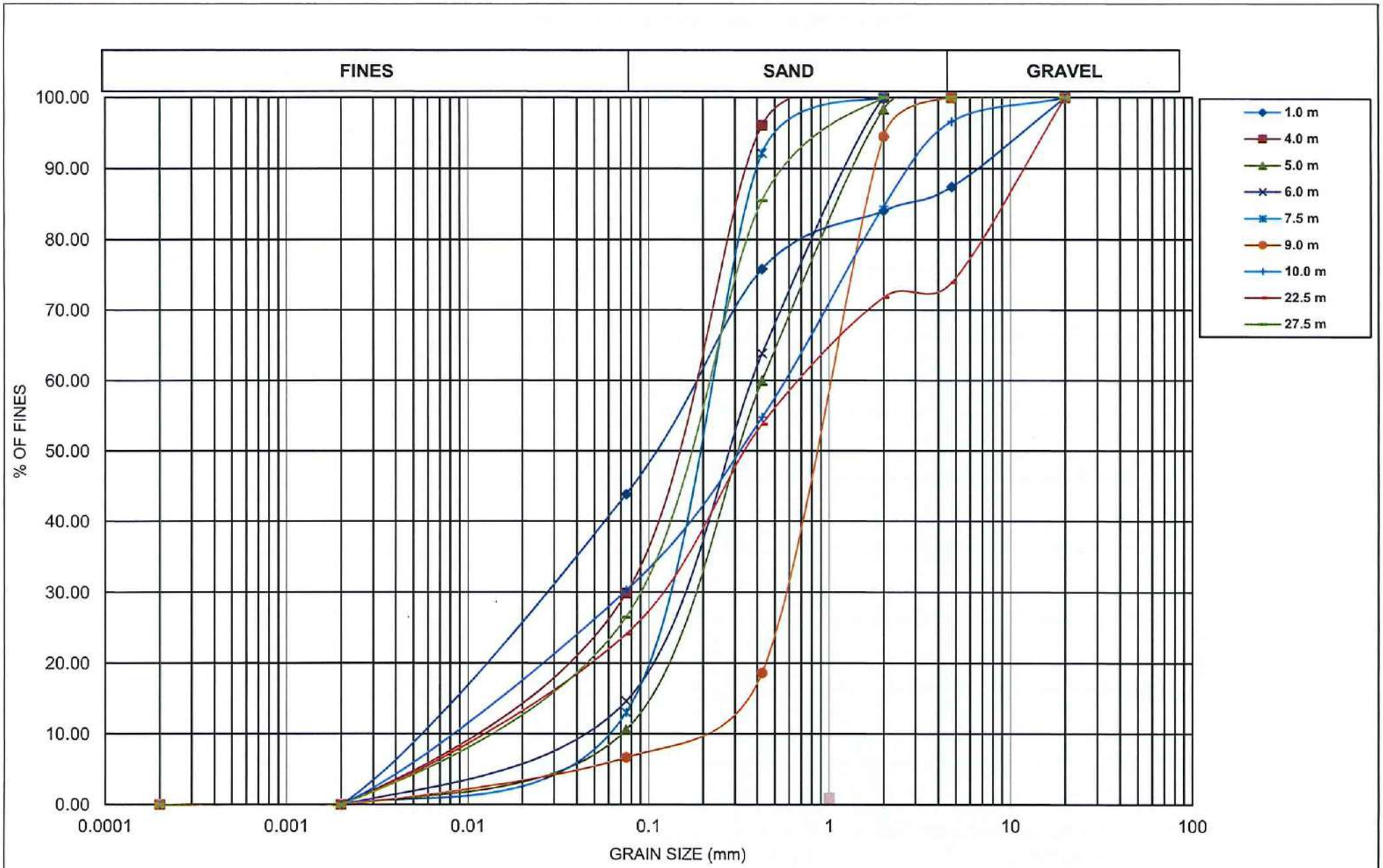


Fig. 2.13 GRAIN SIZE DISTRIBUTION CURVE - BH-01

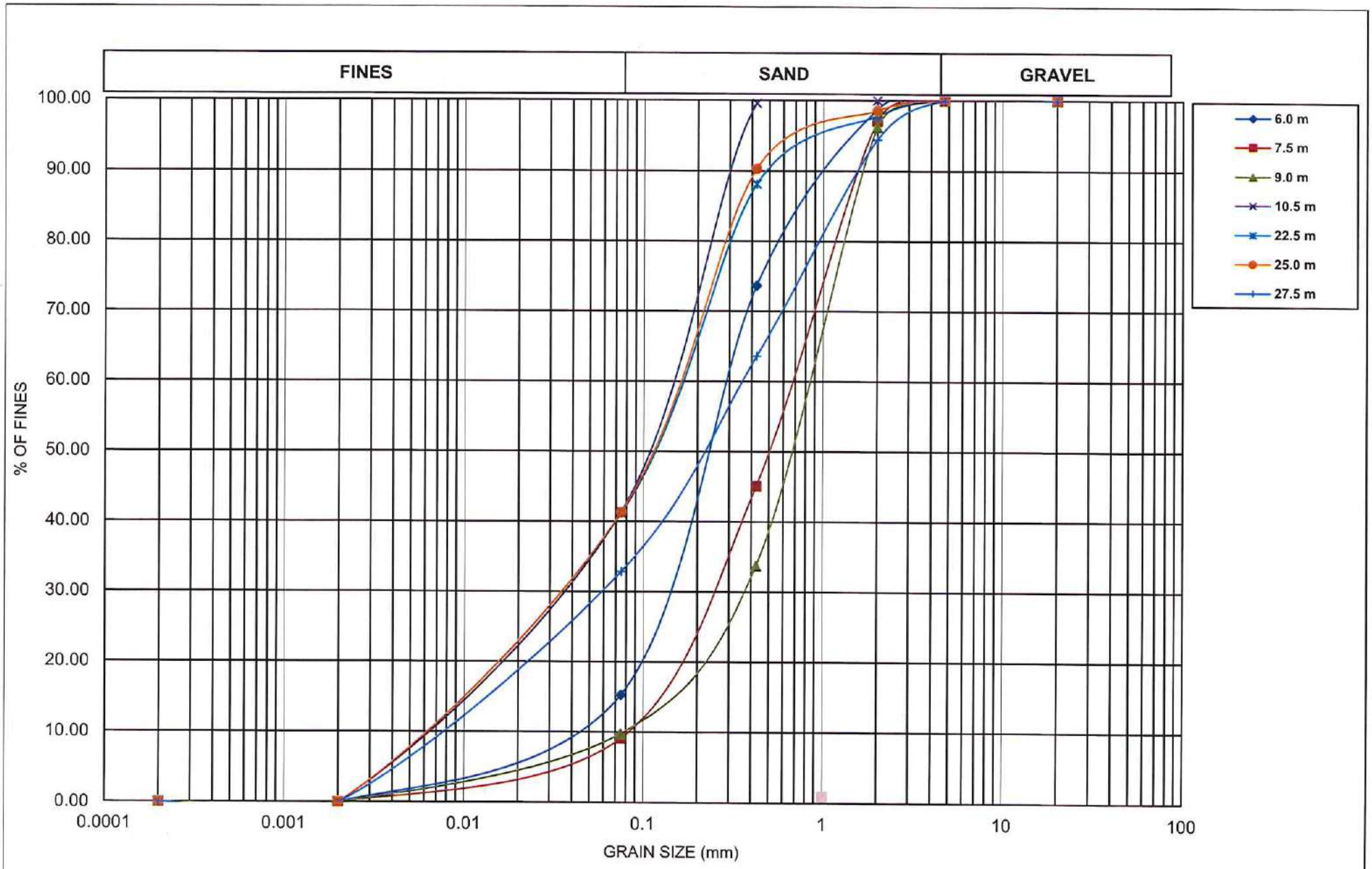


Fig. 2.14 GRAIN SIZE DISTRIBUTION CURVE - BH-02

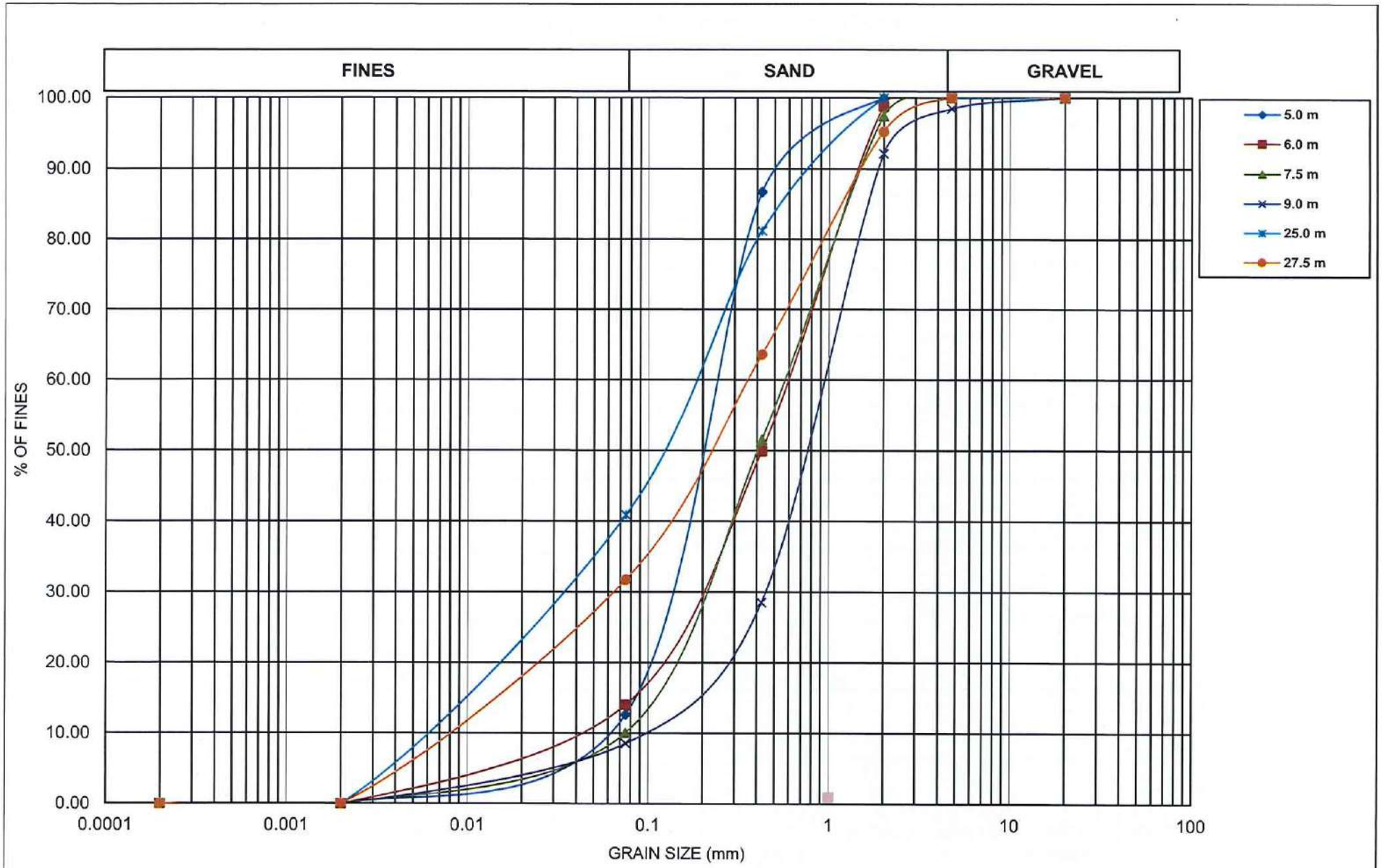


Fig. 2.15 GRAIN SIZE DISTRIBUTION CURVE - BH-03

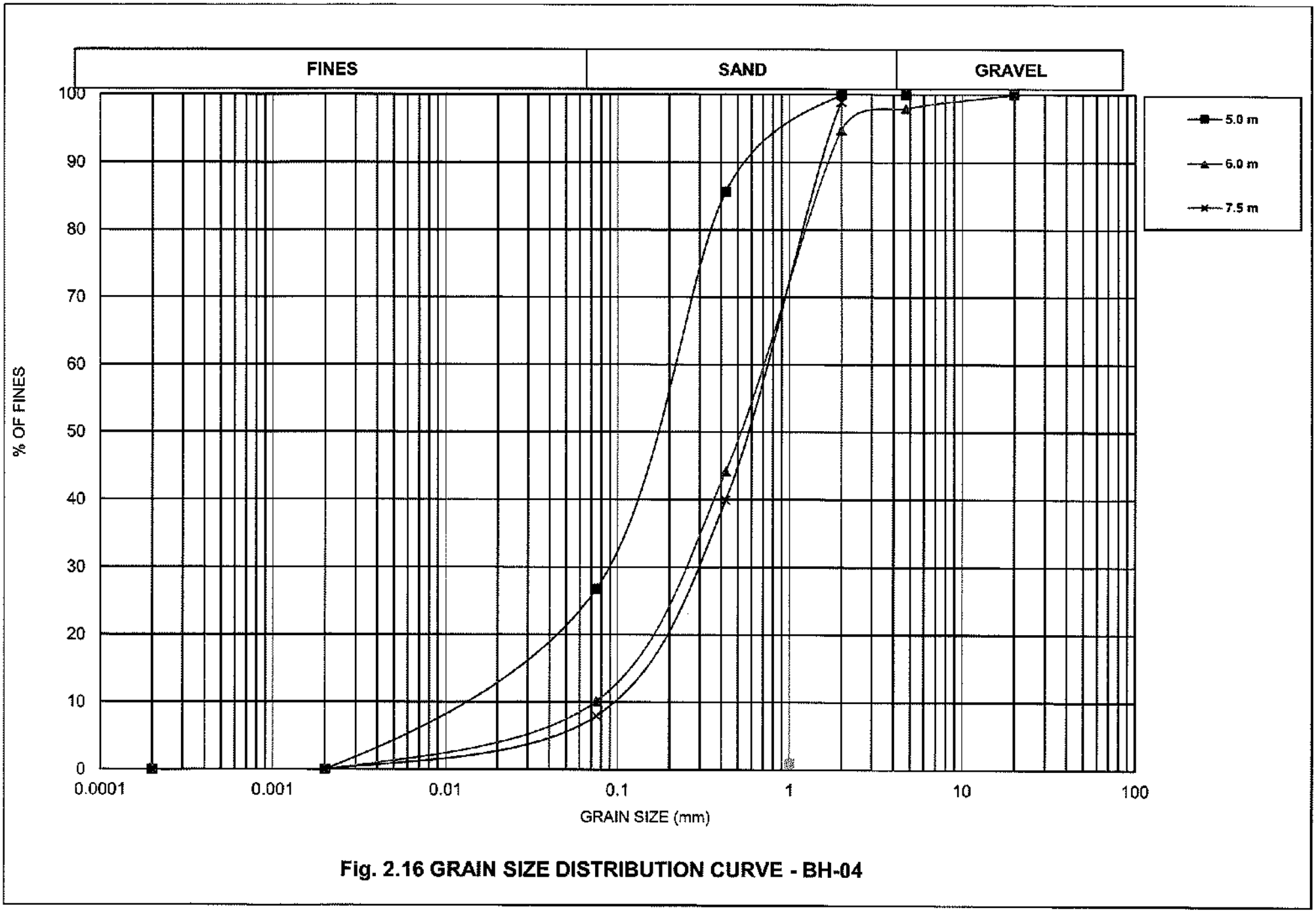


Fig. 2.16 GRAIN SIZE DISTRIBUTION CURVE - BH-04

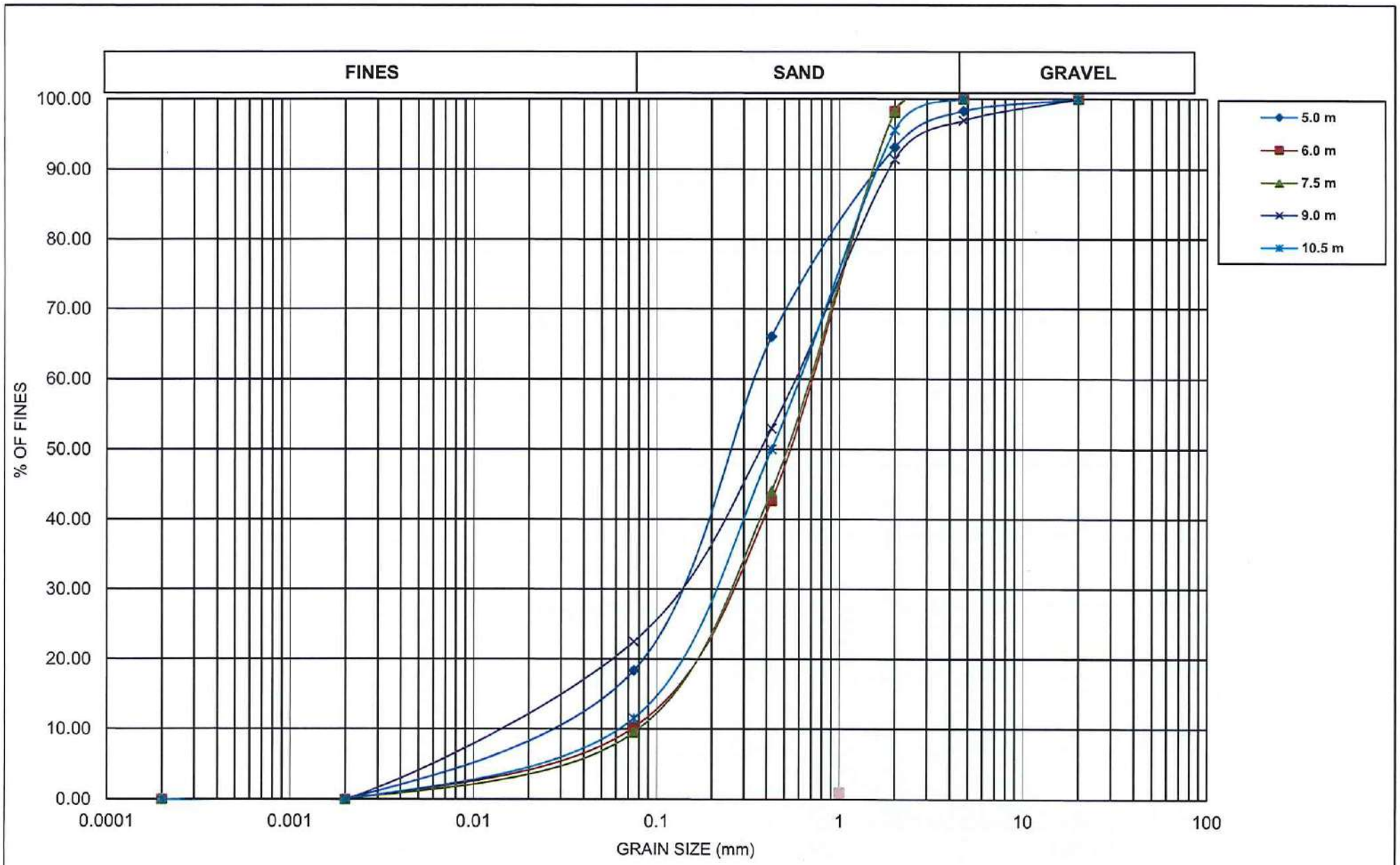


Fig. 2.17 GRAIN SIZE DISTRIBUTION CURVE - BH-05

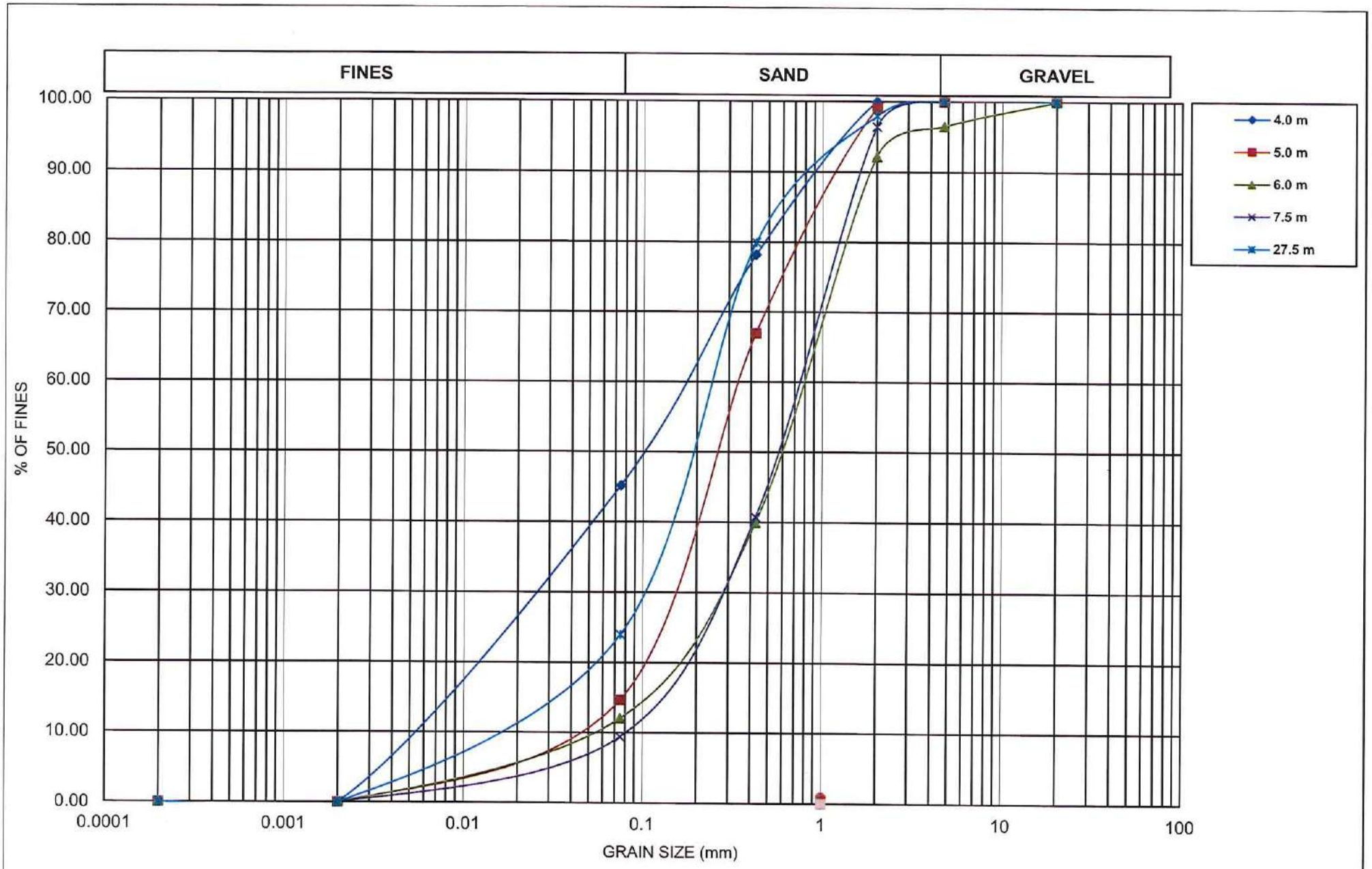


Fig. 2.18 GRAIN SIZE DISTRIBUTION CURVE - BH-08

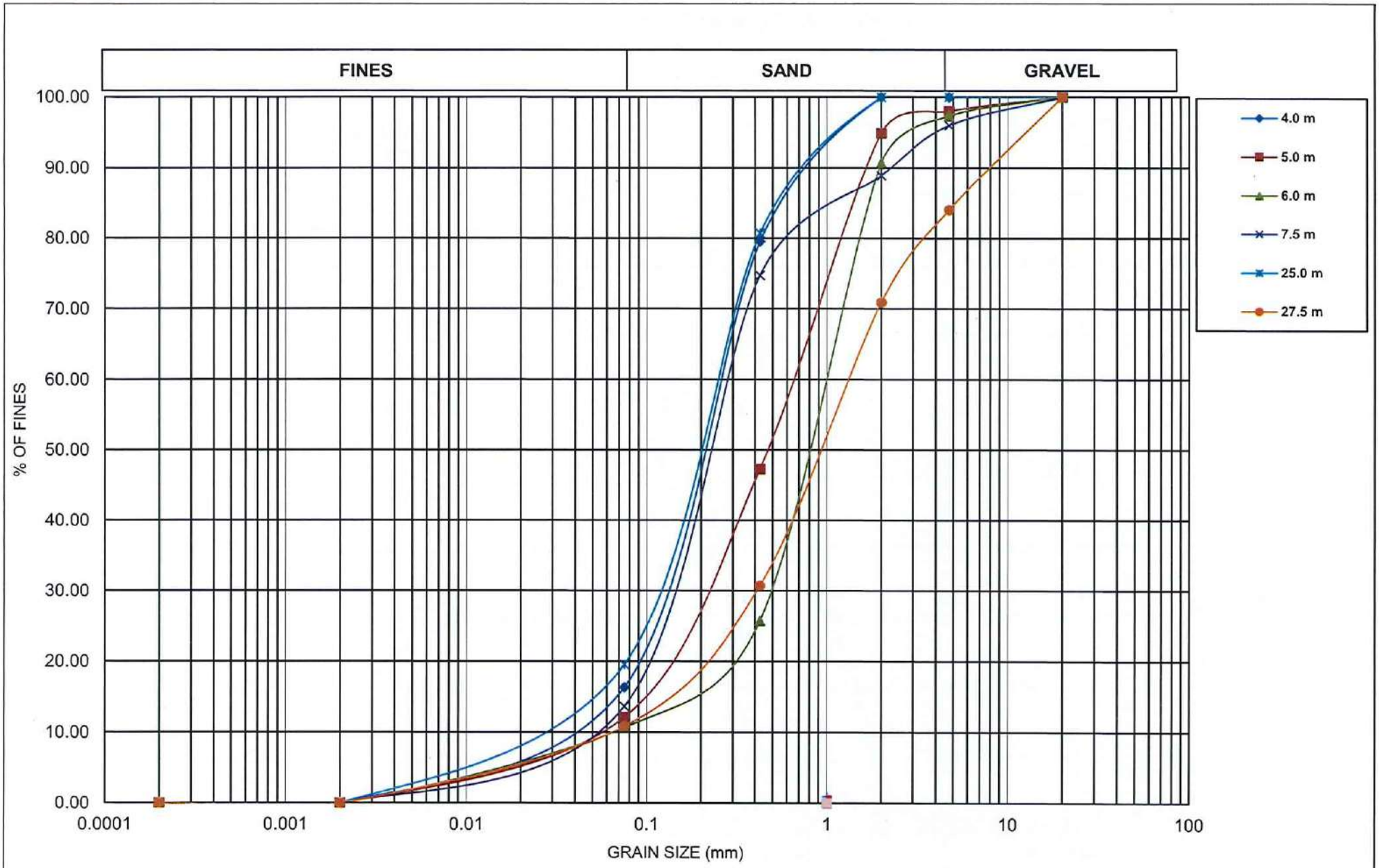


Fig. 2.19 GRAIN SIZE DISTRIBUTION CURVE - BH-10

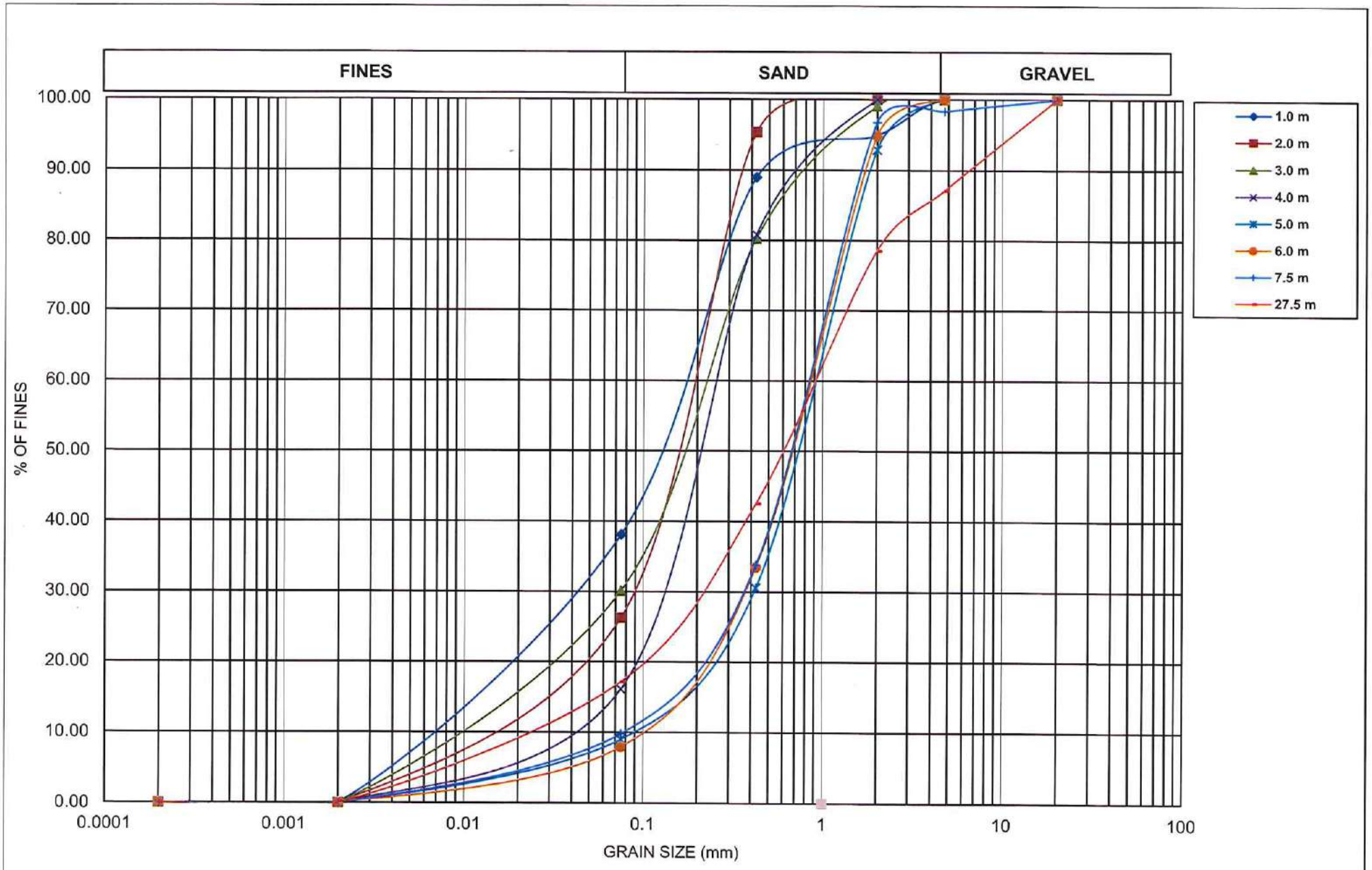


Fig. 2.20 GRAIN SIZE DISTRIBUTION CURVE - BH-11

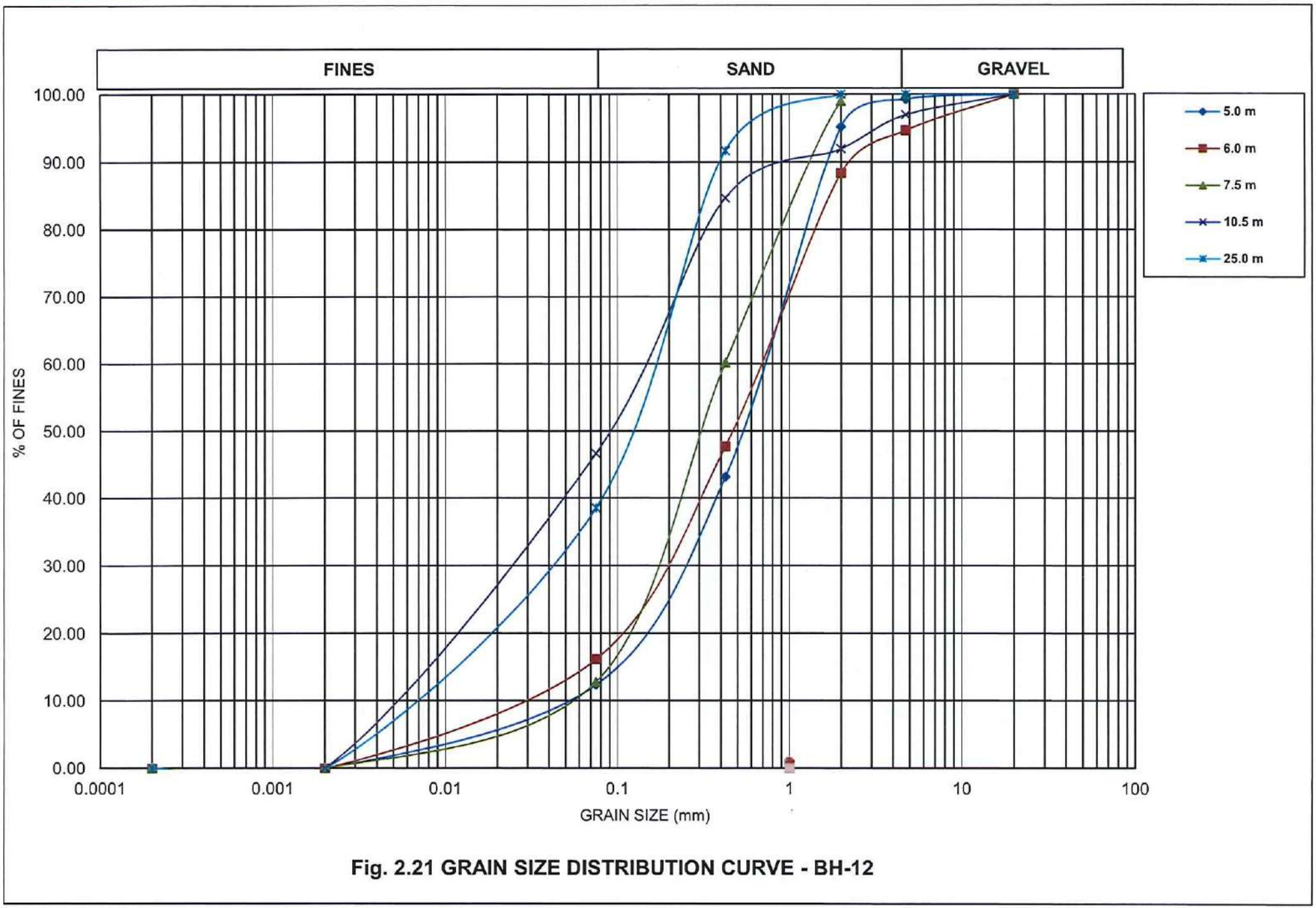


Fig. 2.21 GRAIN SIZE DISTRIBUTION CURVE - BH-12

HYDROMETER ANALYSIS CURVE

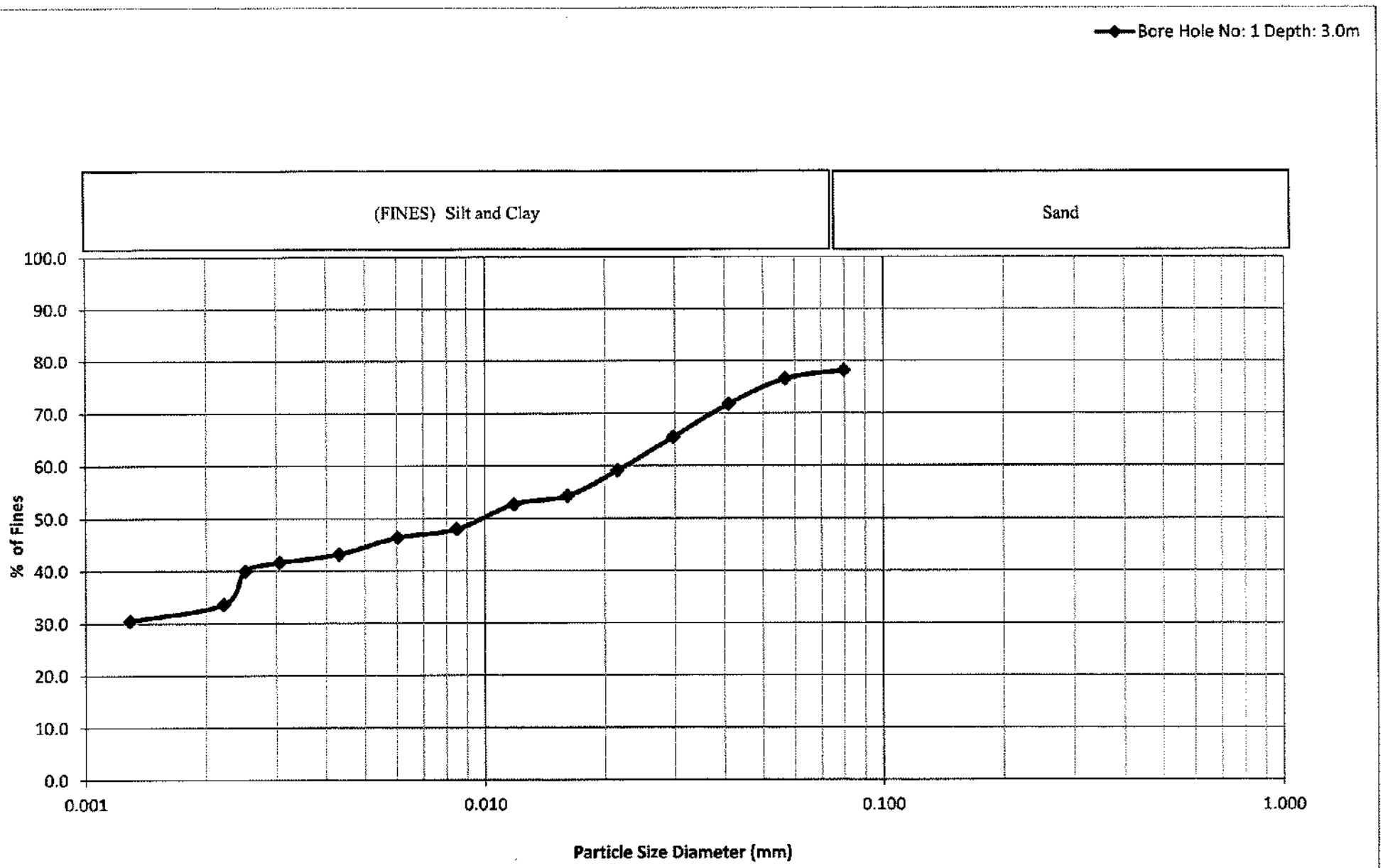


Fig 2.22 Hydrometer Analysis Master Curve

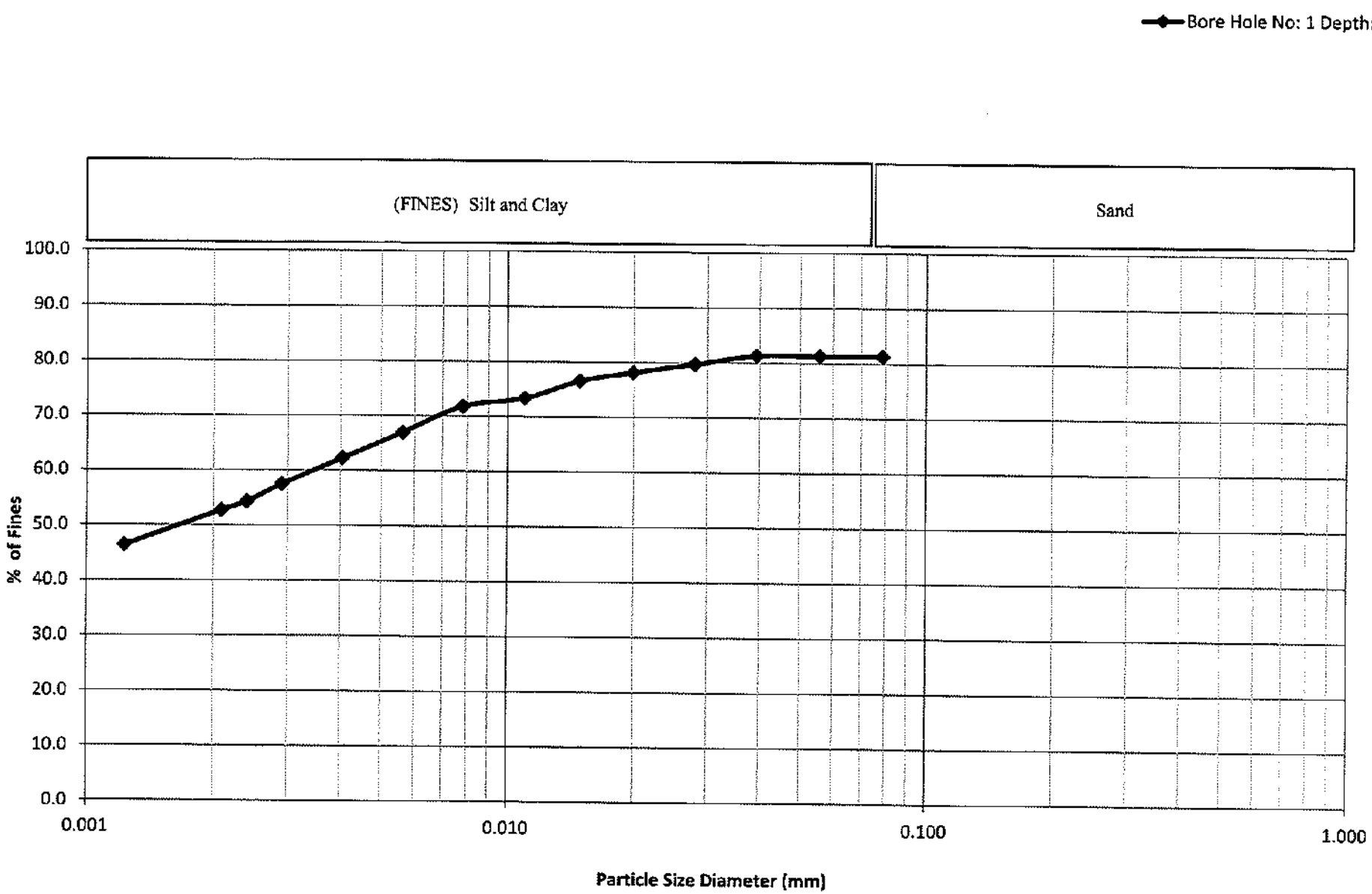


Fig 2.23 Hydrometer Analysis Master Curve

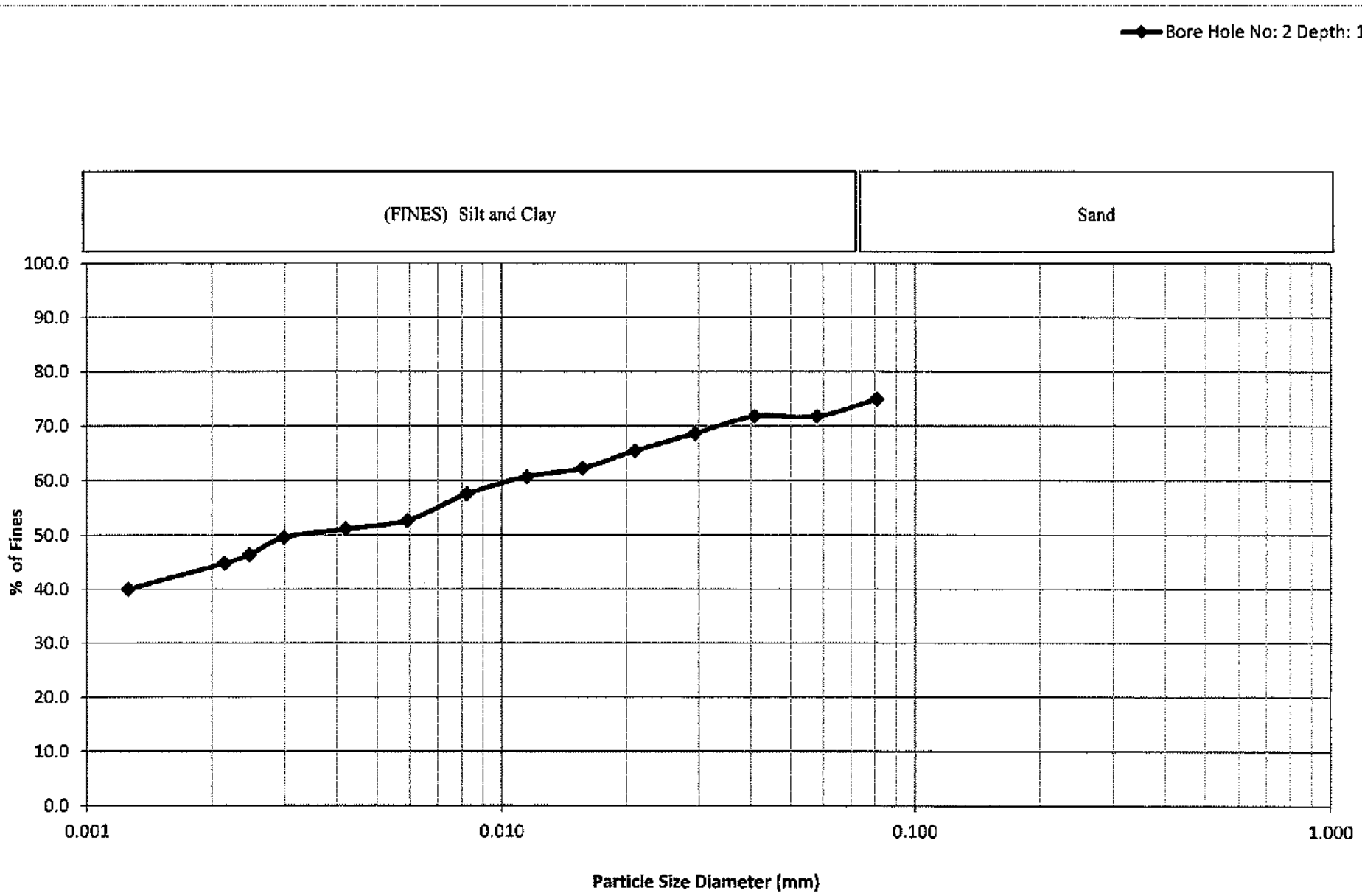


Fig 2.24 Hydrometer Analysis Master Curve

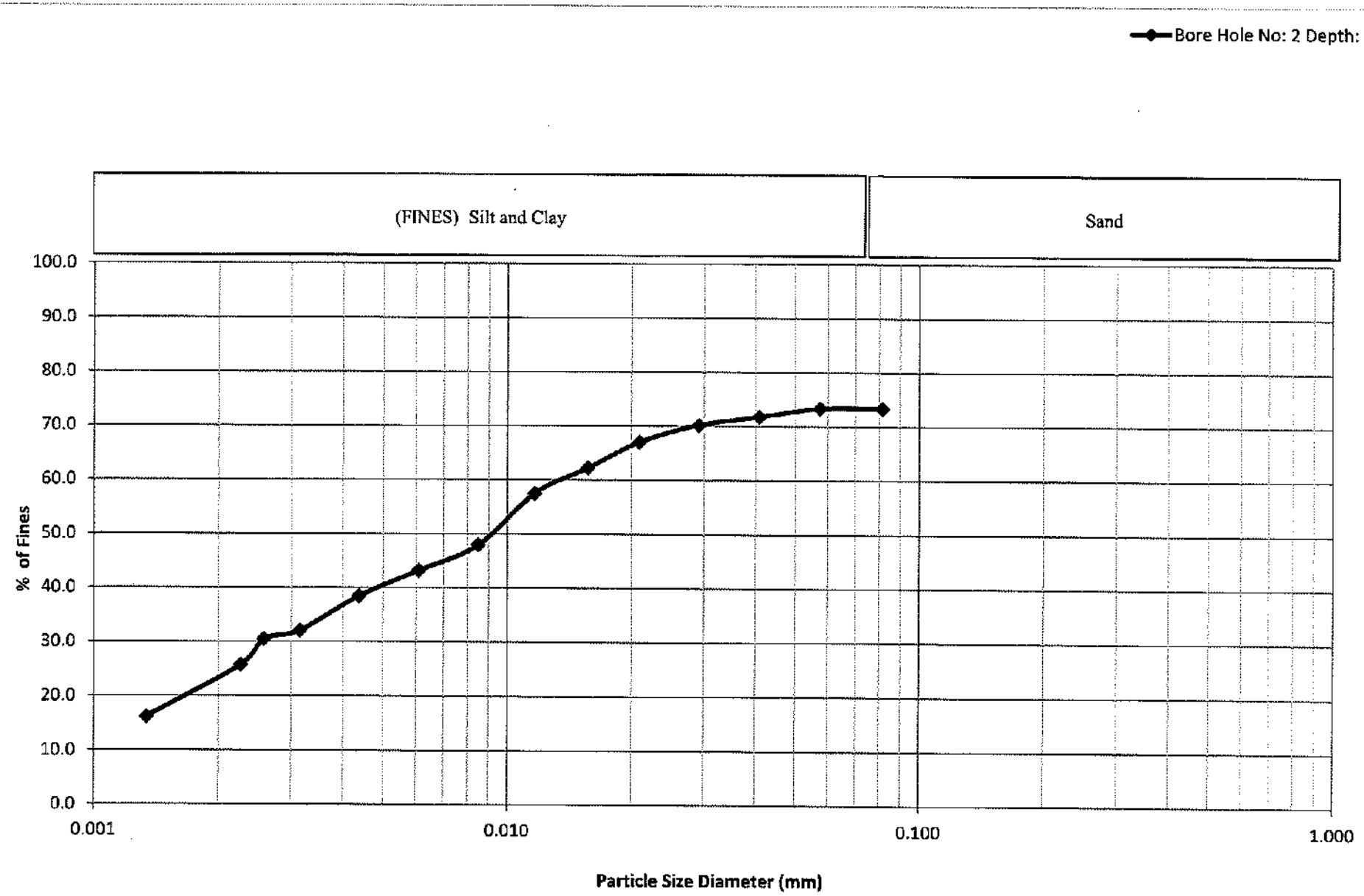


Fig 2.25 Hydrometer Analysis Master Curve

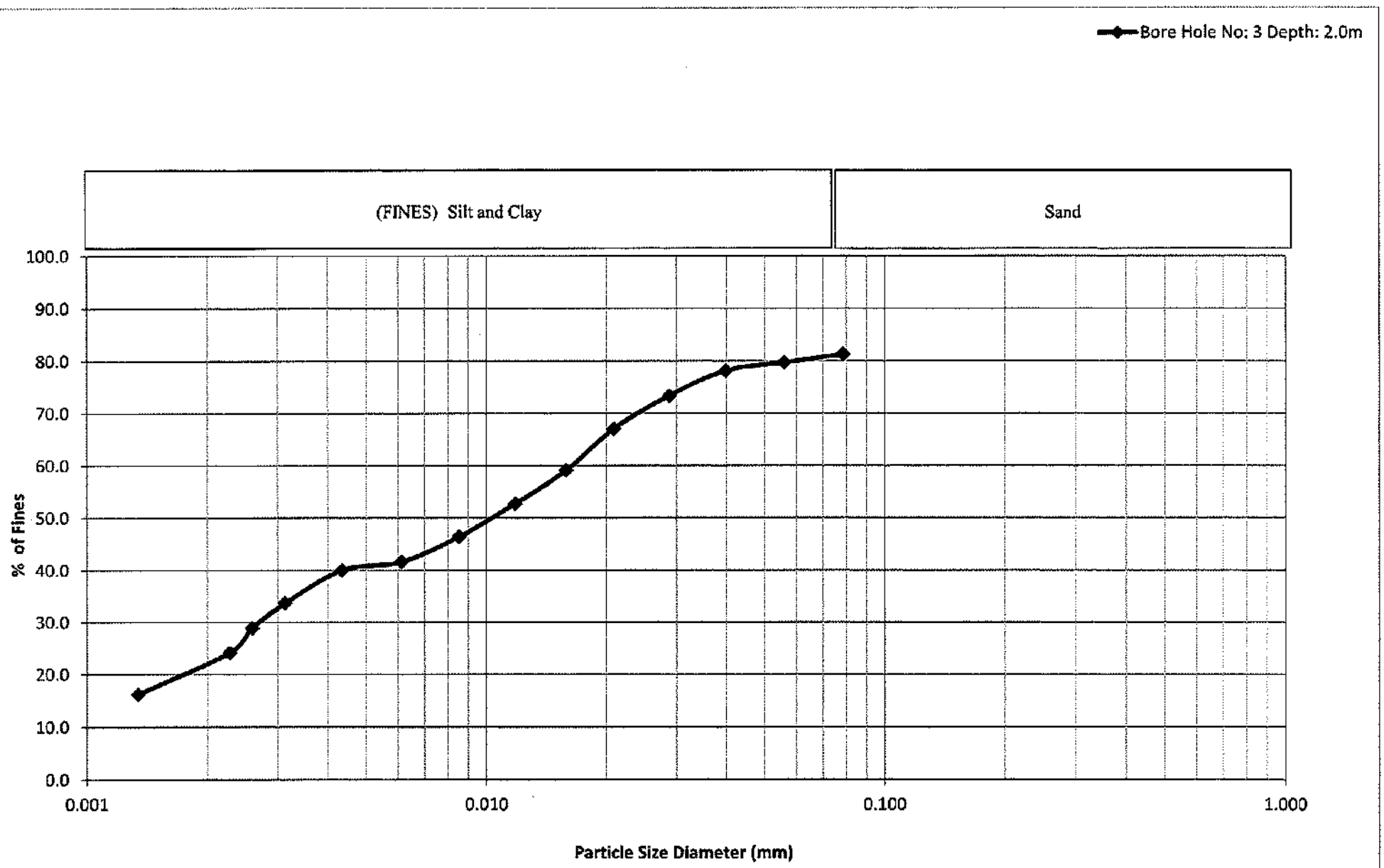


Fig 2.26 Hydrometer Analysis Master Curve

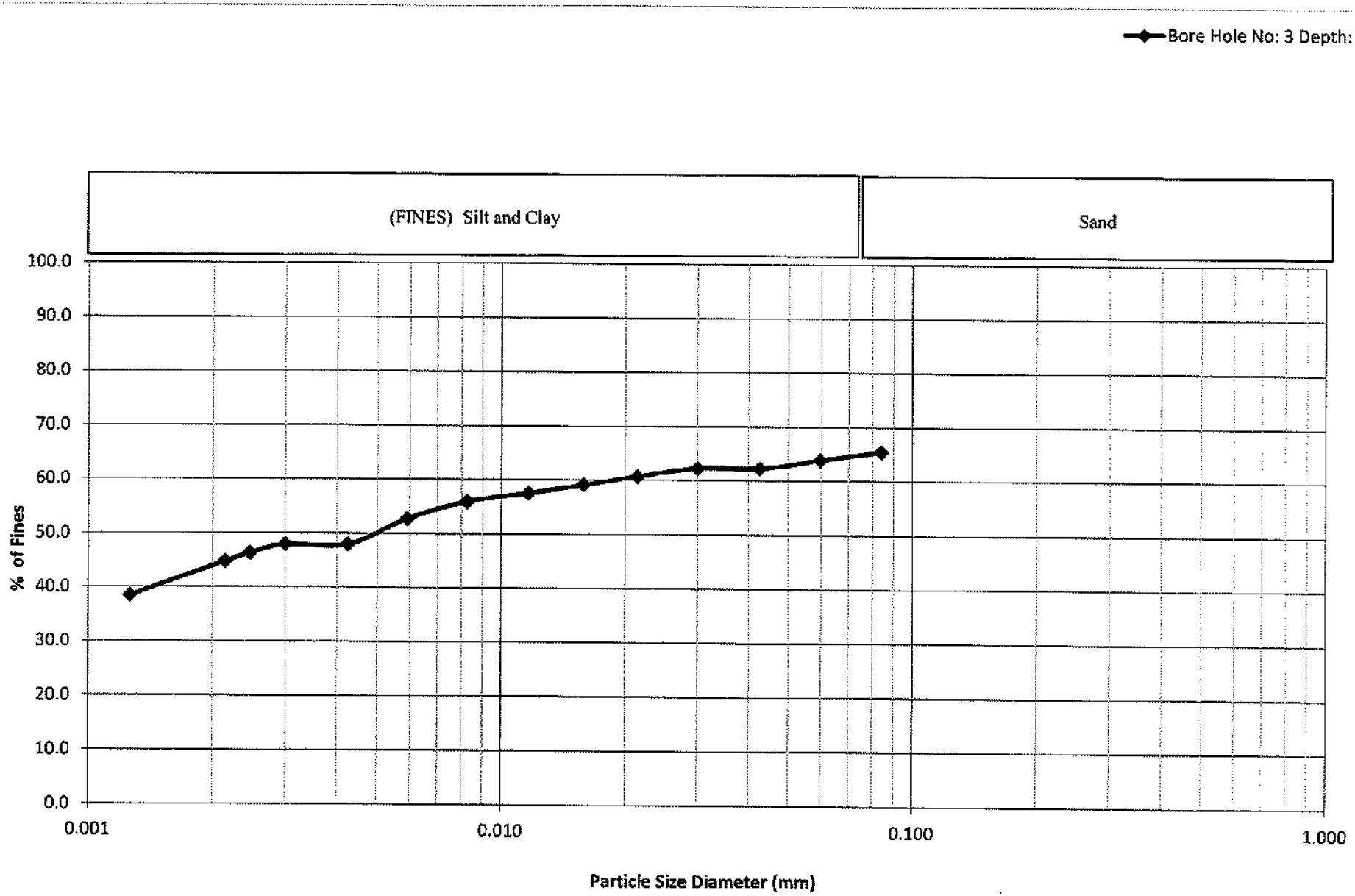


Fig 2.27 Hydrometer Analysis Master Curve

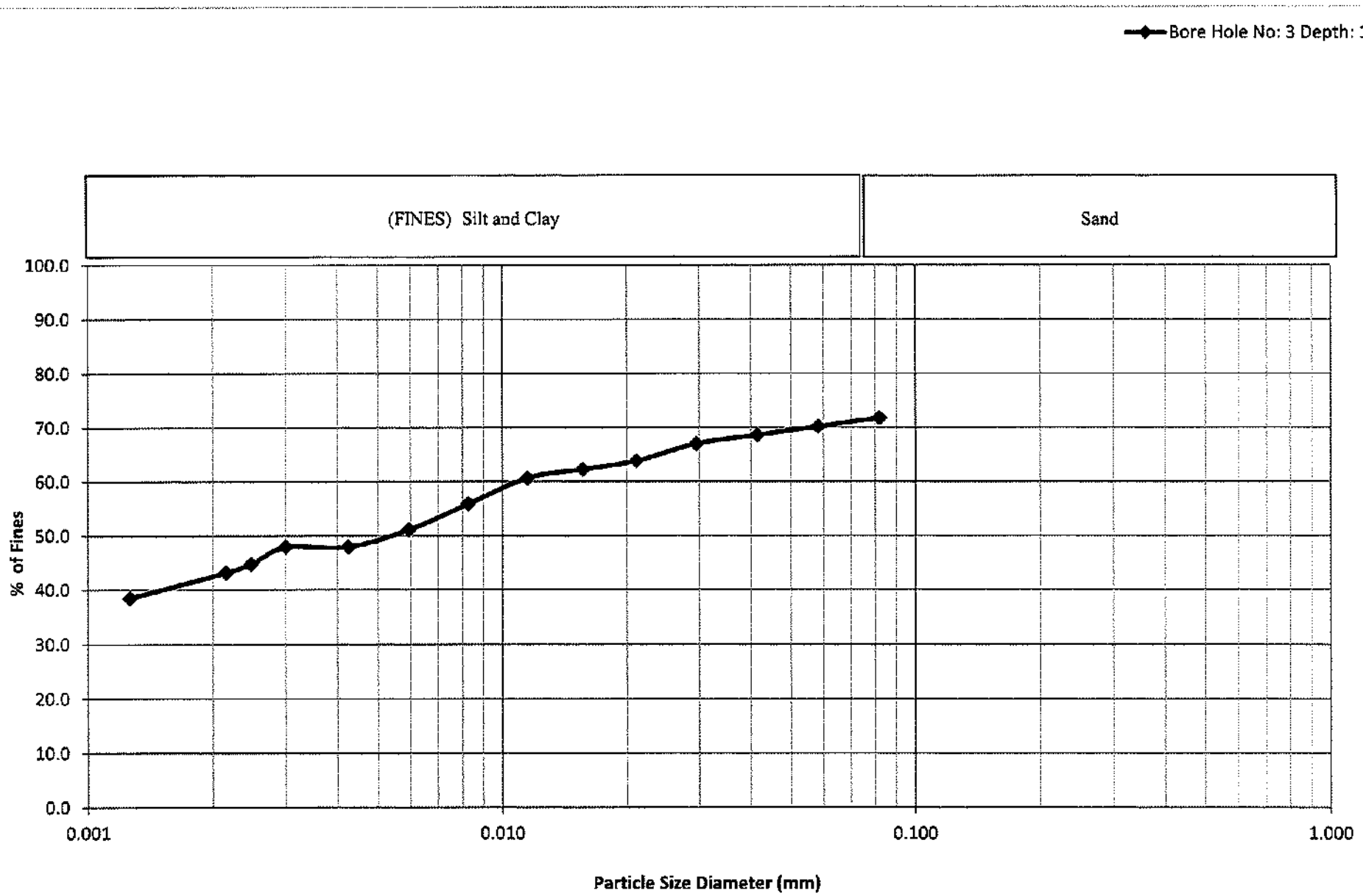


Fig 2.28 Hydrometer Analysis Master Curve

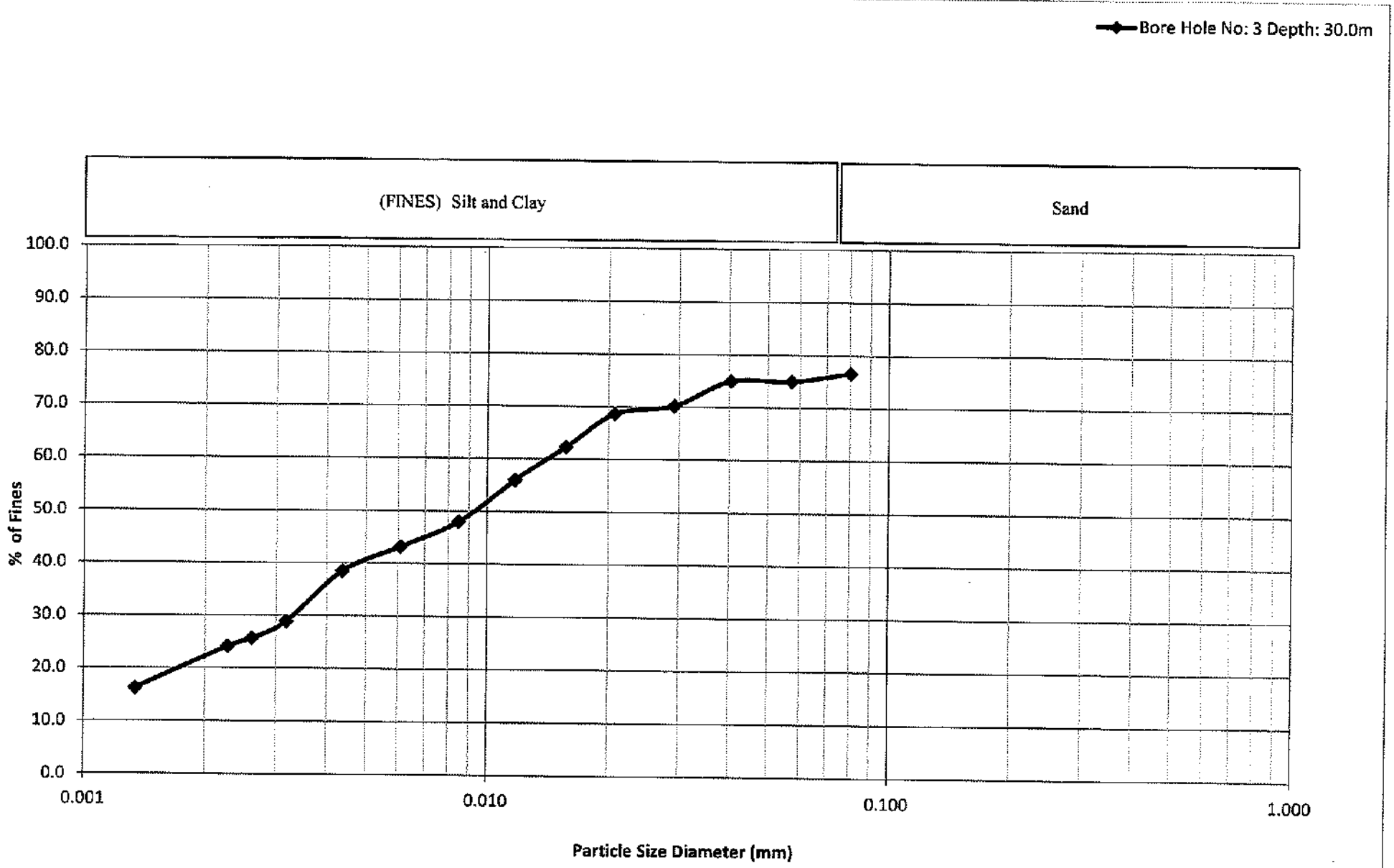


Fig 2.29 Hydrometer Analysis Master Curve

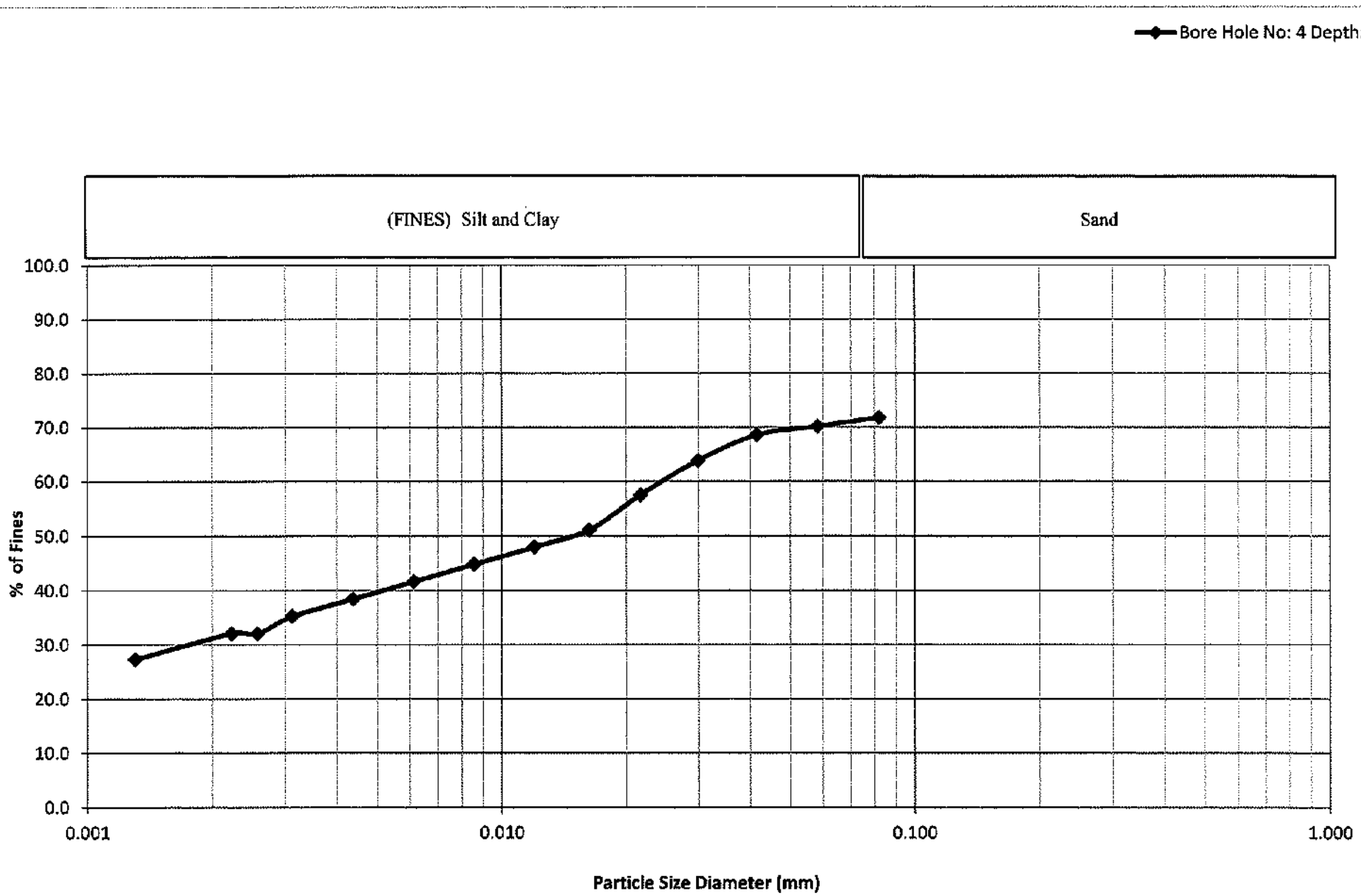


Fig 2.30 Hydrometer Analysis Master Curve

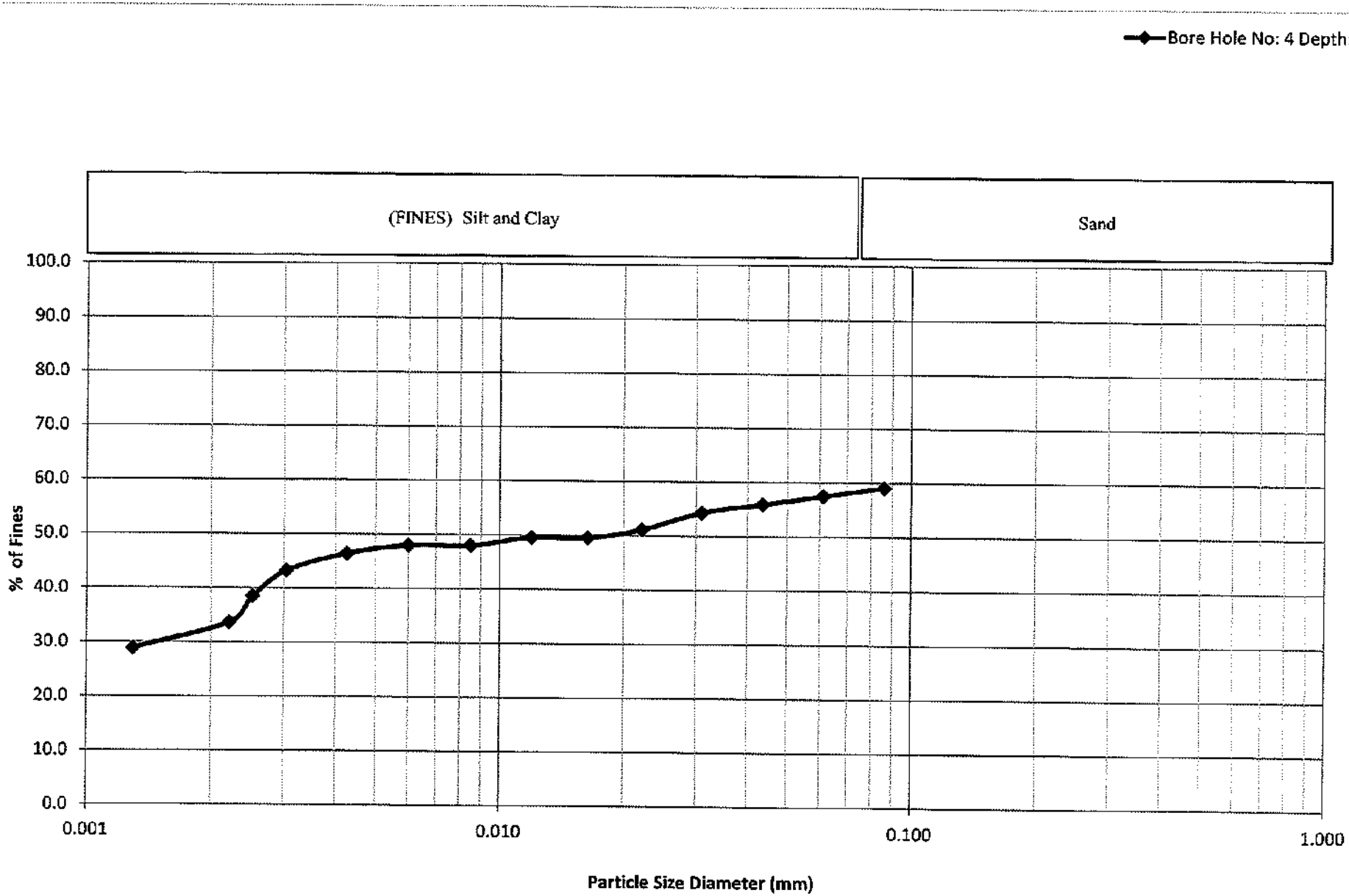


Fig 2.31 Hydrometer Analysis Master Curve

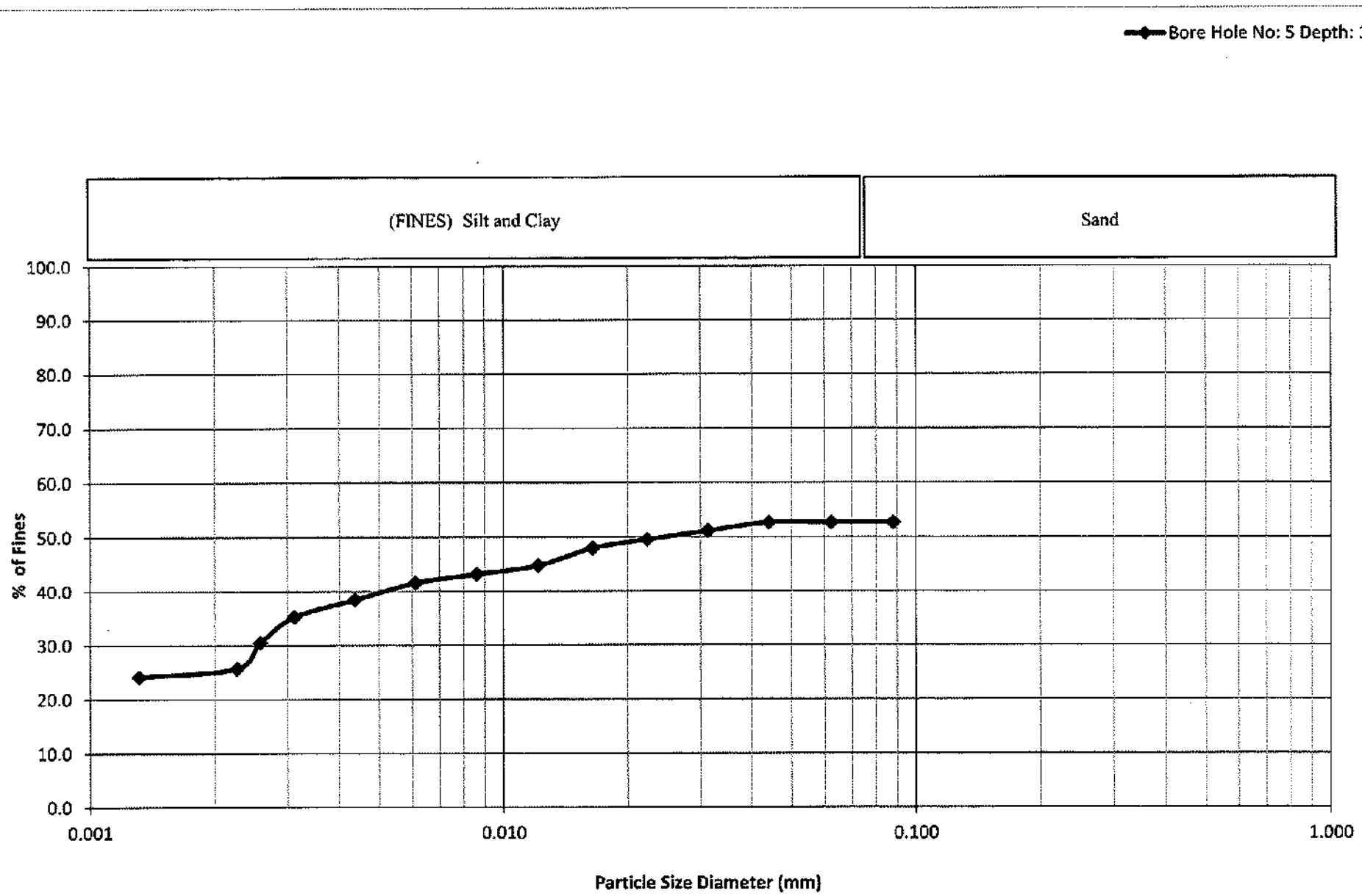


Fig 2.32 Hydrometer Analysis Master Curve

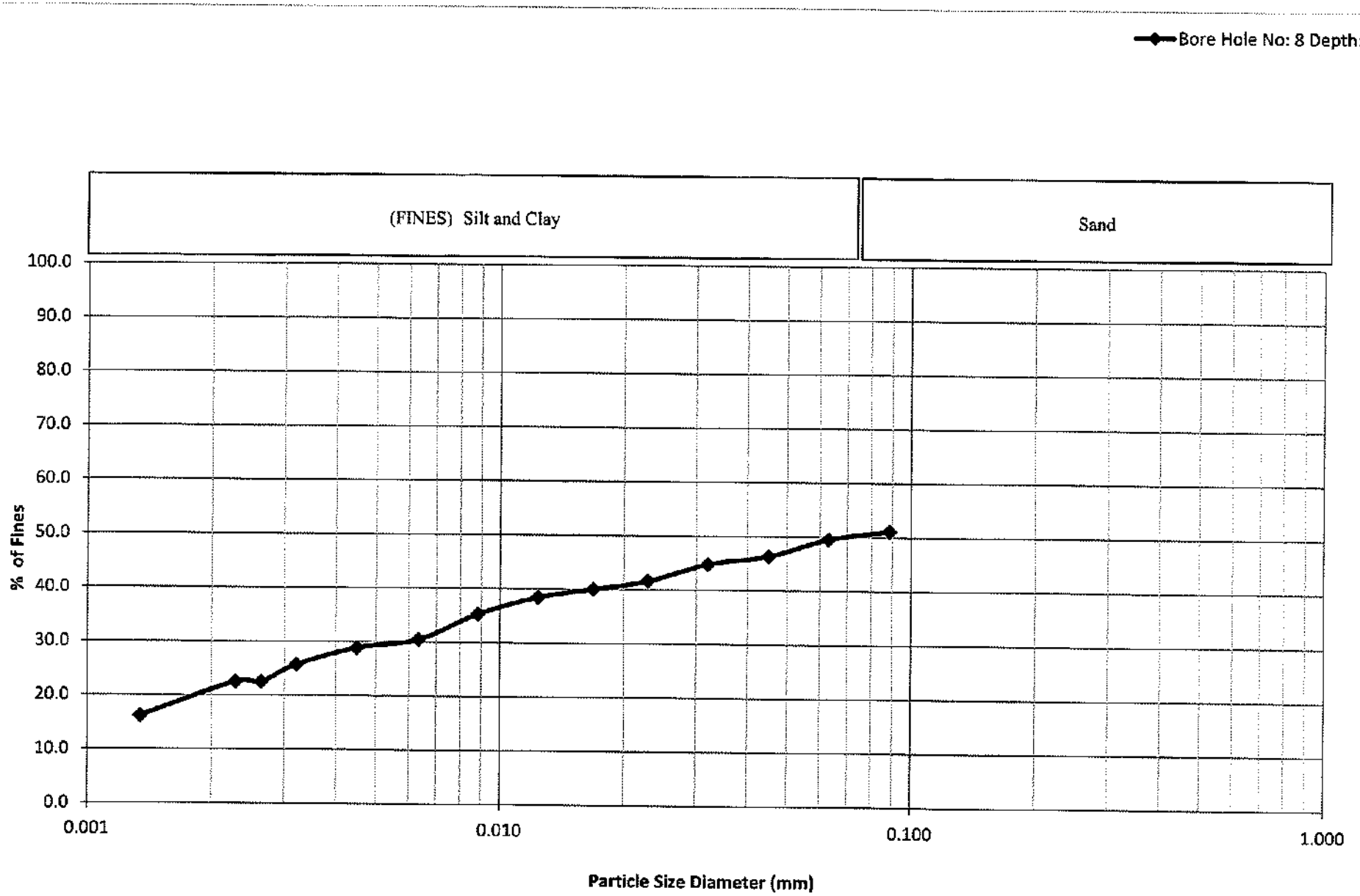


Fig 2.33 Hydrometer Analysis Master Curve

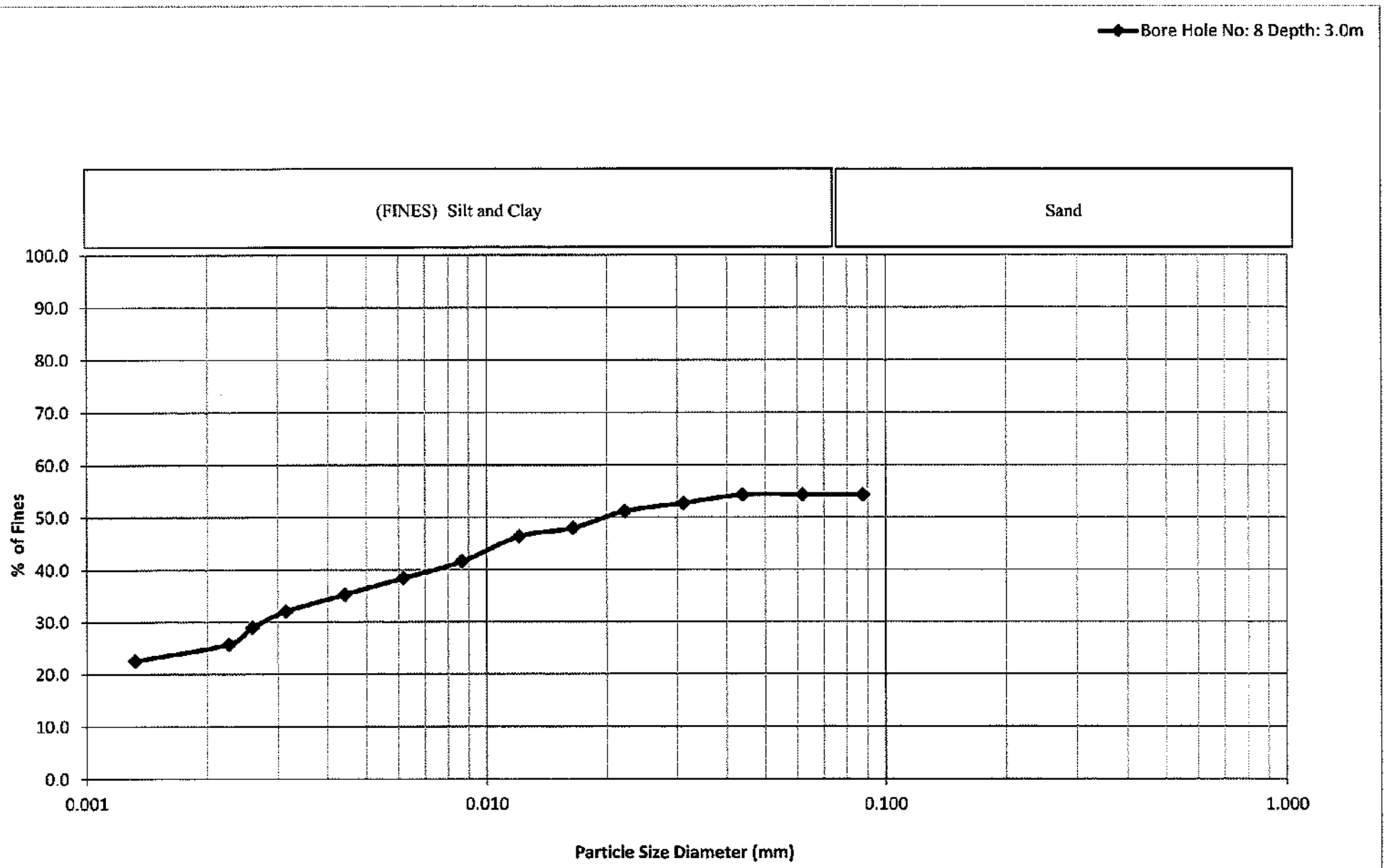


Fig 2.34 Hydrometer Analysis Master Curve

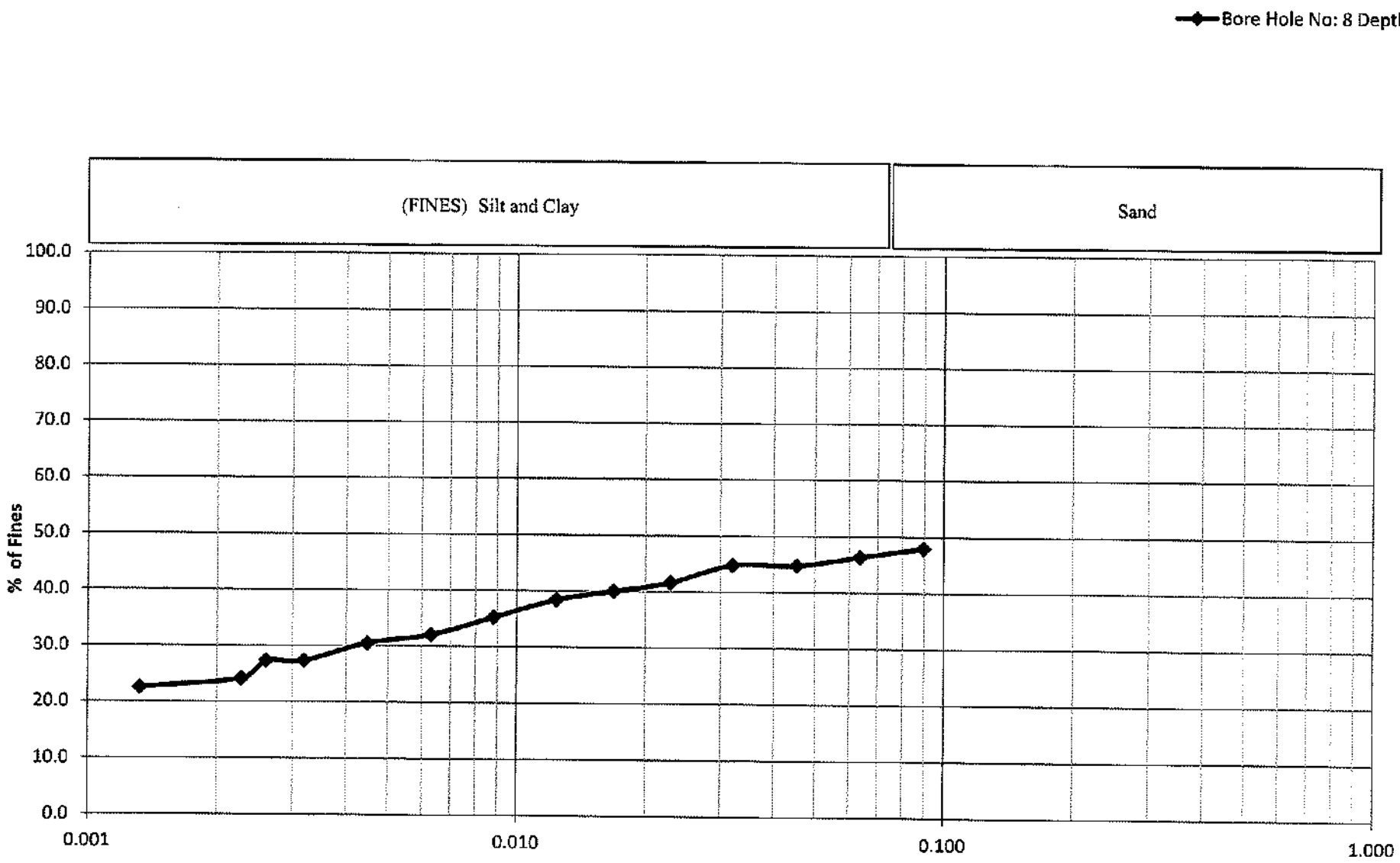


Fig 2.35 Hydrometer Analysis Master Curve

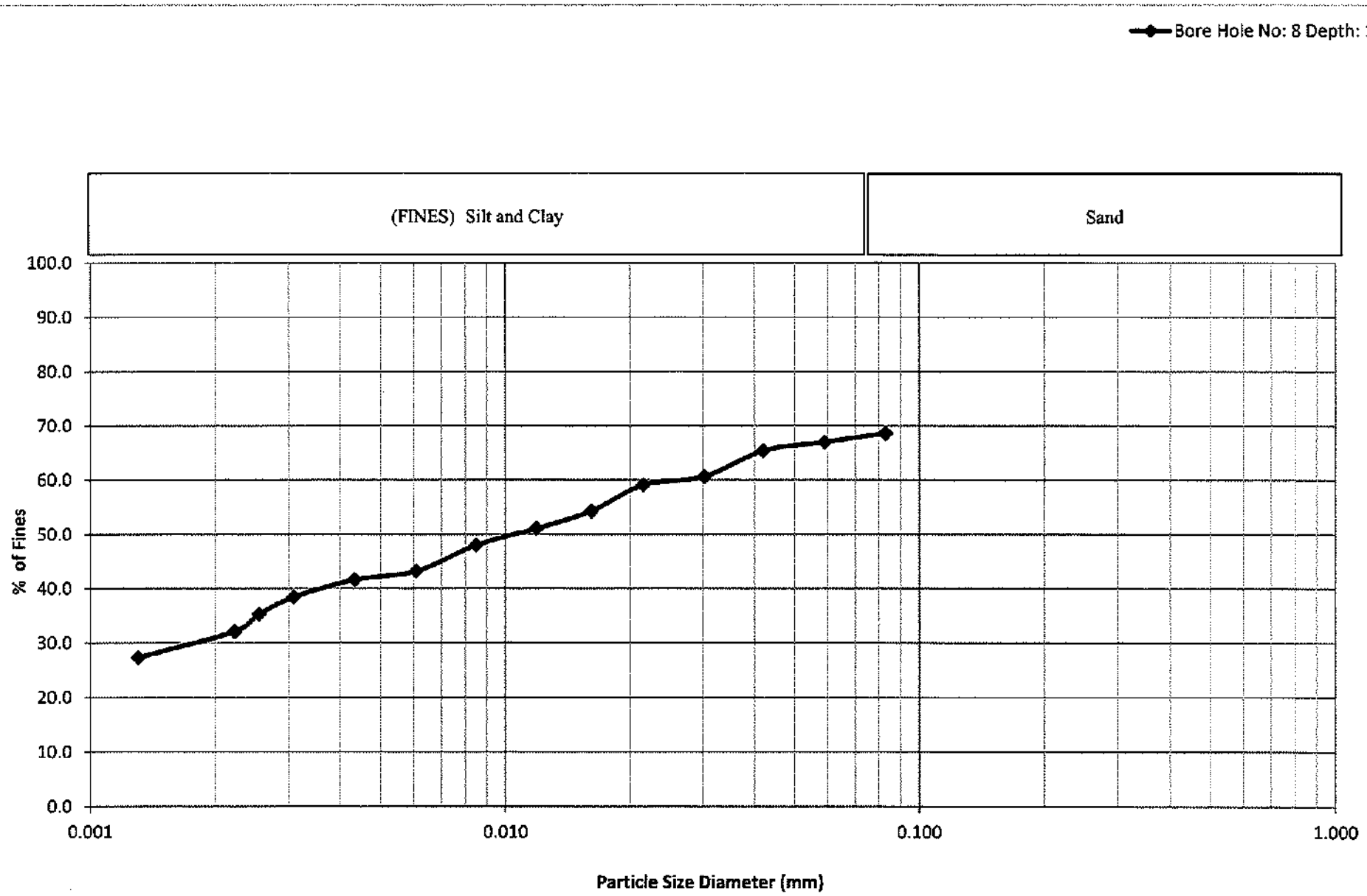


Fig 2.36 Hydrometer Analysis Master Curve

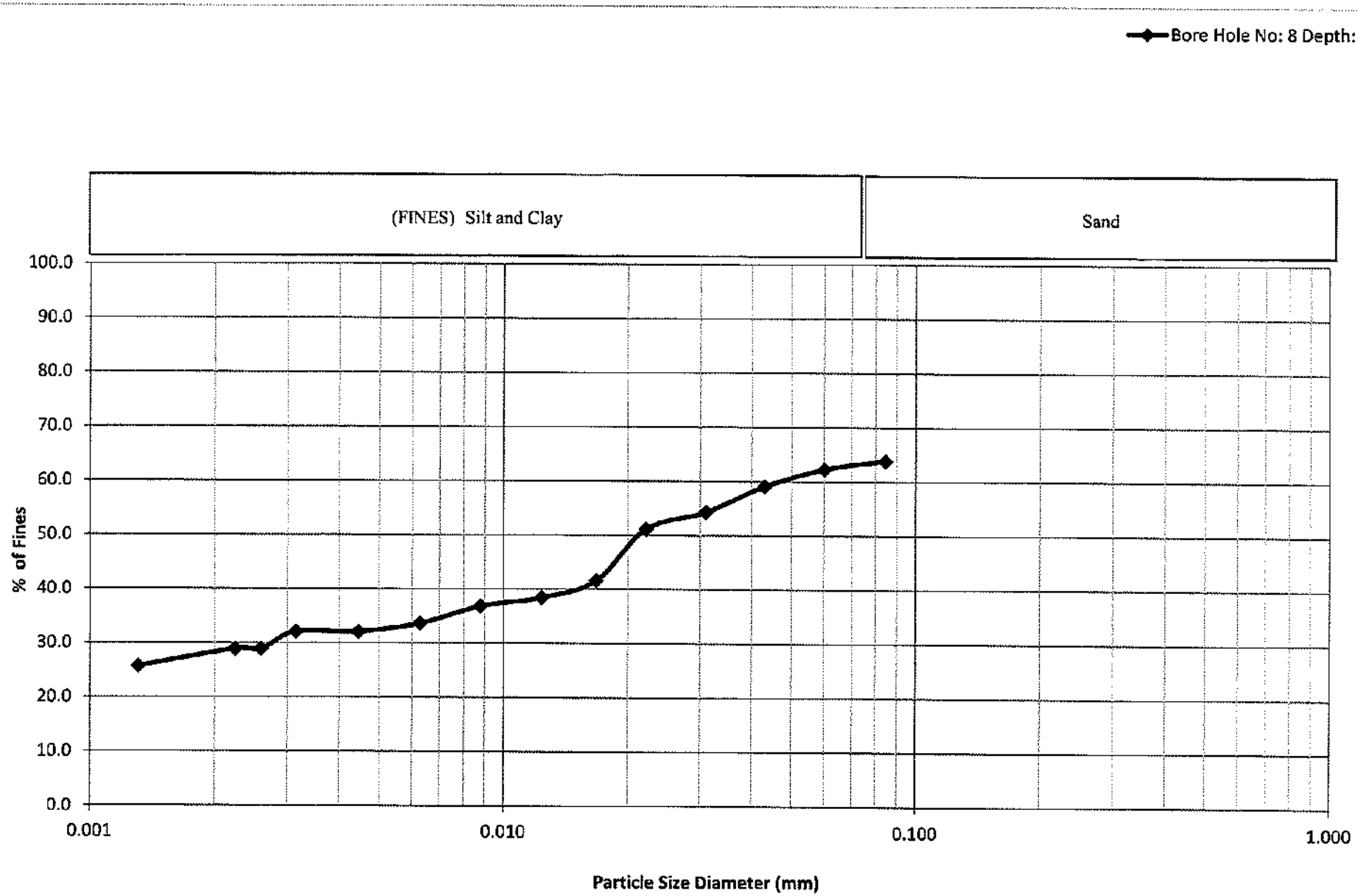


Fig 2.37 Hydrometer Analysis Master Curve

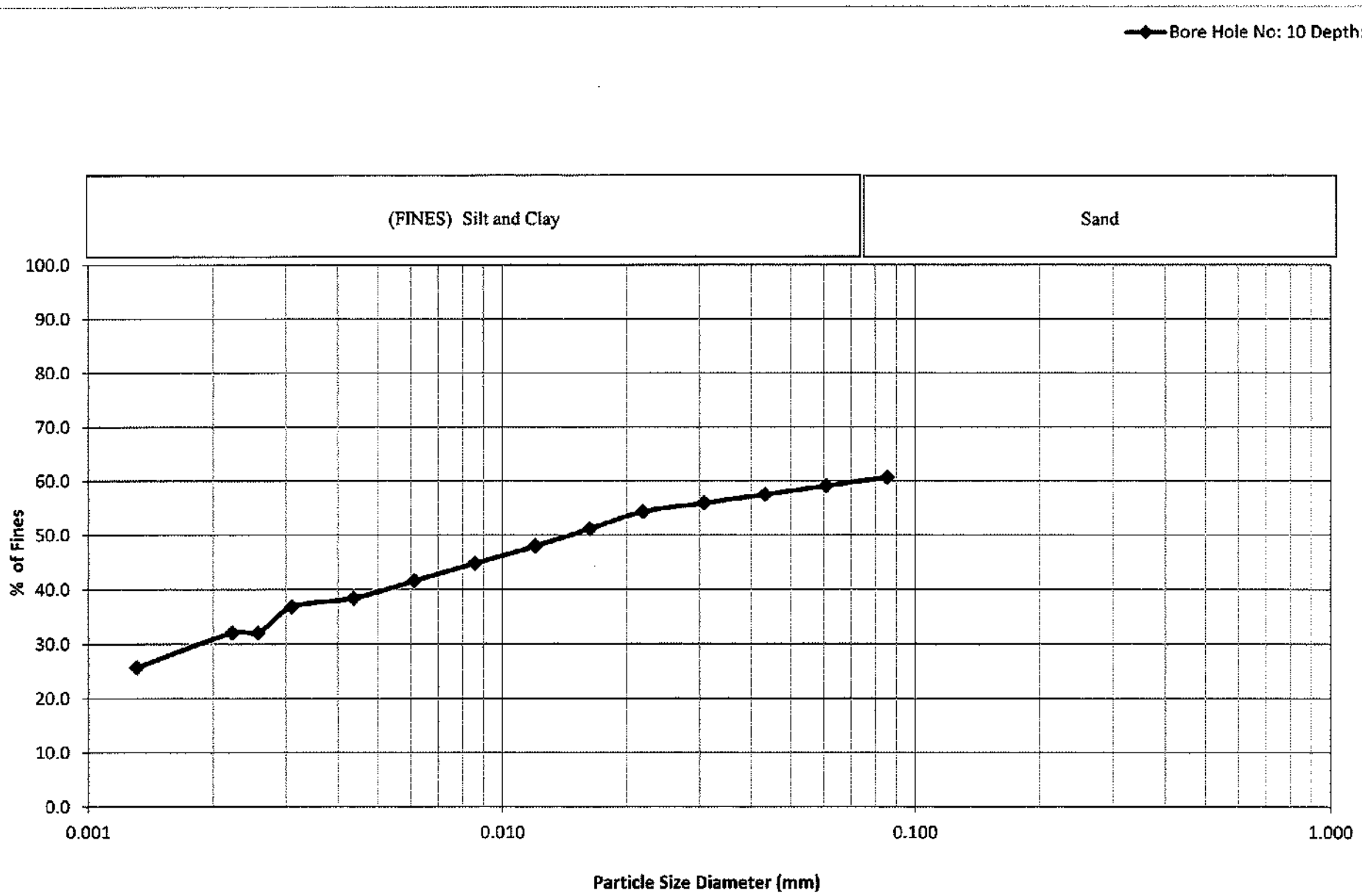


Fig 2.38 Hydrometer Analysis Master Curve

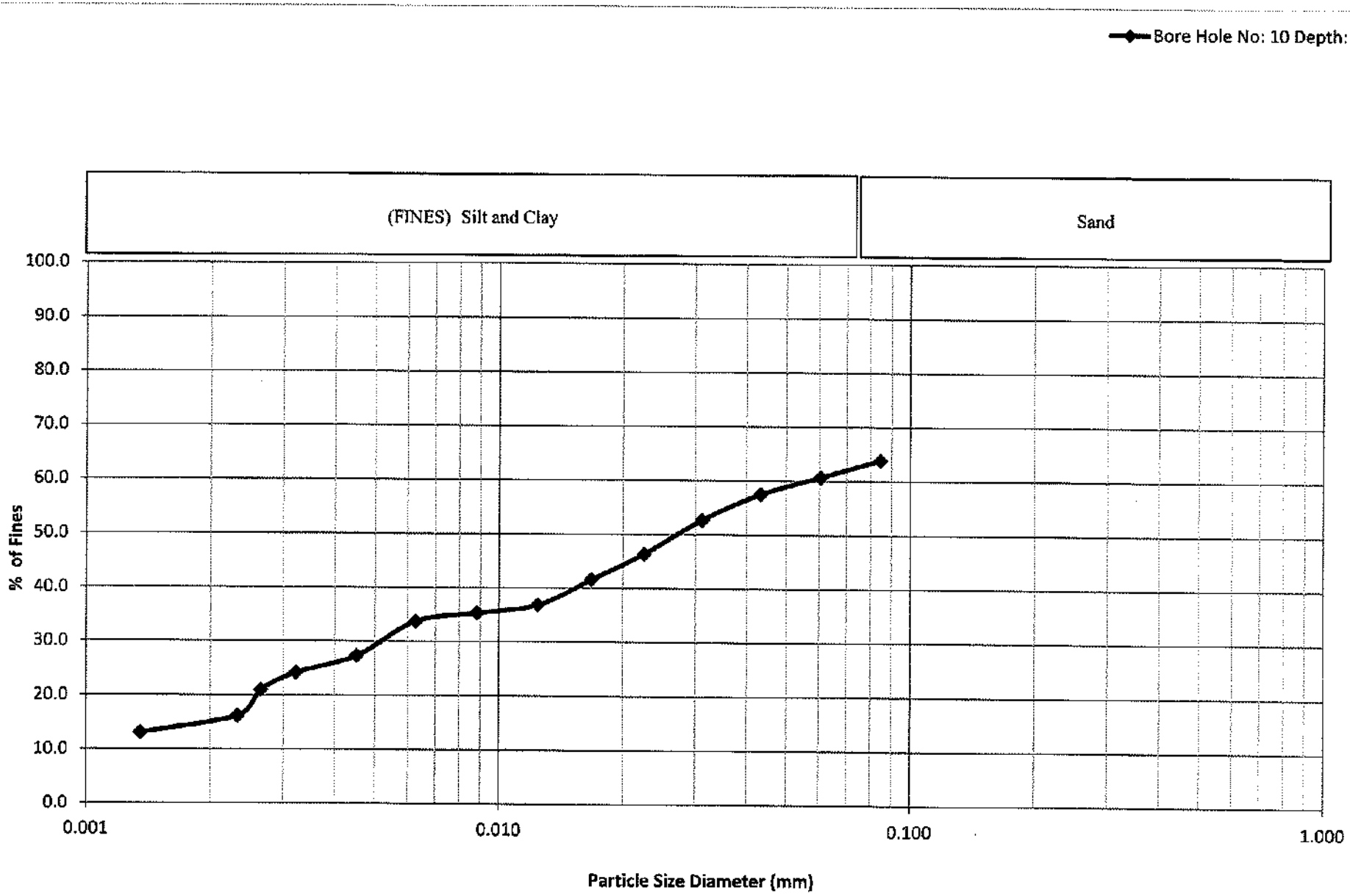


Fig 2.39 Hydrometer Analysis Master Curve

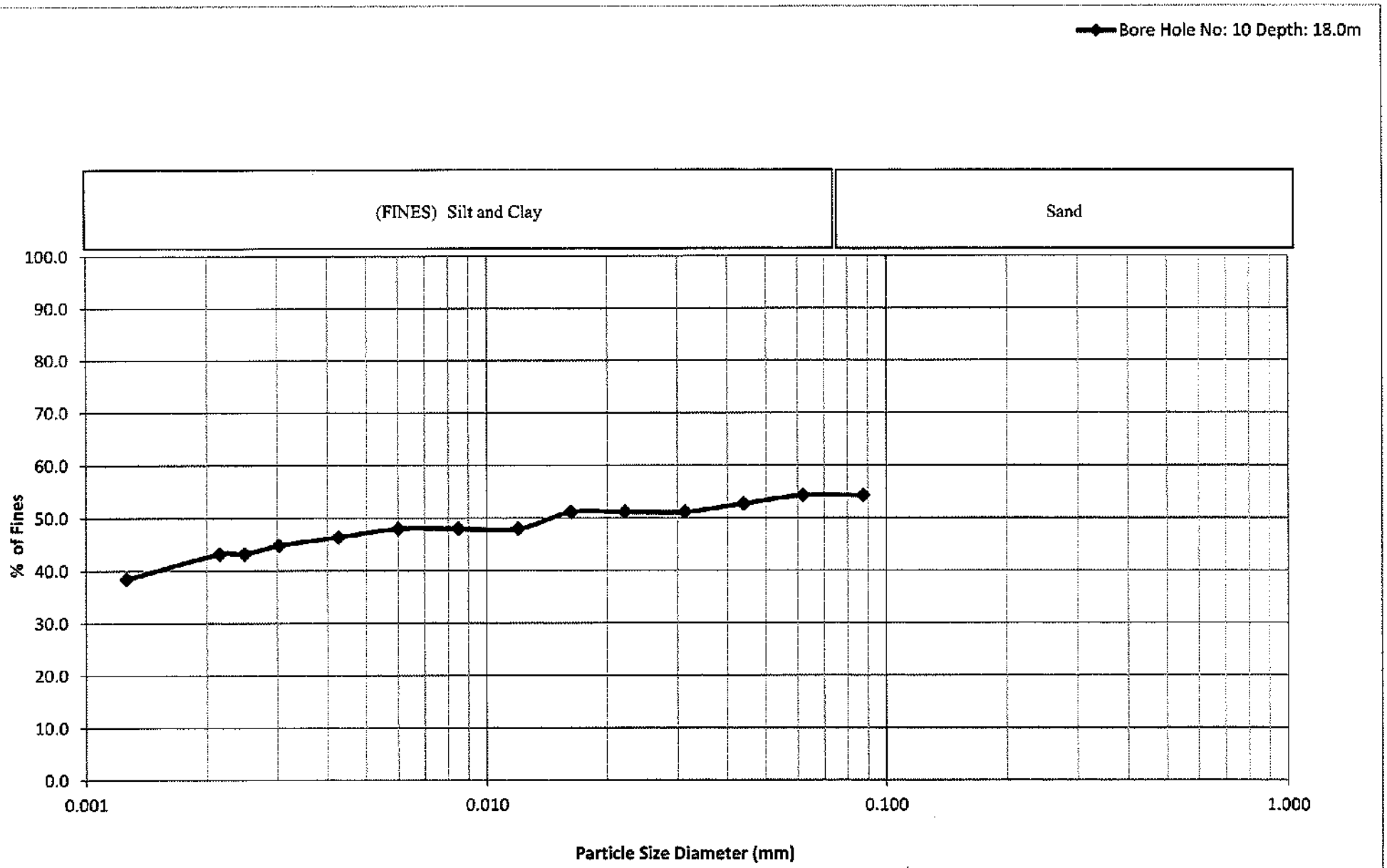


Fig 2.40 Hydrometer Analysis Master Curve

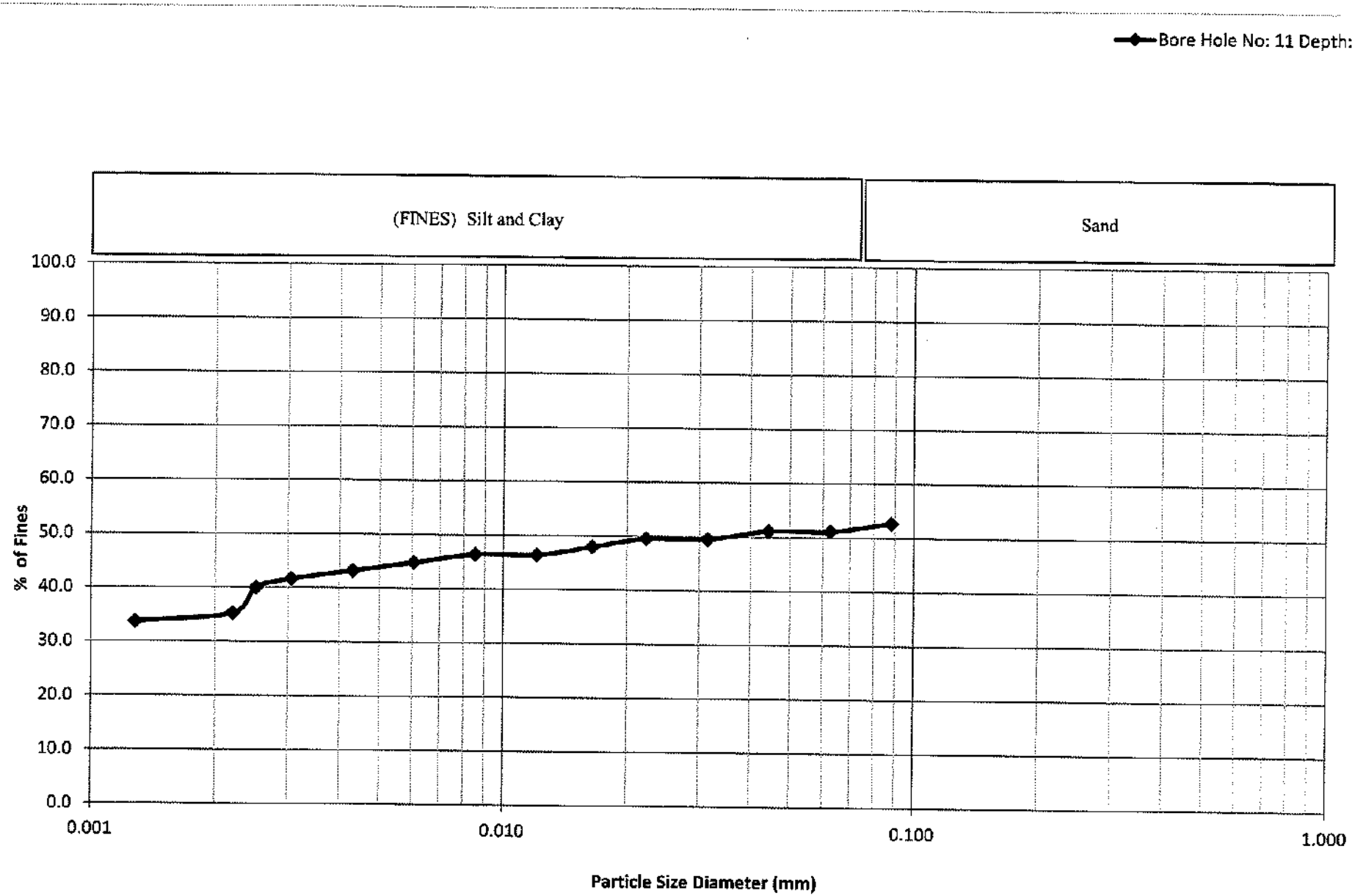


Fig 2.41 Hydrometer Analysis Master Curve

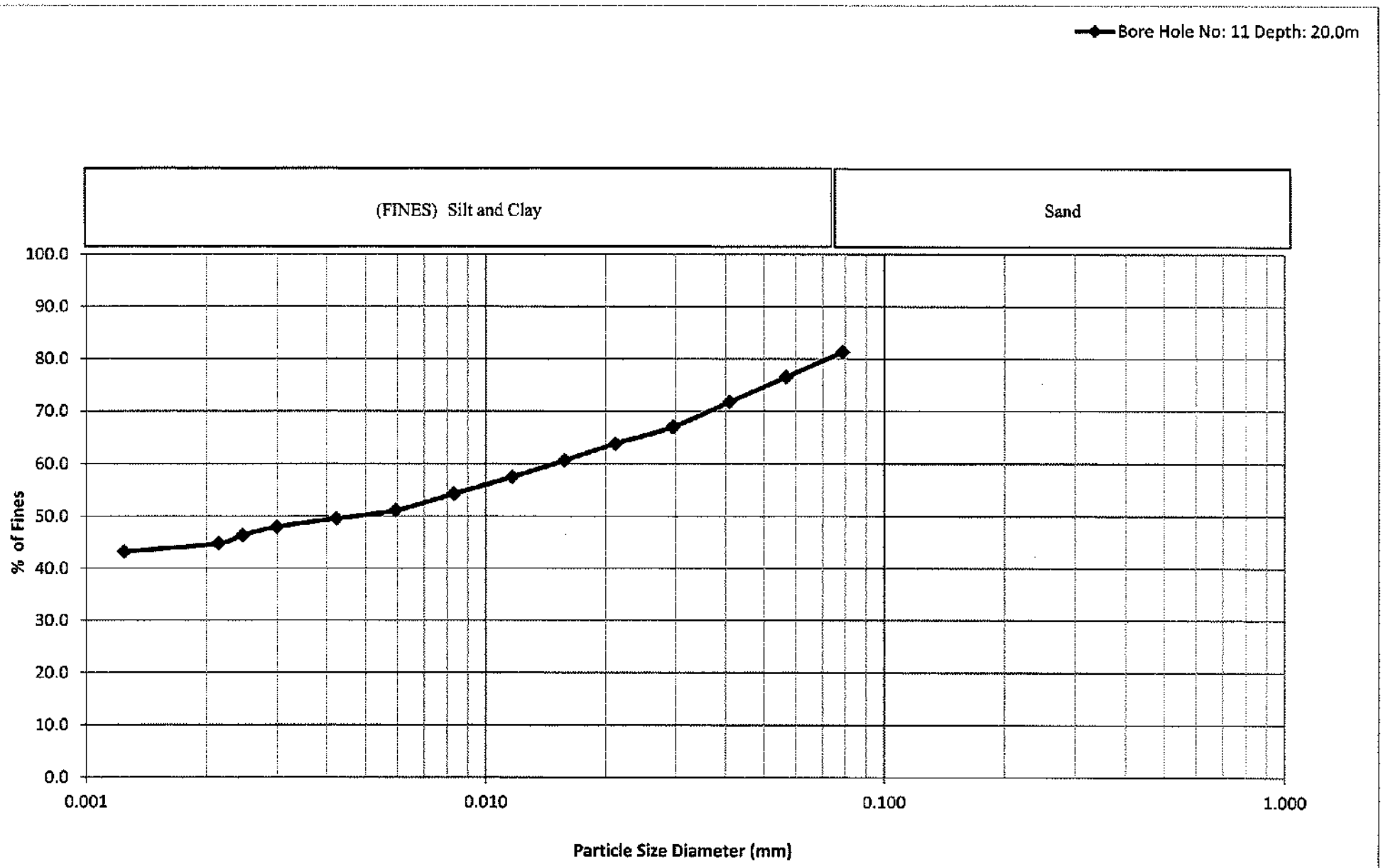


Fig 2.42 Hydrometer Analysis Master Curve

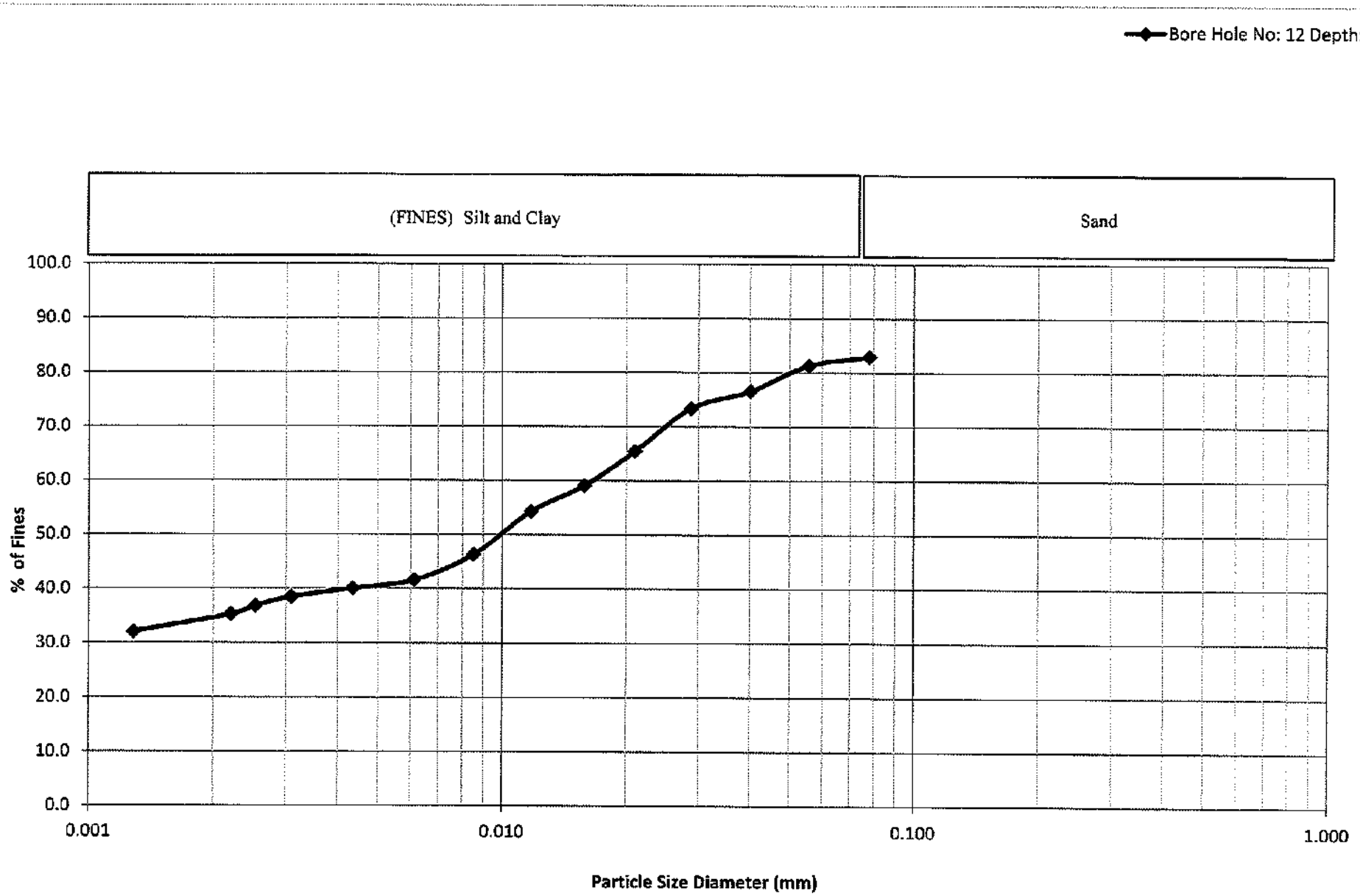


Fig 2.43 Hydrometer Analysis Master Curve

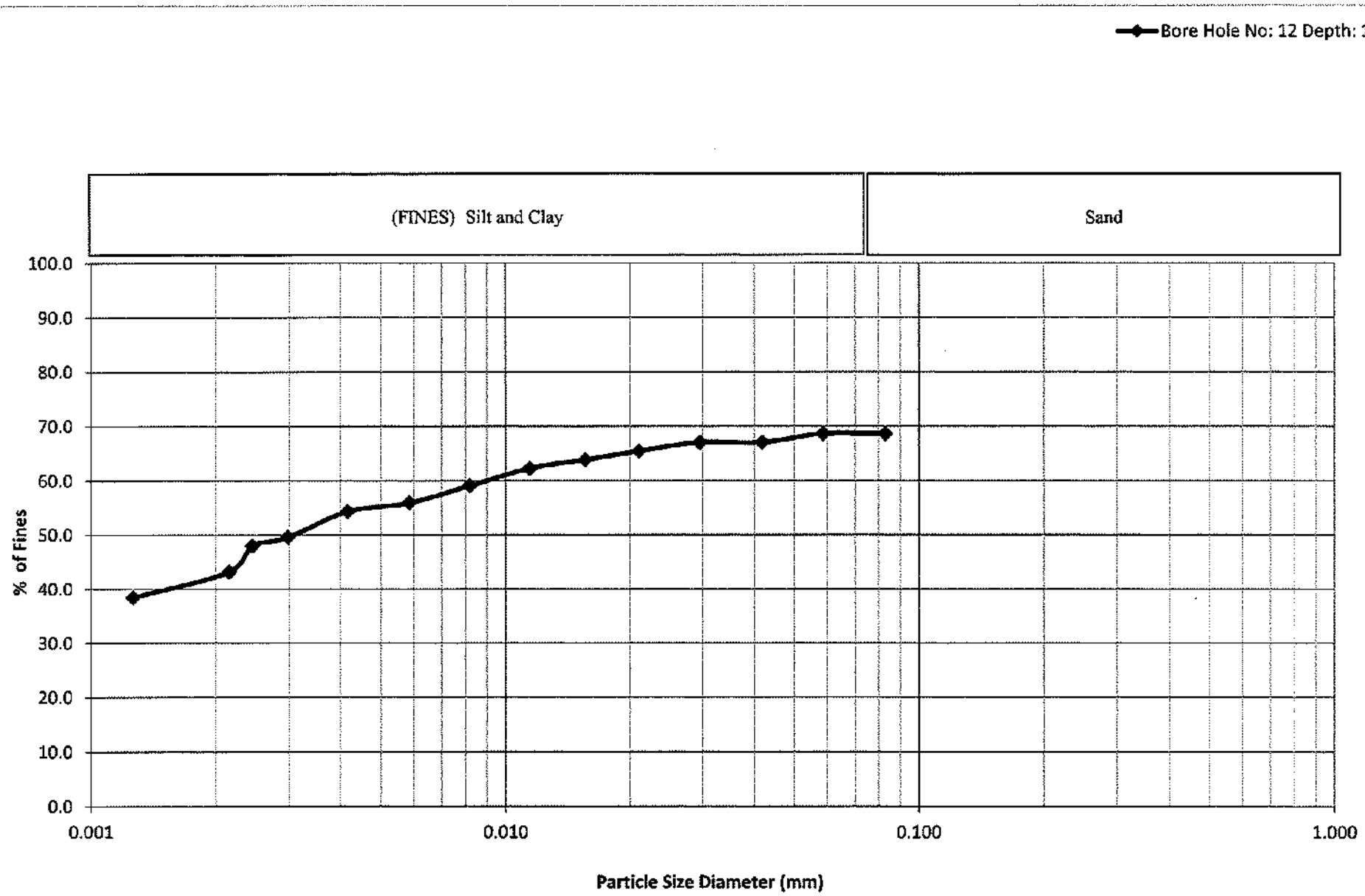


Fig 2.44 Hydrometer Analysis Master Curve

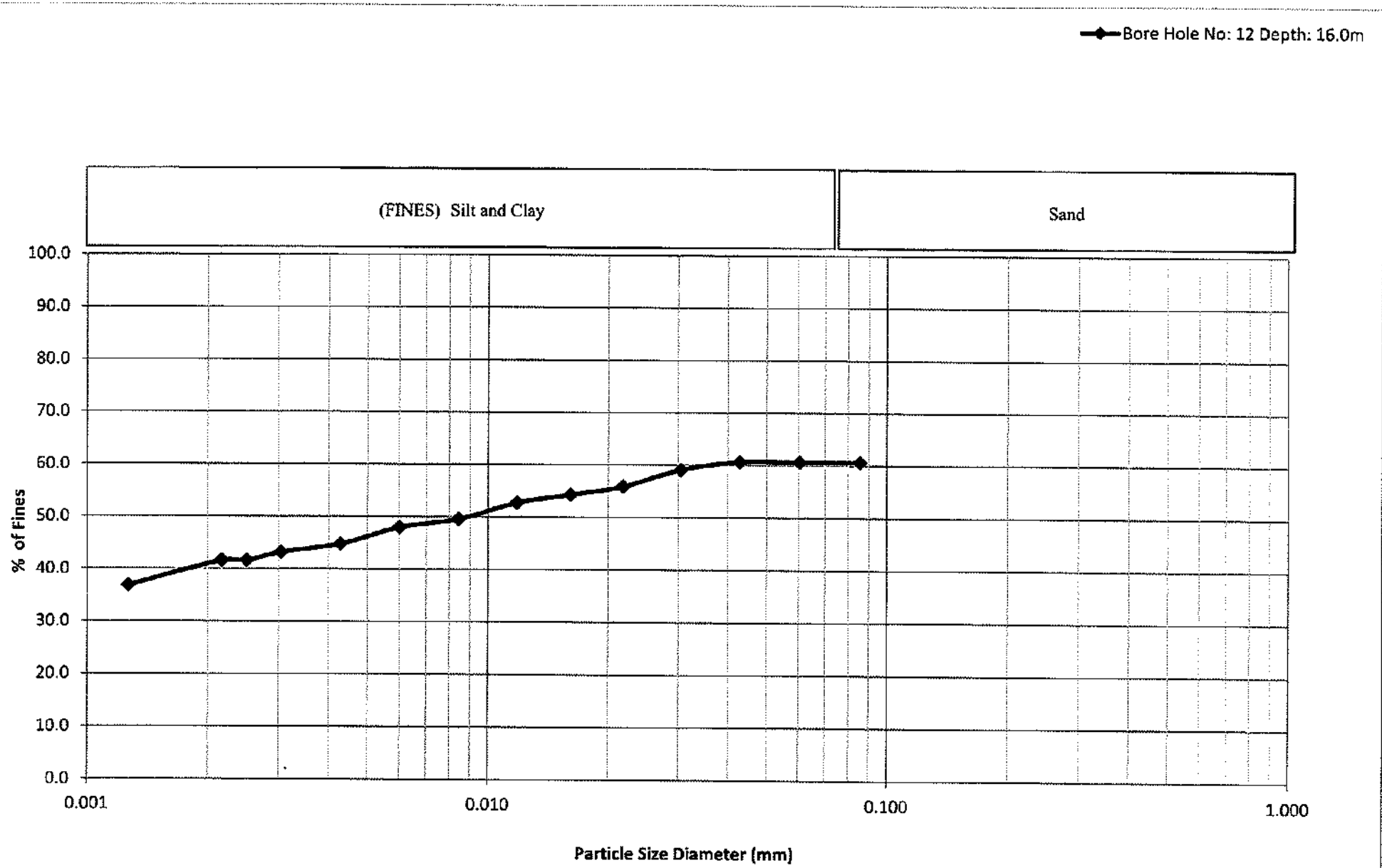


Fig 2.45 Hydrometer Analysis Master Curve

LABORATORY TEST RESULTS

GEOMARINE
Phone No.: 044-24481485, 044-24480305

LABORATORY TEST REPORT

GEOMARINE CONSULTANTS PVT LTD- GEOTECHNICAL LABORATORY
NO.11 2nd MAIN ROAD, KANNAPA NAGAR EXTN,
KOTTIVAKKAM, CHENNAI

Name & Address of the Customer	:	**M/s RAMANIYAM REAL ESTATES (P) LTD**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	06/07/2022 to 28/07/2022
Source of Sample	:	Customer Supplied- Borehole No. BH-01	**Sample Identification Number**	:	SS/GMC/052022/474/BH01
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2374/BH-01
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	30/07/2022
Sample Receipt Date	:	26/05/2022	**Test Report Pages**	:	Two Pages

Table-2.1 Laboratory Classification of Soil Samples from BH-01

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Coarse Grained (CG)												
			Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_p= LL-PL)	Consistency Index (I_c=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistancy	Position With Respect to A-Aline	IS:Notation	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$	Relative Density	IS-Notation	
													Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)							Gravel	Sand
1.0	16	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	12.6	3.3	8.2	31.9	43.9		-	-	-	-	-	M.Dense	<50%	SM
2.0	9	SS	16.5	20.5	15.4	5.1	0.8	15.1	8.3	Stiff	Above	CL-ML	-	0.0	0.0	3.7	33.6	62.8		-	-	-	-	-	FG>50%	FG>50%	FG>50%
3.0	-	UDS	32.1	77.5	25.3	52.2	0.9	10.1	91.7	-	Above	CH	-	0.0	0.9	2.4	9.0	58.2	29.5	-	-	-	-	-	FG>50%	FG>50%	FG>50%
4.0	28	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	4.0	66.1	29.9		-	-	-	-	-	M.Dense	<50%	SM
5.0	35	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	1.6	38.4	49.4	10.6		-	-	-	-	-	Dense	<50%	SP-SM
6.0	45	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	36.1	49.2	14.7		-	-	-	-	-	Dense	<50%	SM
7.5	45	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	7.8	79.1	13.1		-	-	-	-	-	Dense	<50%	SM
9.0	17	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	5.5	75.8	12.0	6.7		-	-	-	-	-	M.Dense	<50%	SP-SM
10.5	21	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	3.4	11.9	29.9	24.5	30.3		-	-	-	-	-	M.Dense	<50%	SM
12.0	9	SS	32.4	53.7	27.8	25.9	0.8	13.2	42.9	Stiff	Above	CH	-	0.0	0.0	0.7	1.5	46.3	51.5	-	-	-	-	-	FG>50%	FG>50%	FG>50%
14.0	11	SS	29.7	55.5	25.5	30.0	0.9	12.9	45.5	Stiff	Above	CH	-	-	-	-	-	72.0	28.0	-	-	-	-	-	FG>50%	FG>50%	FG>50%
16.0	7	SS	28.9	40.7	19.5	21.2	0.6	13.0	38.5	M.Stiff	Above	CI	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
18.0	10	SS	24.5	37.8	21.1	16.7	0.8	13.5	35.7	Stiff	Above	CI	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%

GEOMARINE

Phone No.: 044-24481485, 044-24480305

LABORATORY TEST REPORT

GEOMARINE CONSULTANTS PVT LTD- GEOTECHNICAL LABORATORY
NO.11 2nd MAIN ROAD, KANNAPA NAGAR EXTN,
KOTTIVAKKAM, CHENNAI

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Sample Description	:	Soil Sample	**Period of Testing**	:	06/07/2022 to 28/07/2022
Source of Sample	:	Customer Supplied- Borehole No. BH-01	**Sample Identification Number**	:	SS/GMC/052022/474/BH01
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2374/BH-01
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	30/07/2022
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													Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)							Gravel	Sand
20.0	14	SS	25.4	47.1	18.8	28.3	0.8	12.6	66.7	Stiff	Above	CI	-	-	-	-	-	100.0	-	-	-	-	-	FG>50%	FG>50%	FG>50%
22.5	21	SS	24.8	38.1	15.0	23.1	0.6	16.5	63.6	CG>50%	Above	-	-	26.1	2.1	18.0	29.7	24.2	-	-	-	-	-	M.Dense	<50%	SC
25.0	50	SS	26.8	66.0	31.1	34.9	1.1	12.2	81.8	Hard	Above	CH	-	0.0	0.3	10.2	4.1	85.4	-	-	-	-	-	FG>50%	FG>50%	FG>50%
27.5	84	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	14.5	59.0	26.6	-	-	-	-	-	V.Dense	<50%	SM
30.0	>100	SS	Pieces of Lithified Shale Rock																							
33.0	>100	SS	17.9	66.0	25.8	40.2	1.2	-	33.3	Hard	Above	CH	-	-	-	-	-	100.0	-	-	-	-	-	FG>50%	FG>50%	FG>50%

"" END OF REPORT""

Terms and Conditions

(1) The test results furnished corresponds to the sample received

(2) The tested sample will not be retained for more than 45 days from the date of issue of test report except in the case as required by the applicable regulations.

(3) Any correction in this reports invalidates the reports

Authorised Signatory

A. VINOTH
(Technical Manager)

GEOMARINE
Phone No.: 044-24481485, 044-24480305

LABORATORY TEST REPORT

GEOMARINE CONSULTANTS PVT LTD- GEOTECHNICAL LABORATORY
NO.11 2nd MAIN ROAD, KANNAPA NAGAR EXTN,
KOTTIVAKKAM. CHENNAI

Name & Address of the Customer	:	M/s RAMANIYAM REAL ESTATES (P) LTD	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	06/07/2022 to 28/07/2022
Source of Sample	:	Customer Supplied- Borehole No. BH-02	**Sample Identification Number**	:	SS/GMC/052022/474/BH02
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2374/BH-02
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	30/07/2022
Sample Receipt Date	:	21/05/2022	**Test Report Pages**	:	Two Pages

Table-2.2 Laboratory Classification of Soil Samples from BH-02

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Coarse Grained (CG)												
			Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_p= LL-PL)	Consistency Index (Ic=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistancy	Position With Respect to A-Aline	IS:Notation	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$	Relative Density	IS-Notation	
														Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)							Gravel	Sand
1.0	27	SS	15.7	27.5	16.8	10.7	1.1	16.0	16.7	V.Stiff	Above	CL	-	0.0	0.0	1.9	44.2	53.9		-	-	-	-	-	FG>50%	FG>50%	FG>50%
2.0	23	SS	19.2	39.2	21.0	18.2	1.1	13.3	20.0	V.Stiff	Above	CI	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
3.0	22	SS	19.7	41.7	21.7	19.9	1.1	12.8	38.5	V.Stiff	Above	CI	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
4.0	22	SS	Little to Non Plastic Pred. Silt Binder							CG>50%	Above	-	-	0.0	0.0	0.8	59.6	39.6		-	-	-	-	-	M.Dense	<50%	-
5.0	37	SS	16.5	26.7	17.5	9.2	1.1	15.5	10.0	CG>50%	Above	-	-	0.0	0.0	7.0	59.9	33.1		-	-	-	-	-	Dense	<50%	SC
6.0	34	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	1.2	25.0	58.4	15.4		-	-	-	-	-	Dense	<50%	SM
7.5	23	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	2.9	52.0	36.0	9.1		-	-	-	-	-	M.Dense	<50%	SP-SM
9.0	18	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	3.8	62.5	23.9	9.8		-	-	-	-	-	M.Dense	<50%	SP-SM
10.5	27	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	0.4	58.2	41.4		-	-	-	-	-	M.Dense	<50%	SM
12.0	15	SS	17.6	33.6	16.7	16.9	0.9	14.0	9.1	Stiff	Above	CL	-	0.0	1.0	9.3	8.2	81.5		-	-	-	-	-	FG>50%	FG>50%	FG>50%
14.0	14	SS	29.5	65.5	28.4	37.0	1.0	12.1	42.9	Stiff	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
16.0	UDS Sample Failed																										
18.0	8	SS	21.3	36.5	17.4	19.1	0.8	13.9	63.6	Stiff	Above	CI	-	-	-	-	-	55.2	44.8	-	-	-	-	-	FG>50%	FG>50%	FG>50%

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LABORATORY TEST REPORT

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NO.11 2nd MAIN ROAD, KANNAPA NAGAR EXTN,
KOTTIVAKKAM. CHENNAI

Name & Address of the Customer	:	**M/s RAMANIYAM REAL ESTATES (P) LTD**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	06/07/2022 to 28/07/2022
Source of Sample	:	Customer Supplied- Borehole No. BH-02	**Sample Identification Number**	:	SS/GMC/052022/474/BH02
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2374/BH-02
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	30/07/2022
Sample Receipt Date	:	21/05/2022	**Test Report Pages**	:	Two Pages

Table-2.2 Laboratory Classification of Soil Samples from BH-02

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Coarse Grained (CG)														
			Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_p= LL-PL)	Consistency Index (I_c=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistancy	Position With Respect to A-Afine	IS:Notation	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient $C_u=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$	Relative Density	IS-Notation	
													Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)							Gravel	Sand
20.0	20	SS	17.3	37.0	18.0	19.0	1.0	13.8	50.0	V.Stiff	Above	CI	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
22.5	36	SS	25.8	48.7	24.2	24.5	0.9	13.5	66.7	CG>50%	Above	-	-	0.0	2.2	9.7	47.0	41.2		-	-	-	-	-	Dense	<50%	SC
25.0	44	SS	21.3	47.7	25.4	22.3	1.2	13.5	72.7	CG>50%	Above	-	-	0.0	1.4	8.3	49.0	41.4		-	-	-	-	-	Dense	<50%	SC
27.5	>100	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	5.6	30.8	30.8	32.9	0.0	-	-	-	-	-	V.Dense	<50%	SM
30.0	>100	SS	25.1	55.1	26.2	29.0	1.0	-	17.6	Hard	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
33.0	63	SS	27.3	58.1	29.8	28.3	1.1	13.3	35.7	Hard	Above	CH	-	-	-	-	-	74.3	25.7	-	-	-	-	-	FG>50%	FG>50%	FG>50%

** END OF REPORT**

Terms and Conditions

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(3) Any correction in this reports invalidates the reports

Authorised Signatory

A. VINOTH
(Technical Manager)

GEOMARINE
Phone No.: 044-24481485, 044-24480305

LABORATORY TEST REPORT

GEOMARINE CONSULTANTS PVT LTD- GEOTECHNICAL LABORATORY
NO.11 2nd MAIN ROAD, KANNAPA NAGAR EXTN,
KOTTIVAKKAM. CHENNAI

Name & Address of the Customer	:	**M/s RAMANIYAM REAL ESTATES (P) LTD**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	06/07/2022 to 28/07/2022
Source of Sample	:	Customer Supplied- Borehole No. BH-03	**Sample Identification Number**	:	SS/GMC/052022/474/BH03
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2374/BH-03
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	30/07/2022
Sample Receipt Date	:	21/05/2022	**Test Report Pages**	:	Two Pages

Table-2.3 Laboratory Classification of Soil Samples from BH-03

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Coarse Grained (CG)													
													GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015												IS-Notation	
			Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_p= LL-PL)	Consistency Index (I_c=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistancy	Position With Respect to A-Aline	IS:Notation	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2016	Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)	D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$	Relative Density	Gravel	Sand
1.0	24	SS	14.2	18.8	14.8	4.0	1.1	16.0	15.4	V.Stiff	Above	CL-ML	-	0.0	0.0	3.6	33.4	63.1		-	-	-	-	-	FG>50%	FG>50%	FG>50%
2.0	31	SS	17.4	30.0	19.4	10.6	1.2	15.5	27.3	Hard	Above	CL	-	-	-	-	-	75.9	24.1	-	-	-	-	-	FG>50%	FG>50%	FG>50%
3.0	33	SS	17.7	56.5	25.9	30.6	1.3	12.3	6.7	Hard	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
4.0	22	SS	14.8	29.6	15.2	14.4	1.0	15.8	12.5	V.Stiff	Above	CL	-	0.0	0.0	1.0	28.1	70.9		-	-	-	-	-	FG>50%	FG>50%	FG>50%
5.0	50	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	13.3	74.1	12.6		-	-	-	-	-	Dense	<50%	SM
6.0	40	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	1.2	48.8	35.9	14.0		-	-	-	-	-	Dense	<50%	SM
7.5	32	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	2.6	45.9	41.5	10.1		-	-	-	-	-	Dense	<50%	SP-SM
9.0	30	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	1.5	6.3	63.5	20.0	8.6		-	-	-	-	-	M.Dense	<50%	SP-SM
10.5	4	SS	33.5	45.3	18.4	26.9	0.4	14.8	0.0	Soft	Above	CI	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
12.0	16	SS	25.7	61.4	30.2	31.2	1.1	12.3	42.9	V.Stiff	Above	CH	-	-	-	-	-	55.2	44.8	-	-	-	-	-	FG>50%	FG>50%	FG>50%
14.0	14	SS	31.1	65.5	30.5	35.0	1.0	11.7	55.5	Stiff	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
16.0	10	SS	27.2	50.1	23.6	26.5	0.9	13.3	75.0	Stiff	Above	CH	-	-	-	-	-	56.8	43.2	-	-	-	-	-	FG>50%	FG>50%	FG>50%
18.0	17	SS	24.2	55.5	25.2	30.3	1.0	12.8	65.5	V.Stiff	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%

GEOMARINE
Phone No.: 044-24481485, 044-24480305

LABORATORY TEST REPORT

GEOMARINE CONSULTANTS PVT LTD- GEOTECHNICAL LABORATORY
NO.11 2nd MAIN ROAD, KANNAPA NAGAR EXTN,
KOTTIVAKKAM. CHENNAI

Name & Address of the Customer	:	**M/s RAMANIYAM REAL ESTATES (P) LTD**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	06/07/2022 to 28/07/2022
Source of Sample	:	Customer Supplied- Borehole No. BH-03	**Sample Identification Number**	:	SS/GMC/052022/474/BH03
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2374/BH-03
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	30/07/2022
Sample Receipt Date	:	21/05/2022	**Test Report Pages**	:	Two Pages

Table-2.3 Laboratory Classification of Soil Samples from BH-03

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	Coarse Grained (CG)														
			Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_p= LL-PL)	Consistency Index (Ic=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistancy	Position With Respect to A-Aline	IS:Notation		GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient C_u=D_{60}/D_{10}	Co-Efficient of Curvature C_c=$D_{30}^2/(D_{10}xD_{60})$	Relative Density	IS-Notation	
														Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)							Gravel	Sand
20.0	32	SS	26.3	58.3	27.8	30.5	1.0	12.2	50.0	Hard	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
22.5	56	SS	28.9	64.6	31.1	33.5	1.1	11.9	61.5	Hard	Above	CH	-	0.0	0.0	8.2	16.3	75.6		-	-	-	-	-	FG>50%	FG>50%	FG>50%
25.0	40	SS	16.3	35.5	14.4	21.1	0.9	16.3	0.0	CG>50%	Above	-	-	0.0	0.0	18.8	40.4	40.9		-	-	-	-	-	Dense	<50%	SC
27.5	>100	SS	15.7	40.5	15.2	25.3	1.0	16.0	66.7	CG>50%	Above	-	-	0.0	4.8	31.6	31.9	31.8		-	-	-	-	-	V.Dense	<50%	SC
30.0	>100	SS	28.9	71.2	32.3	38.9	1.1	-	90.9	Hard	Above	CH	-	-	-	-	-	75.9	24.1	-	-	-	-	-	FG>50%	FG>50%	FG>50%
33.0	>100	SS	27.6	76.7	30.7	46.0	1.1	-	40.0	Hard	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%

** END OF REPORT**

Terms and Conditions

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Authorised Signatory

A. VINOTH
(Technical Manager)

GEOMARINE
Phone No.: 044-24481485, 044-24480305

LABORATORY TEST REPORT

GEOMARINE CONSULTANTS PVT LTD- GEOTECHNICAL LABORATORY
NO.11 2nd MAIN ROAD, KANNAPA NAGAR EXTN,
KOTTIVAKKAM, CHENNAI

Name & Address of the Customer	:	**M/s RAMANIYAM REAL ESTATES (P) LTD**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	08/07/2022 to 28/07/2022
Source of Sample	:	Customer Supplied- Borehole No. BH-04	**Sample Identification Number**	:	SS/GMC/052022/474/BH04
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2374/BH-04
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	30/07/2022
Sample Receipt Date	:	14/05/2022	**Test Report Pages**	:	Two Pages

Table-2.4 Laboratory Classification of Soil Samples from BH-04

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Coarse Grained (CG)													
			Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_p= LL-PL)	Consistency Index (Ic=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistancy	Position With Respect to A-Aline	IS:Notation	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient C_u=D_{60}/D_{10}	Co-Efficient of Curvature C_c=D_{30}^2/(D_{10}xD_{60})	Relative Density	IS-Notation	
														Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)							Gravel	Sand
1.0	19	SS	14.6	40.3	17.2	23.1	1.1	14.5	23.1	V.Stiff	Above	CI	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
2.0	14	SS	21.8	47.2	20.0	27.3	0.9	13.8	45.5	Stiff	Above	CI	-	-	-	-	-	67.9	32.1	-	-	-	-	-	FG>50%	FG>50%	FG>50%
3.0	17	SS	16.5	28.8	19.0	9.7	1.3	16.0	8.3	V.Stiff	Above	CL	-	0.0	0.0	1.5	43.1	55.4		-	-	-	-	-	FG>50%	FG>50%	FG>50%
4.0	10	SS	Little to Non Plastic Fine Sand/Silt									ML	-	0.0	0.0	0.7	43.1	56.2		-	-	-	-	-	FG>50%	FG>50%	FG>50%
5.0	34	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	14.3	58.8	26.8		-	-	-	-	-	Dense	<50%	SM
6.0	38	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	2.0	3.2	50.5	34.1	10.2		-	-	-	-	-	Dense	<50%	SP-SM
7.5	30	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	1.1	58.9	32.0	8.0		-	-	-	-	-	M.Dense	<50%	SP-SM
9.0	9	SS	32.5	60.1	25.6	34.5	0.8	11.9	28.6	Stiff	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
10.5	9	SS	37.0	74.4	28.1	46.2	0.8	10.5	30.8	Stiff	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
12.0	11	SS	27.3	50.7	20.6	30.0	0.8	12.5	23.1	Stiff	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
14.0	10	SS	29.0	53.5	25.5	28.0	0.9	12.1	71.4	Stiff	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
16.0	9	SS	24.4	44.0	19.4	24.5	0.8	13.3	55.5	Stiff	Above	CI	-	-	-	-	-	66.6	33.4	-	-	-	-	-	FG>50%	FG>50%	FG>50%
18.0	13	SS	19.1	43.8	18.7	25.1	1.0	14.0	116.7	Stiff	Above	CI	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%

GEOMARINE

Phone No.: 044-24481485, 044-24480305

LABORATORY TEST REPORT

GEOMARINE CONSULTANTS PVT LTD- GEOTECHNICAL LABORATORY
NO.11 2nd MAIN ROAD, KANNAPA NAGAR EXTN,
KOTTIVAKKAM. CHENNAI

Name & Address of the Customer	:	**M/s RAMANIYAM REAL ESTATES (P) LTD**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	08/07/2022 to 28/07/2022
Source of Sample	:	Customer Supplied- Borehole No. BH-04	**Sample Identification Number**	:	SS/GMC/052022/474/BH04
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2374/BH-04
Test Method	:	As per Bureau of indian Standards	**Report Date**	:	30/07/2022
Sample Receipt Date	:	14/05/2022	**Test Report Pages**	:	Two Pages

Table-2.4 Laboratory Classification of Soil Samples from BH-04

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Coarse Grained (CG)												
			Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity index (I_p= LL-PL)	Consistency Index (Ic=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistancy	Position With Respect to A-Aline	IS:Notation	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient C_U=D_{60}/D_{10}	Co-Efficient of Curvature C_z=$D_{30}^2/(D_{10}xD_{60})$	Relative Density	IS-Notation	
														Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)							Gravel	Sand
20.0	34	SS	16.8	98.8	28.2	70.6	1.2	-	108.3	Hard	Above	CH	-	-	-	-	-	100.0	-	-	-	-	-	FG>50%	FG>50%	FG>50%
22.5	55	SS	4.2	67.1	24.9	42.2	1.5	-	100.0	Hard	Above	CH	-	0.0	1.1	3.1	4.2	91.7	-	-	-	-	-	FG>50%	FG>50%	FG>50%
25.0	70	SS	16.9	45.9	17.6	28.1	1.0	-	30.8	Hard	Above	CI	-	0.0	0.0	4.2	18.5	77.3	-	-	-	-	-	FG>50%	FG>50%	FG>50%
27.5	>100	SS	Clay Binder/Clayey Sand						60.0	Hard	Above	CL	-	0.0	0.0	3.9	32.9	63.2	-	-	-	-	-	FG>50%	FG>50%	FG>50%
30.0	>100	SS	15.2	73.8	24.1	49.7	1.2	-	110.0	Hard	Above	CH	-	-	-	-	-	100.0	-	-	-	-	-	FG>50%	FG>50%	FG>50%
33.0	>100	SS	14.5	73.0	27.8	45.2	1.3	-	25.0	Hard	Above	CH	-	-	-	-	-	100.0	-	-	-	-	-	FG>50%	FG>50%	FG>50%

**** END OF REPORT****

Terms and Conditions

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(2) The tested sample will not be retained for more than 45 days from the date of issue of test report except in the case as required by the applicable regulations.
(3) Any correction in this reports invalidates the reports

Authorised Signatory

A. VINOTH
(Technical Manager)

GEOMARINE
Phone No.: 044-24481485, 044-24480305

LABORATORY TEST REPORT

GEOMARINE CONSULTANTS PVT LTD- GEOTECHNICAL LABORATORY
NO.11 2nd MAIN ROAD, KANNAPA NAGAR EXTN,
KOTTIVAKKAM, CHENNAI

Name & Address of the Customer	:	**M/s RAMANIYAM REAL ESTATES (P) LTD**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	08/07/2022 to 28/07/2022
Source of Sample	:	Customer Supplied- Borehole No. BH-05	**Sample Identification Number**	:	SS/GMC/052022/474/BH05
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2374/BH-05
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	30/07/2022
Sample Receipt Date	:	06/05/2022	**Test Report Pages**	:	Two Pages

Table-2.5 Laboratory Classification of Soil Samples from BH-05

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Coarse Grained (CG)													
			Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_p= LL-PL)	Consistency Index (I_c=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistancy	Position With Respect to A-Aline	IS:Notation	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						D_{15} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$	Relative Density	IS-Notation	
														Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)							Gravel	Sand
1.0	9	SS	21.2	38.2	17.2	21.0	0.8	14.7	14.3	Stiff	Above	CI	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
2.0	6	SS	25.4	47.0	17.1	30.0	0.7	14.0	25.0	M.Stiff	Above	CI	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
3.0	12	SS	Little to Non Plastic Binder							CG>50%	Above	-	-	0.0	0.0	2.5	55.5	42.0		-	-	-	-	-	M.Dense	<50%	-
4.0	6	SS								CG>50%	Above	-	-	0.0	0.0	7.4	49.9	42.7		-	-	-	-	-	Loose	<50%	-
5.0	15	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	1.7	5.2	27.1	47.7	18.4		-	-	-	-	-	M.Dense	<50%	SM
6.0	13	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	1.7	55.6	32.5	10.3		-	-	-	-	-	M.Dense	<50%	SP-SM
7.5	15	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	1.9	54.0	34.6	9.5		-	-	-	-	-	M.Dense	<50%	SP-SM
9.0	4	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	3.0	5.5	38.5	30.5	22.5		-	-	-	-	-	V.Loose	<50%	SM
10.5	7	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	4.4	45.6	38.5	11.6		-	-	-	-	-	Loose	<50%	SP-SM
12.0	0	SS	48.3	53.1	22.3	30.8	0.2	13.7	13.3	Very Soft	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
14.0	2	SS	37.8	43.0	22.2	20.8	0.2	14.2	19.5	Very Soft	Above	CI	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
16.0	2	SS	41.5	45.8	23.2	22.6	0.2	14.0	45.5	Very Soft	Above	CI	-	-	-	-	-	74.3	25.7	-	-	-	-	-	FG>50%	FG>50%	FG>50%
18.0	4	SS	42.7	58.2	22.0	36.2	0.4	12.1	46.2	Soft	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%

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KOTTIVAKKAM, CHENNAI

Name & Address of the Customer	:	**M/s RAMANIYAM REAL ESTATES (P) LTD**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	08/07/2022 to 28/07/2022
Source of Sample	:	Customer Supplied- Borehole No. BH-05	**Sample Identification Number**	:	SS/GMC/052022/474/BH05
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2374/BH-05
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	30/07/2022
Sample Receipt Date	:	06/05/2022	**Test Report Pages**	:	Two Pages

Table-2.5 Laboratory Classification of Soil Samples from BH-05

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Coarse Grained (CG)														
			Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_p= LL-PL)	Consistency Index (I_c=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistancy	Position With Respect to A-Aline	IS:Notation	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC.1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient C_u=D_{60}/D_{10}	Co-Efficient of Curvature C_c=$D_{30}^2/(D_{10}xD_{60})$	Relative Density	IS-Notation	
													Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)							Gravel	Sand
20.0	11	SS	39.1	88.5	33.3	55.2	0.9	9.8	100.0	Stiff	Above	CH	-	-	-	-	-	100.0	-	-	-	-	-	FG>50%	FG>50%	FG>50%
22.5	15	SS	26.1	49.4	20.5	28.9	0.8	13.7	50.0	Stiff	Above	CI	-	-	-	-	-	100.0	-	-	-	-	-	FG>50%	FG>50%	FG>50%
25.0	30	SS	15.9	34.3	17.5	16.8	1.1	-	23.5	V.Stiff	Above	CL	-	0.0	0.0	1.9	30.5	67.6	-	-	-	-	-	FG>50%	FG>50%	FG>50%
27.5	63	SS	31.1	71.0	31.2	39.8	1.0	11.2	26.7	Hard	Above	CH	-	-	-	-	-	100.0	-	-	-	-	-	FG>50%	FG>50%	FG>50%
30.0	52	SS	27.3	74.5	33.5	41.0	1.2	11.0	29.5	Hard	Above	CH	-	-	-	-	-	100.0	-	-	-	-	-	FG>50%	FG>50%	FG>50%
32.5	52	SS	28.5	74.4	32.8	41.6	1.1	11.0	39.9	Hard	Above	CH	-	-	-	-	-	100.0	-	-	-	-	-	FG>50%	FG>50%	FG>50%
35.0	52	SS	27.3	69.4	31.2	38.2	1.1	11.5	25.0	Hard	Above	CH	-	-	-	-	-	100.0	-	-	-	-	-	FG>50%	FG>50%	FG>50%

**** END OF REPORT****

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Authorised Signatory

A. VINOTH
(Technical Manager)

GEOMARINE
Phone No.: 044-24481485, 044-24480305

LABORATORY TEST REPORT

GEOMARINE CONSULTANTS PVT LTD- GEOTECHNICAL LABORATORY
NO.11 2nd MAIN ROAD, KANNAPA NAGAR EXTN,
KOTTIVAKKAM, CHENNAI

Name & Address of the Customer	:	**M/s RAMANIYAM REAL ESTATES (P) LTD**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	08/07/2022 to 28/07/2022
Source of Sample	:	Customer Supplied- Borehole No. BH-08	**Sample Identification Number**	:	SS/GMC/052022/474/BH08
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2374/BH-08
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	30/07/2022
Sample Receipt Date	:	08/06/2022	**Test Report Pages**	:	Two Pages

Table-2.6 Laboratory Classification of Soil Samples from BH-08

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Coarse Grained (CG)													
													GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015												IS-Notation	
			Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity index (I_p= LL-PL)	Consistency index (I_c=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistancy	Position With Respect to A-Aline	IS:Notation	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)	D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient C_u=D_{60}/D_{10}	Co-Efficient of Curvature C_c=D_{30}^2/(D_{10}xD_{60})	Relative Density	Gravel	Sand
1.0	16	SS	22.8	52.3	25.8	26.5	1.1	12.7	25.0	V.Stiff	Above	CH	-	-	-	-	-	77.5	22.5	-	-	-	-	-	FG>50%	FG>50%	FG>50%
2.0	15	SS	28.6	46.8	23.2	23.6	0.8	13.5	46.2	Stiff	Above	CI	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
3.0	-	UDS	48.9	71.1	32.5	38.6	0.6	10.1	63.6	-	Above	CH	-	-	-	-	-	74.3	25.7	-	-	-	-	-	FG>50%	FG>50%	FG>50%
4.0	14	SS	Clay Binder						0.0	CG>50%	Above	-	-	0.0	0.0	21.6	33.0	45.3		-	-	-	-	-	M.Dense	<50%	SC
5.0	41	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.9	32.1	52.3	14.7		-	-	-	-	-	Dense	<50%	SM
6.0	28	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	3.5	4.3	52.3	27.9	12.1		-	-	-	-	-	M.Dense	<50%	SM
7.5	31	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	3.6	55.6	31.3	9.5		-	-	-	-	-	Dense	<50%	SP-SM
9.0	18	SS	21.2	40.1	22.2	17.9	1.1	15.4	0.0	V.Stiff	Above	CI	-	-	-	-	-	75.9	24.1	-	-	-	-	-	FG>50%	FG>50%	FG>50%
10.5	14	SS	34.4	60.6	30.7	29.9	0.9	11.1	16.7	Stiff	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
12.0	10	SS	34.5	79.8	29.5	50.4	0.9	10.3	64.3	Stiff	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
14.0	8	SS	32.6	71.3	30.5	40.8	0.9	10.5	75.0	Stiff	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
15.0	-	UDS	32.8	56.8	25.2	31.6	0.8	12.2	100.0	-	Above	CH	-	2.7	1.6	3.5	8.8	56.7	26.7	-	-	-	-	-	FG>50%	FG>50%	FG>50%
18.0	23	SS	17.7	56.5	24.2	32.3	1.2	12.5	46.2	V.Stiff	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%

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LABORATORY TEST REPORT

GEOMARINE CONSULTANTS PVT LTD- GEOTECHNICAL LABORATORY
NO.11 2nd MAIN ROAD, KANNAPA NAGAR EXTN,
KOTTIVAKKAM. CHENNAI

Name & Address of the Customer	:	**M/s RAMANIYAM REAL ESTATES (P) LTD**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	08/07/2022 to 28/07/2022
Source of Sample	:	Customer Supplied- Borehole No. BH-08	**Sample Identification Number**	:	SS/GMC/052022/474/BH08
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2374/BH-08
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	30/07/2022
Sample Receipt Date	:	08/06/2022	**Test Report Pages**	:	Two Pages

Table-2.6 Laboratory Classification of Soil Samples from BH-08

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Coarse Grained (CG)													
			Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_p= LL-PL)	Consistency Index (I_c=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistancy	Position With Respect to A-Aline	IS:Notation	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}{}^2/(D_{10}*D_{60})$	Relative Density	IS-Notation	
													Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)							Gravel	Sand
20.0	28	SS	22.6	111.6	27.4	84.2	1.1	8.2	184.6	V.Stiff	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
22.5	26	SS	12.7	51.6	17.0	34.7	1.1	13.0	90.0	V.Stiff	Above	CH	-	-	-	-	-	71.1	28.9	-	-	-	-	-	FG>50%	FG>50%	FG>50%
25.0	>100	SS	17.9	34.5	18.1	16.4	1.0	-	63.6	Hard	Above	CL	-	0.0	0.0	2.8	34.6	62.6		-	-	-	-	-	FG>50%	FG>50%	FG>50%
27.5	>100	SS	Clay Binder						16.7	CG>50%	Above	-	-	0.0	2.0	18.0	56.0	24.0		-	-	-	-	-	V.Dense	<50%	SC
30.0	>100	SS	12.7	65.9	28.0	37.9	1.4	12.3	38.5	Hard	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%

** END OF REPORT**

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Phone No.: 044-24481485, 044-24480305

LABORATORY TEST REPORT

GEOMARINE CONSULTANTS PVT LTD- GEOTECHNICAL LABORATORY
NO.11 2nd MAIN ROAD, KANNAPA NAGAR EXTN,
KOTTIVAKKAM. CHENNAI

Name & Address of the Customer	:	**M/s RAMANIYAM REAL ESTATES (P) LTD**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	08/07/2022 to 28/07/2022
Source of Sample	:	Customer Supplied- Borehole No. BH-10	**Sample Identification Number**	:	SS/GMC/052022/474/BH10
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2374/BH-10
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	30/07/2022
Sample Receipt Date	:	08/06/2022	**Test Report Pages**	:	Two Pages

Table-2.7 Laboratory Classification of Soil Samples from BH-10

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Coarse Grained (CG)														
			Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_p= LL-PL)	Consistency Index (I_c=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistancy	Position With Respect to A-Aline	IS:Notation	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient $C_u=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}\times D_{60})$	Relative Density	IS-Notation	
													Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)							Gravel	Sand
1.0	25	SS	16.4	30.4	18.0	12.3	1.1	16.5	25.0	V.Stiff	Above	CL	-	0.0	0.0	1.0	6.7	92.4		-	-	-	-	-	FG>50%	FG>50%	FG>50%
2.0	12	SS	15.7	26.4	14.1	12.2	0.9	18.3	15.4	Stiff	Above	CL	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
3.0	17	SS	21.0	53.3	26.5	26.8	1.2	12.0	40.0	V.Stiff	Above	CH	-	-	-	-	-	67.9	32.1	-	-	-	-	-	FG>50%	FG>50%	FG>50%
4.0	42	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	20.5	63.2	16.4		-	-	-	-	-	Dense	<50%	SM
5.0	34	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	2.0	3.1	47.5	35.2	12.2		-	-	-	-	-	Dense	<50%	SM
6.0	28	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	2.7	6.6	65.0	15.0	10.7		-	-	-	-	-	M.Dense	<50%	SP-SM
7.5	43	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	4.0	7.1	14.1	61.1	13.7		-	-	-	-	-	Dense	<50%	SM
9.0	48	SS	15.5	28.7	15.9	12.8	1.0	12.9	0.0	Hard	Above	CL	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
10.5	13	SS	24.3	47.6	23.3	24.3	1.0	14.0	14.3	Stiff	Above	CI	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
12.0	10	SS												0.0	2.0	9.4	2.7	85.9		-	-	-	-	-	FG>50%	FG>50%	FG>50%
14.0	-	UDS	20.7	31.9	17.1	14.9	0.8	17.1	16.7	-	Above	CL	-	0.0	0.0	1.0	6.2	77.8	15.0	-	-	-	-	-	FG>50%	FG>50%	FG>50%
16.0	9	SS	19.7	51.8	18.9	32.9	1.0	-	46.2	Stiff	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
18.0	7	SS	43.5	73.2	27.6	45.6	0.7	10.5	100.0	M.Stiff	Above	CH	-	-	-	-	-	56.8	43.2	-	-	-	-	-	FG>50%	FG>50%	FG>50%

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LABORATORY TEST REPORT

GEOMARINE CONSULTANTS PVT LTD- GEOTECHNICAL LABORATORY
NO.11 2nd MAIN ROAD, KANNAPA NAGAR EXTN,
KOTTIVAKKAM. CHENNAI

Name & Address of the Customer	:	**M/s RAMANIYAM REAL ESTATES (P) LTD**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	08/07/2022 to 28/07/2022
Source of Sample	:	Customer Supplied- Borehole No. BH-10	**Sample Identification Number**	:	SS/GMC/052022/474/BH10
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2374/BH-10
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	30/07/2022
Sample Receipt Date	:	08/06/2022	**Test Report Pages**	:	Two Pages

Table-2.7 Laboratory Classification of Soil Samples from BH-10

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	Coarse Grained (CG)											IS-Notation	
			Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_p= LL-PL)	Consistency Index (I_c=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistancy	Position With Respect to A-Aline	IS:Notation		GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}\times D_{60})$	Relative Density		
														Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)							Gravel	Sand
20.0	31	SS	18.5	88.7	32.2	56.5	1.2	9.7	91.7	Hard	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
22.5	42	SS	18.2	48.8	24.2	24.6	1.2	12.9	58.3	Hard	Above	CI	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
25.0	>100	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	19.3	61.1	19.6		-	-	-	-	-	V.Dense	<50%	SM
27.5	>100	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	15.9	13.1	40.2	19.9	10.9		-	-	-	-	-	V.Dense	<50%	SP-SM
30.0	>100	SS	21.2	69.3	33.2	36.1	1.3	-	33.3	Hard	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%

** END OF REPORT**

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Authorised Signatory

A. VINOTH
(Technical Manager)

GEOMARINE
Phone No.: 044-24481485, 044-24480305

LABORATORY TEST REPORT

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NO.11 2nd MAIN ROAD, KANNAPA NAGAR EXTN,
KOTTIVAKKAM. CHENNAI

Name & Address of the Customer	:	**M/s RAMANIYAM REAL ESTATES (P) LTD**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	08/07/2022 to 28/07/2022
Source of Sample	:	Customer Supplied- Borehole No. BH-11	**Sample Identification Number**	:	SS/GMC/052022/474/BH11
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2374/BH-11
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	30/07/2022
Sample Receipt Date	:	01/06/2022	**Test Report Pages**	:	Two Pages

Table-2.8 Laboratory Classification of Soil Samples from BH-11

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Coarse Grained (CG)													
			Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_p= LL-PL)	Consistency Index (Ic=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistancy	Position With Respect to A-Aline	IS:Notation	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient $C_u=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$	Relative Density	IS-Notation	
														Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)							Gravel	Sand
1.0	27	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	5.0	6.0	50.8	38.1		-	-	-	-	-	M.Dense	<50%	SM
2.0	30	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	4.6	69.0	26.3		-	-	-	-	-	M.Dense	<50%	SM
3.0	41	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.9	18.8	50.1	30.2		-	-	-	-	-	Dense	<50%	SM
4.0	37	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	19.2	64.7	16.1		-	-	-	-	-	Dense	<50%	SM
5.0	77	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	7.1	62.3	21.6	9.0		-	-	-	-	-	V.Dense	<50%	SP-SM
6.0	40	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	5.1	61.3	25.6	8.0		-	-	-	-	-	Dense	<50%	SP-SM
7.5	29	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	1.6	1.6	62.9	24.0	9.8		-	-	-	-	-	M.Dense	<50%	SP-SM
9.0	26	SS	17.2	37.4	17.8	19.6	1.0	14.2	23.1	V.Stiff	Above	CI	-	0.0	0.0	2.9	7.0	90.1		-	-	-	-	-	FG>50%	FG>50%	FG>50%
10.5	6	SS	33.7	56.4	25.9	30.5	0.7	12.7	12.5	M.Stiff	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
12.0	10	SS	30.9	58.9	24.5	34.4	0.8	11.5	23.1	Stiff	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
14.0	10	SS	33.4	83.2	29.8	53.4	0.9	9.8	25.5	Stiff	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
16.0	11	SS	31.1	73.5	28.8	44.7	0.9	10.2	39.9	Stiff	Above	CH	-	-	-	-	-	64.8	35.2	-	-	-	-	-	FG>50%	FG>50%	FG>50%
18.0	13	SS	30.5	67.9	24.3	43.6	0.9	11.5	78.6	Stiff	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%

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LABORATORY TEST REPORT

GEOMARINE CONSULTANTS PVT LTD- GEOTECHNICAL LABORATORY
NO.11 2nd MAIN ROAD, KANNAPA NAGAR EXTN,
KOTTIVAKKAM. CHENNAI

Name & Address of the Customer	:	**M/s RAMANIYAM REAL ESTATES (P) LTD**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	08/07/2022 to 28/07/2022
Source of Sample	:	Customer Supplied- Borehole No. BH-11	**Sample Identification Number**	:	SS/GMC/052022/474/BH11
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2374/BH-11
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	30/07/2022
Sample Receipt Date	:	01/06/2022	**Test Report Pages**	:	Two Pages

Table-2.8 Laboratory Classification of Soil Samples from BH-11

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Specific Gravity AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	Coarse Grained (CG)													
														GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015											Relative Density	IS-Notation	
			Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_p= LL-PL)	Consistency Index (Ic=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistancy	Position With Respect to A-Aline	IS:Notation		Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)	D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}XD_{60})$		Gravel	Sand
20.0	20	SS	18.7	111.3	24.5	86.7	1.1	8.2	200.0	V.Stiff	Above	CH	-	-	-	-	-	55.2	44.8	-	-	-	-	-	FG>50%	FG>50%	FG>50%
22.5	41	SS	29.6	85.2	33.5	51.7	1.1	9.5	107.7	Hard	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
25.0	48	SS	27.5	73.6	31.2	42.4	1.1	10.3	133.3	Hard	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
27.5	>100	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	12.9	8.6	36.0	25.4	17.2		-	-	-	-	-	V.Dense	<50%	SM
30.0	>100	SS	23.8	63.8	26.0	37.8	1.1	-	20.0	Hard	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
33.0	>100	SS	24.2	60.0	28.8	31.2	1.1	-	33.3	Hard	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%

**** END OF REPORT****

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Authorised Signatory

A. VINOTH
(Technical Manager)

GEOMARINE
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LABORATORY TEST REPORT

GEOMARINE CONSULTANTS PVT LTD- GEOTECHNICAL LABORATORY
NO.11 2nd MAIN ROAD, KANNAPA NAGAR EXTN,
KOTTIVAKKAM, CHENNAI

Name & Address of the Customer	:	**M/s RAMANIYAM REAL ESTATES (P) LTD**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	08/07/2022 to 28/07/2022
Source of Sample	:	Customer Supplied- Borehole No. BH-12	**Sample Identification Number**	:	SS/GMC/052022/474/BH12
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2374/BH-12
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	30/07/2022
Sample Receipt Date	:	31/05/2022	**Test Report Pages**	:	Two Pages

Table-2.9 Laboratory Classification of Soil Samples from BH-12

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Coarse Grained (CG)													
			Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_p= LL-PL)	Consistency Index (I_c=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistancy	Position With Respect to A-Aline	IS:Notation	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient C_U=D_{60}/D_{10}	Co-Efficient of Curvature C_c=D_{30}^2/(D_{10}xD_{60})	Relative Density	IS-Notation	
													Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)							Gravel	Sand
1.0	27	SS	23.9	48.2	25.5	22.7	1.1	14.0	29.9	V.Stiff	Above	CI	-	0.0	0.0	2.0	19.4	78.6		-	-	-	-	-	FG>50%	FG>50%	FG>50%
2.0	-	UDS	21.3	41.0	18.7	22.2	0.9	14.0	25.0	-	Above	CI	-	0.0	0.0	3.1	37.6	38.5	20.8	-	-	-	-	-	FG>50%	FG>50%	FG>50%
3.0	15	SS	19.9	33.3	15.7	17.6	0.8	16.2	7.7	Stiff	Above	CL	-	0.0	0.0	2.6	28.4	69.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
4.0	8	SS	26.5	39.8	23.0	16.8	0.8	14.7	25.0	Stiff	Above	CI	-	0.0	0.0	1.1	8.9	89.9		-	-	-	-	-	FG>50%	FG>50%	FG>50%
5.0	44	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.7	4.1	51.9	30.8	12.4		-	-	-	-	-	Dense	<50%	SM
6.0	41	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	5.4	6.3	40.6	31.5	16.2		-	-	-	-	-	Dense	<50%	SM
7.5	30	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	0.0	1.0	38.7	47.4	12.8		-	-	-	-	-	M.Dense	<50%	SM
9.0	14	SS	26.7	54.7	24.2	30.5	0.9	13.3	0.0	Stiff	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
10.5	15	SS	-	-	-	-	-	-	-	CG>50%	-	-	-	3.1	5.0	7.2	38.0	46.7		-	-	-	-	-	M.Dense	<50%	SM
12.0	-	UDS	44.0	66.3	29.9	36.4	0.6	11.8	33.3	-	Above	CH	-	0.0	0.9	2.4	2.6	53.5	40.6	-	-	-	-	-	FG>50%	FG>50%	FG>50%
14.0	11	SS	27.2	53.9	24.2	29.7	0.9	11.8	45.5	Stiff	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%
16.0	10	SS	33.5	71.3	28.9	42.4	0.9	10.2	69.2	Stiff	Above	CH	-	-	-	-	-	58.4	41.6	-	-	-	-	-	FG>50%	FG>50%	FG>50%
18.0	11	SS	29.2	60.7	26.5	34.2	0.9	11.0	66.7	Stiff	Above	CH	-	-	-	-	-	100.0		-	-	-	-	-	FG>50%	FG>50%	FG>50%

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LABORATORY TEST REPORT

GEOMARINE CONSULTANTS PVT LTD- GEOTECHNICAL LABORATORY
NO.11 2nd MAIN ROAD, KANNAPA NAGAR EXTN,
KOTTIVAKKAM, CHENNAI

Name & Address of the Customer	:	**M/s RAMANIYAM REAL ESTATES (P) LTD**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	08/07/2022 to 28/07/2022
Source of Sample	:	Customer Supplied- Borehole No. BH-12	**Sample Identification Number**	:	SS/GMC/052022/474/BH12
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2374/BH-12
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	30/07/2022
Sample Receipt Date	:	31/05/2022	**Test Report Pages**	:	Two Pages

Table-2.9 Laboratory Classification of Soil Samples from BH-12

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Coarse Grained (CG)												
			Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_p= LL-PL)	Consistency Index (Ic=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistancy	Position With Respect to A-Aline	IS:Notation	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient C_u=D_{60}/D_{10}	Co-Efficient of Curvature C_c=$D_{30}^2/(D_{10}xD_{60})$	Relative Density	IS-Notation	
													Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)							Gravel	Sand
20.0	22	SS	19.7	66.5	28.5	38.0	1.2	10.7	109.1	V.Stiff	Above	CH	-	10.1	3.9	3.9	4.2	78.0	-	-	-	-	-	FG>50%	FG>50%	FG>50%
22.5	36	SS	22.3	58.9	25.9	33.0	1.1	12.1	66.7	Hard	Above	CH	-	0.0	0.0	7.5	29.5	63.0	-	-	-	-	-	FG>50%	FG>50%	FG>50%
25.0	45	SS	12.2	28.6	13.7	14.9	1.1	18.0	50.0	CG>50%	Above	-	-	0.0	0.0	8.3	53.1	38.6	-	-	-	-	-	Dense	<50%	SC
27.5	109	SS	18.5	36.1	19.9	16.2	1.1	15.9	8.3	Hard	Above	Cl	-	-	-	-	-	100.0	-	-	-	-	-	FG>50%	FG>50%	FG>50%
30.0	>100	SS	17.3	68.2	27.8	40.3	1.3	-	26.7	Hard	Above	CH	-	-	-	-	-	100.0	-	-	-	-	-	FG>50%	FG>50%	FG>50%
33.0	>100	SS	15.8	63.7	27.5	36.2	1.3	-	31.3	Hard	Above	CH	-	-	-	-	-	100.0	-	-	-	-	-	FG>50%	FG>50%	FG>50%

**** END OF REPORT****

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A. VINOTH
(Technical Manager)

Table-2.10 Results of Chemical Analysis

SL No.	Bore HoleNo.	Water				Soil (2:1)			
		Depth of Sample (m)	pH	Chlorides (ppm)	Sulphates (ppm)	Depth of Sample (m)	pH	Chlorides (ppm)	Sulphates (ppm)
1.0	BH-01	4.30	7.33	68.1	50.6	1.0	7.10	22.7	24.6
2.0	BH-02	4.30	7.14	36.3	337.8	2.0	7.16	181.5	31.2
3.0	BH-03	4.30	7.28	99.5	228.4	3.0	7.36	127.1	54.1
4.0	BH-04	4.00	7.01	263.2	350.3	1.0	7.25	113.4	38.7
5.0	BH-05	4.00	6.98	68.1	181.1	2.0	7.26	90.8	44.9
6.0	BH-08	4.00	7.25	139.5	211.8	2.0	7.57	158.8	38.1
7.0	BH-10	3.80	7.10	115.7	213.0	1.0	7.95	45.4	39.2
8.0	BH-11	3.80	7.21	98.7	133.5	1.0	8.37	45.4	31.0
9.0	BH-12	3.80	7.27	40.8	321.3	4.0	7.21	204.2	46.1

CHAPTER-3

GEOLOGY & SUB-SURFACE STRATIFICATION

3.0 PREAMBLE:

Geotechnical investigation carried out at a specific site provides location specific sub surface engineering characteristics. However in major project sites where the construction activities spread over a very large area location specific sub surface strata characteristics are studied together with the geological mapping data.

This is required to incorporate the impact of any documented macro-level geological characteristics of the region on the foundation design, irrespective of the location specific sub surface strata characteristics.

In view on the above, though it is beyond the scope of the present study to carry out macro-level geological investigation the regional geology based on the published data is presented and discussed.

3.1 CLIMATE AND RAINFALL:

The study area receives the rain under the influence of both southeast and northeast monsoons. Predominantly northeast monsoon contributes rainfall and most of the precipitation occurs in the form of cyclonic storm caused due to the depressions in Bay of Bengal. The north east monsoon occurs between October & December. The southwest monsoon rainfall is highly erratic and summer rains are negligible.

The normal annual rainfall over the study area varies from 1100 mm to 1200mm.

3.2 GEOMORPHOLOGY:

Chennai district forms part of coastal plains of northern Tamil Nadu. Major part of the district is having flat topography with very gentle slope towards east. The altitudes of land surface vary from 10 m above MSL in the west to sea level in the east.

Fluvial, marine and erosional landforms are noticed in the district. Marine transgression and regressions and neo-tectonic activity during the recent past have influenced the morphology and resulted in various present landforms.

Meandering streams with small sand bars are present along the course of Adyar River. The pediment and buried pediment in Guindy area in and around the reserved forest, is the only area where the ecological system is less disturbed, while the other areas are completely disturbed by built up area with large-scale human interference and pollution.

3.3 GEOLOGY OF CHENNAI DISTRICT:

Chennai district is underlain by various geological formations from ancient Archaean to the Recent Alluvium. The geological formations of the district can be grouped into three units, namely

i) Archaean crystalline rocks

ii) Gondwana (Consolidated Clay/Clayey Silt) and Tertiary sediments and

iii) Recent Alluvium.

The Archaean crystalline rocks of the district comprise chiefly of Charnockite, gneisses and the associated basic and ultra-basic intrusive dykes.

3.4 GEOLOGICAL ORDER OF THE STUDY AREA:

The stratigraphy of the study area can be classified as recent formation which is underlain by basement rock of meta-igneous origin (hypersthene granite/ Charnockite rock)

↑ Deposits of Recent Age

---------- Eparchean Unconformity ----------

Archaean Basement Rock (Charnockite Rock / Hypersthene Granite)

3.5 DESIGN SUB SOIL PROFILE: (WRT Foundation Engineering Application)

The sub soil characteristics obtained at the test location are further processed to arrive at the design soil parameters required for the design of sub structure using the following shear strength correlations with respect to the Standard Penetration Test Values of different layers.

- For Coarse Grained Material, Ref. IS: 6403 to estimate Angle of Shearing Resistance (Reproduced and shown in Fig.A1)
- For Fine Grained Material, Ref. Terzaghi & Peck, 1948, to estimate Unconfined Compressive Strength (Reproduced and shown in Fig.A2)

Based on the above, the average design soil characteristics are given below:

REFERENCE BORE HOLE					BH-01	Ref R.L. of G.L. (m):			0.00		
Layer No.	Layer Thk. (m)			Type of Strata	Colour	Ave. Design SPT	Relative Density	Consistency	(γ) kN/m³	Shear Parameters	
	Top BGL	Bottom BGL	Thickness							(Cu) kPa	(ϕ) Deg.
1.0	0.00	1.50	1.50	Filled up soil (Silty Sand)	Brown	16	Medium Dense	-	18	-	31.8
2.0	1.50	4.00	2.50	Silty Clay	Brown	9	-	Stiff	17	60	-
3.0	4.00	9.00	5.00	Silty Sand	Brown	38	Dense	-	19.5	-	38.2
4.0	9.00	12.00	3.00	Silty Sand	Brown	19	Medium Dense	-	18	-	32.7
5.0	12.00	16.00	4.00	Silty Clay	Black	10	Loose	-	15	-	30
6.0	16.00	18.00	2.00	Silty Clay	Black	7	Loose	-	14.5	-	29.4
7.0	18.00	22.50	4.50	Silty Clay	Black	12	-	Stiff	18.5	80	-
8.0	22.50	25.00	2.50	Silty Sand	Grey	21	Medium Dense	-	18.5	-	33.3
9.0	25.00	27.50	2.50	Fissile Silty Clay	Grey	50	Dense	-	20.5	-	41
10.0	27.50	30.00	2.50	Silty Sand	Grey	84	Very Dense	-	21	-	42.5
11.0	30.00	33.00	3.00	Shale	Grey	>100	-	Hard	22	400	-

REFERENCE BORE HOLE					BH-02	Ref R.L. of G.L. (m):			0.00		
Layer No.	Layer Thk. (m)			Type of Strata	Colour	Ave. Design SPT	Relative Density	Consistency	(γ) kN/m³	Shear Parameters	
	Top BGL	Bottom BGL	Thickness							(Cu) kPa	(ϕ) Deg.
1.0	0.00	4.00	4.00	Silty Clay	Brown	36	-	Hard	21	240	-
2.0	4.00	5.00	1.00	Silty Sand	Brown	22	Medium Dense	-	18.5	-	33.6
3.0	5.00	7.50	2.50	Silty Sand	Brown	36	Dense	-	19.5	-	37.65
4.0	7.50	12.00	4.50	Silty Sand	Grey	23	Medium Dense	-	18.5	-	33.9
5.0	12.00	16.00	4.00	Silty Clay	Black	15	-	Stiff	20	100	-
6.0	16.00	20.00	4.00	Silty Clay	Black	8	-	Medium Stiff	16.5	53	-
7.0	20.00	22.50	2.50	Silty Clay	Black	20	-	Very Stiff	20	133	-
8.0	22.50	27.50	5.00	Clayey Silty Sand	Grey	40	Dense	-	20	-	38.75
9.0	27.50	30.00	2.50	Silty Sand	Brown Yellow	>100	Very Dense	-	21	-	42.5
10.0	30.00	33.50	3.50	Fissile Silty Clay	Grey	85	Very Dense	-	21	-	42.5

REFERENCE BORE HOLE					BH-03	Ref R.L. of G.L. (m):			0.00		
Layer No.	Layer Thk. (m)			Type of Strata	Colour	Ave. Design SPT	Relative Density	Consistency	(γ) kN/m³	Shear Parameters	
	Top BGL	Bottom BGL	Thickness							(Cu) kPa	(ϕ) Deg.
1.0	0.00	5.00	5.00	Sandy Silty Clay	Brown	28	-	Very Stiff	20.5	187	-
2.0	5.00	10.50	5.50	Silty Sand	Brown	38	Dense	-	19.5	-	38.2
3.0	10.50	12.00	1.50	Silty Clay	Black	4	-	Soft	14.5	27	-
4.0	12.00	16.00	4.00	Silty Clay	Black	15	-	Stiff	20	100	-
5.0	16.00	18.00	2.00	Silty Clay	Black	10	-	Stiff	17.5	67	-
6.0	18.00	20.00	2.00	Silty Clay	Black	17	-	Very Stiff	20	113	-
7.0	20.00	25.00	5.00	Silty Clay	Green	40	-	Hard	21	267	-
8.0	25.00	27.50	2.50	Clayey Silty Sand	Yellow	>100	Very Dense	-	21	-	42.5
9.0	27.50	30.00	2.50	Clayey Silty Sand	Yellow	>100	Very Dense	-	21	-	42.5
10.0	30.00	33.30	3.30	Silty Clay	Brown	>100	-	Hard	22	400	-

REFERENCE BORE HOLE					BH-04	Ref R.L. of G.L. (m):			0.00		
Layer No.	Layer Thk. (m)			Type of Strata	Colour	Ave. Design SPT	Relative Density	Consistency	(γ) kN/m³	Shear Parameters	
	Top BGL	Bottom BGL	Thickness							(Cu) kPa	(ϕ) Deg.
1.0	0.00	4.00	4.00	Silty Clay	Brown	17	-	Very Stiff	20	113	-
2.0	4.00	5.00	1.00	Silty Sand	Brown	10	Loose	-	15	-	30
3.0	5.00	9.00	4.00	Silty Sand	Brown	34	Dense	-	19.5	-	37.1
4.0	9.00	20.00	11.00	Silty Clay	Black	10	-	Stiff	17.5	67	-
5.0	20.00	22.50	2.50	Silty Clay	Green	34	-	Hard	21	227	-
6.0	22.50	27.50	5.00	Silty Clay	Grey	62.5	-	Hard	22	400	-
7.0	27.50	30.00	2.50	Clayey Silty Sand	Grey	>100	Very Dense	-	21	-	42.5
8.0	30.00	33.30	3.30	Silty Clay	Brown	>100	-	Hard	22	400	-

REFERENCE BORE HOLE					BH-05	Ref R.L. of G.L. (m):			0.00		
Layer No.	Layer Thk. (m)			Type of Strata	Colour	Ave. Design SPT	Relative Density	Consistency	(γ) kN/m³	Shear Parameters	
	Top BGL	Bottom BGL	Thickness							(Cu) kPa	(ϕ) Deg.
1.0	0.00	3.00	3.00	Silty Clay	Brown	8	-	Medium Stiff	16.5	53	-
2.0	3.00	4.00	1.00	Silty Sand	Brown Grey	12	Medium Dense	-	16	-	30.6
3.0	4.00	5.00	1.00	Silty Sand	Brown	6	Loose	-	14.5	-	29.2
4.0	5.00	9.00	4.00	Silty Sand	Brown	15	Medium Dense	-	17.5	-	31.5
5.0	9.00	12.00	3.00	Silty Sand	Grey	6	Loose	-	14.5	-	29.2
6.0	12.00	14.00	2.00	Silty Clay	Black	0	-	Very Soft	13	4	-
7.0	14.00	20.00	6.00	Silty Clay	Black	3	-	Soft	14	20	-
8.0	20.00	25.00	5.00	Silty Clay	Grey Green	13	-	Stiff	19	87	-
9.0	25.00	27.50	2.50	Clayey Silty Sand	Brown Grey	30	Medium Dense	-	19	-	36
10.0	27.50	35.50	8.00	Fissile Silty Clay	Brown Grey	55	Very Dense	-	20.5	-	41.75

GEOMARINE

REFERENCE BORE HOLE					BH-08	Ref R.L. of G.L. (m):					0.00
Layer No.	Layer Thk. (m)			Type of Strata	Colour	Ave. Design SPT	Relative Density	Consistency	(γ) kN/m³	Shear Parameters	
	Top BGL	Bottom BGL	Thickness							(Cu) kPa	(ϕ) Deg.
1.0	0.00	4.00	4.00	Silty Clay	Brown	16	-	Very Stiff	20	107	-
2.0	4.00	5.00	1.00	Silty Sand	Brown Grey	14	Medium Dense	-	17	-	31.2
3.0	5.00	9.00	4.00	Silty Sand	Brown	33	Dense	-	19.5	-	36.825
4.0	9.00	10.50	1.50	Silty Clay	Black	18	-	Very Stiff	20	120	-
5.0	10.50	18.00	7.50	Silty Clay	Black	11	-	Stiff	18	73	-
6.0	18.00	25.00	7.00	Silty Clay	BrownGrey	27	-	Very Stiff	20.5	180	-
7.0	25.00	27.50	2.50	Sandy Silty Clay	BrownGrey	>100	-	Hard	22	400	-
8.0	27.50	30.00	2.50	Clayey Silty Sand	BrownGrey	>100	Very Dense	-	21	-	42.5
9.0	30.00	30.30	0.30	Fissile Silty Clay	Brown	>100	Very Dense	-	21	-	42.5

REFERENCE BORE HOLE					BH-10	Ref R.L. of G.L. (m):					0.00
Layer No.	Layer Thk. (m)			Type of Strata	Colour	Ave. Design SPT	Relative Density	Consistency	(γ) kN/m³	Shear Parameters	
	Top BGL	Bottom BGL	Thickness							(Cu) kPa	(ϕ) Deg.
1.0	0.00	2.00	2.00	Silty Clay	Brown Grey	25	-	Very Stiff	20.5	167	-
2.0	2.00	3.00	1.00	Silty Clay	Grey	12	-	Stiff	18.5	80	-
3.0	3.00	4.00	1.00	Silty Clay	Grey	17	-	Very Stiff	20	113	-
4.0	4.00	9.00	5.00	Silty Sand	Brown	36	Dense	-	19.5	-	37.65
5.0	9.00	10.50	1.50	Silty Clay	Black	48	-	Hard	21	320	-
6.0	10.50	18.00	7.50	Silty Clay	Black	11	-	Stiff	18	73	-
7.0	18.00	20.00	2.00	Silty Clay	Black	7	-	Medium Stiff	16	47	-
8.0	20.00	22.50	2.50	Silty Clay	Green Red	31	-	Hard	21	207	-
9.0	22.50	25.00	2.50	Silty Clay	Pale Green	42	-	Hard	21	280	-
10.0	25.00	30.00	5.00	Silty Sand	Green	>100	Very Dense	-	21	-	42.5

GEO MARINE

REFERENCE BORE HOLE					BH-11	Ref R.L. of G.L. (m):			0.00		
Layer No.	Layer Thk. (m)			Type of Strata	Colour	Ave. Design SPT	Relative Density	Consistency	(γ) kN/m³	Shear Parameters	
	Top BGL	Bottom BGL	Thickness							(Cu) kPa	(ϕ) Deg.
1.0	0.00	5.00	5.00	Silty Sand	Brown	34	Dense	-	19.5	-	37.1
2.0	5.00	6.00	1.00	Silty Sand	Brown	77	Very Dense	-	21	-	42.5
3.0	6.00	9.00	3.00	Silty Sand	Brown	35	Dense	-	19.5	-	37.375
4.0	9.00	10.50	1.50	Silty Clay	Black	26	-	Very Stiff	20.5	173	-
5.0	10.50	12.00	1.50	Silty Clay	Black	6	-	Medium Stiff	15.5	40	-
6.0	12.00	20.00	8.00	Silty Clay	Black	11	-	Stiff	18	73	-
7.0	20.00	22.50	2.50	Silty Clay	Green Black	20	-	Very Stiff	20	133	-
8.0	22.50	27.50	5.00	Silty Clay	Grey Green	45	-	Hard	21	300	-
9.0	27.50	30.00	2.50	Silty Sand	Brown	>100	Very Dense	-	21	-	42.5
10.0	30.00	33.10	3.10	Fissile Clay	Grey	>100	Very Dense	-	21	-	42.5

REFERENCE BORE HOLE					BH-12	Ref R.L. of G.L. (m):			0.00		
Layer No.	Layer Thk. (m)			Type of Strata	Colour	Ave. Design SPT	Relative Density	Consistency	(γ) kN/m³	Shear Parameters	
	Top BGL	Bottom BGL	Thickness							(Cu) kPa	(ϕ) Deg.
1.0	0.00	2.00	2.00	Silty Clay	Brown	27	-	Very Stiff	20.5	180	-
2.0	2.00	5.00	3.00	Silty Clay	Brown	12	-	Stiff	18.5	80	-
3.0	5.00	9.00	4.00	Silty Sand	Brown	38	Dense	-	19.5	-	38.2
4.0	9.00	10.50	1.50	Silty Clay	Black	14	-	Stiff	19.5	93	-
5.0	10.50	12.00	1.50	Silty Sand	Grey	15	Medium Dense	-	17.5	-	31.5
6.0	12.00	20.00	8.00	Silty Clay	Black	11	-	Stiff	18	73	-
7.0	20.00	22.50	2.50	Silty Clay	Black	22	-	Very Stiff	20.5	147	-
8.0	22.50	25.00	2.50	Silty Clay	Grey	36	-	Hard	21	240	-
9.0	25.00	27.50	2.50	Clayey Silty Sand	Grey Brown	45	Dense	-	20	-	39.875
10.0	27.50	30.00	2.50	Silty Clay	Grey Brown	109	-	Hard	22	400	-
11.0	30.00	33.00	3.00	Silty Clay	Grey	>100	-	Hard	22	400	-

FOUNDATION SYSTEM

CHAPTER-4

FOUNDATION SYSTEM

4.0 PREAMBLE:

In the design of foundation system, the stress-strain compatibility of the super structure, sub structure and the bearing strata should be satisfied both individually and as a combined system. In view of this, the following data are needed for the design of foundation system, defined in terms of the type of sub structure and the bearing strata characteristics.

- The super structure characteristics along with the loading pattern on the sub structure
- The sub soil characteristics that define the required substructure configuration for a safe transfer of super-structural loads to the bearing strata

Considering the above aspects of the foundation design, the suitable type of foundation system is presented below.

4.1 PROPOSED STRUCTURES:

An understanding of the proposed construction and the order of loads on the foundations is needed for choosing the appropriate foundation system. In the present case, the proposed structure is configured with two basement floors and seventeen upper floors, and is meant for residential occupancy. For this kind of structure, the column loads could vary between 6000kN to 8000 kN.

The above mentioned loads have no bearing on the design of either sub or super structures and are mentioned just to provide an insight to choose an appropriate foundation system with respect to subsoil conditions.

4.2 SUB SOIL STRATIFICATION:

The sub soil stratification of the project site is idealised and presented below:

Layer-I extents from existing ground level, the soil stratum is silty clay and continues up to 3.5m below the existing ground level. Consistency based on "N" is Stiff to Hard With Sand Lenses

Layer-II is sandy formation and this layer extends from 3.5m to 12.0m. The relative density of this layer is Medium Dense to Dense.

Layer-III is stiff to very stiff, Silty Clay formation and extends from 12.0m to 20.0m/22.0m. Further this layer at borehole location extends even up to 25.0m

Layer-IV, the geology of this layer varied from Clayey Silty Sand & Silty Clay with gravels at location. The relative density & consistency ranges from Dense to Very Dense & Hard. Layer extends from 25.0m to 30.0m below the existing ground level.

Layer-V, The geological formation beyond 30.0m is Fissile Silty Clay/ Soft Shale Formation. The formation is predominantly **Soft Shale/ Fissile Clay** with lenses of Lithified Shale (shale rock) at depths.

4.3 FOUNDATION SYSTEM:

Taking into consideration of average depth of basement of 3.5m, the depth of excavation shall be 9.0m to 10.0m below the existing ground level including the thickness of foundation.

For the kind of proposed construction, adopt pile foundation due to very weak sub soil conditions. The length of pile is 30m from existing ground level with cut-off at 9.0m. The pile capacity do not change even if cut-off increased to 9.5m.

The piles can be installed by drilling with direct mud circulation technique (Bored Cast Insitu Piles) and Table 4.1 presents the allowable safe load carrying capacity of bored cast insitu piles in vertical, tension & lateral for different diameter and the computations are worked out as per IS 2911-Part I, Section-2.

Typical computations are presented in Annexure-I.

TABLE:- 5.1 RECOMMENDED SAFE LOAD CARRYING CAPACITIES OF BORED CAST-IN SITU PILES

Sl.No	Reference Bore hole No.	Length of Pile below E.G.L	Assumed Length of Cut-Off Below E.G.L	Length of Pile below Cut-off	Dia.of Pile in (mm)	SAFE LOAD CARRYING CAPACITY (kN)		
						Vertical Load Carrying Capacity	Pull Out Capacity	Lateral Load Carrying Capacity
1	BH-05	30.0	9.0	21.00	500	1000	450	27
2					550	1100	500	32
3					600	1300	550	37
4					650	1450	600	42
5					750	1800	650	53
6					800	2000	700	59
7					900	2400	800	70

4.4 FOUNDATION EXCAVATION:

Taking into consideration of high ground water table and predominantly coarse grain formation (sand formation from 3.5m) it ideal to adopt diaphragm wall as shoring system.

For lateral stability, adopt semi top-down construction technique as described below.

- Install diaphragm wall up to ground level
- Carryout mass excavation up to bottom of floor beam levels of top basement floors.
- Construct the floor system duly supported on dummy piles with pockets to grow column from lowering basement and connect the same to the diaphragm wall
- Provide pockets in floor slab with size to facilitate lowering of excavation
- Carryout excavation below top basement floor levels and progress till the pile cut-off.
- After Completion of excavation, Construct the lower basement floor and connect to the pile cut-off walls

- ❖ The factual system requires a detailed analysis by the structural consultant in association with geotechnical consultant

NOTE:

Carrying out lateral load analysis with appropriate boundary conditions and adopt the depth of diaphragm wall as a guideline, the depth shall be 20.0 m below the ground level.

4.5 DEWATERING/ GROUND WATER LOWERING DESIGN:

For ground water lowering, since diaphragm wall is recommended as shoring system for ground water lowering a combination of dewatering bore-wells installed both inside and outside the diaphragm are needed.

The internal bore-wells functions effectively for dewatering the green field zone confined within the diaphragm wall. External bore-wells helps in lateral seepage into the excavation zone.

4.5 UPLIFT DESIGN:

Though the diaphragm wall act like a cut-off wall, check the basement slab for uplift pressure equivalent to 3.0m head of water.

RECOMMENDATIONS

CHAPTER-5

RECOMMENDATIONS

5.1 RECOMMENDATION FOR DEEP PILE FOUNDATION SYSTEM:

- For the kind of proposed structure and sub soil condition deep pile foundation is the suitable foundation to adopt. In the present case, Bored **Cast in situ piles** are recommended as the suitable foundation system.
- The allowable safe load carrying capacities of different diameters of piles as given in Table-4.1.can be adopted as provisional design loads, as the load carrying capacity of piles not only depends upon the sub soil properties, but also depends on the care and experience of installation of piles.
- The theoretical load carrying estimates of piles shall be confirmed by conducting pile loads tests as per the guide lines laid down in IS: 2911-Part-IV.
- The boring shall be carried out using direct mud circulation prepared out of sodium bentonite.
- After reaching the borehole termination depth, the borehole shall be cleaned using mud circulation for a minimum period of 30min or till the return mud is relatively clear of soil particles.
- After ensuring the borehole is clean, the tremie pipe shall be lowered and concreting can be done.

5.1.1 CONSTRUCTION METHOD STATEMENT OF PILE FOUNDATION:

- The mud used shall be made out of sodium bentonite with minimum free swell index of more than 300% and liquid limit more than 100%. The silt content in bentonite shall not be more than 5%.
- The mud should be prepared using sodium bentonite with a density of range 1.03 g/cc to 1.10 g/cc. However, while flushing before concreting the density should not be more than 1.12 g/cc.

5.2 RECOMMENDATIONS FOR EXCAVATION:

- As discussed in Chapter-4.0, Section 4.4 it is recommended to adopt shoring system of diaphragm wall for excavation.

5.3 GENERAL RECOMMENDATION:

- The chlorides content in ground water & soil-water extract is less than the permissible limit of 500 mg/l as per IS 456 Table 1.0. Hence no special reinforcement is required for the construction.
- Corresponding to the sulphate content in 2:1 Water-Soil extract and ground water use Table 4.0 of IS 456 Clause 2.0 for minimum cement content and maximum water cement ratio. Hence ordinary Portland cement can be used.

- *Before excavation is started a workshop shall be conducted including the Owner, Architect, Structural Engineer, Geotechnical Engineer and Execution agency to ensure the proposal given by the contractor is workable and safe.*
- *Before construction activities are initiated, a scientific due-diligence of the condition of the neighbouring structures shall be carried out and authenticated. This is required to ensure that no undue claims or interpretations are made by the neighbourhood that the construction activities cause damages to their structures*

AUTHORISED SIGNATORY

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On behalf of CMDA MRB panel, the Geotechnical report is generally reviewed and in order.

Superintending Engineer, P.W.D.,
Planning and Designs Circle,
Chepauk, Chennai-5.

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ANNEXURE-I

GEOMARINE

ESTIMATION OF SAFE LOAD CARRYING CAPACITY OF BORED CAST-INSITU PILES

Type of Pile	Bored	Diameter of Pile			Length of Pile below G.L. (m)	30.0	As Per IS:2911-(P-I,S-2)-2010	
Reference Bore Hole	BH-01		500	mm	Surcharge Pressure	0	kPa	

Layer No.	Layer Thk. (m) Top. R.L.	Bot. R.L.	Thickness	Type of Strata	Ave. SPT	(γ) kN/m³ of Layer	Ave. upto Layer	Shear Parameters (C_u) kPa	(ϕ) Deg.	Effective Overburden Pressure (kPa) At top of Layer	At Bot. of Layer	At Mid. of Layer	Adhesion Factor (α)	Earth Pressure Coefficient (k)	Skin Friction (Q_f) kN		
1.0	0.0	9.0	9.0	Cut-Off Level													
2.0	9.0	12.0	3.0	Sand	19	18.0	18.0	-	32.7	0.0	24.0	12.0	-	1.1	qf	2	41.3
3.0	12.0	16.0	4.0	Clay	10	17.5	17.8	67	-	24.0	54.0	39.0	0.7	-	qf	3	307.3
4.0	16.0	18.0	2.0	Clay	7	16.0	16.8	47	-	54.0	66.0	60.0	0.9	-	qf	4	132.9
5.0	18.0	22.5	4.5	Clay	12	18.5	17.3	80	-	66.0	104.3	85.1	0.6	-	qf	5	311.0
6.0	22.5	25.0	2.5	Sand	21	18.5	18.5	-	33.3	104.3	125.5	114.9	-	1.2	qf	6	345.9
7.0	25.0	27.5	2.5	Clay	50	21.0	19.8	333	-	125.5	153.0	139.3	0.3	-	qf	7	340.0
8.0	27.5	30.0	2.5	Sand	50	20.5	20.8	-	36.0	153.0	179.3	166.1	-	1.5	qf	8	711.0

Summation of Positive Skin Resitance (kN) Q_f= 2189.32

Summation of Negative Skin Resistance (kN) -Qf= 0.00

Computation of End Bearing Resistance

		SPT	ϕ	C_u	N_q	N_c			
Bearing Stratum	Shale	60	-	600	-	9	Eff.Ht.of Overburden	8	m
							Effective Overburden Pressure	62.95	kN/m²

End Bearing Resistance (kN) Q_p= 1060.29

Skin Resistance in Clay Layer is $\pi*d*T_i*C_u*\alpha$	Ultimate Load Carrying Capacity (Q_{ult})	$Q_u=Q_f-Q_f+Q_p$ (kN) 3249.61
Skin Resistance in Sand Layer is $\pi*d*T_i*q_i*K*Tan(\phi)$	Safe Load Carrying Capacity (Q_{safe})	$Q_u/2.5$ (kN) 1299.84
End Bearing Resistance in Clay Layer is $\pi*d^2/4*C_u*N_c$	Allowable Safe Load Carrying Capacity	$Q_{A\text{-}safe}$ (kN) 1299.84
End Bearing Resistance in Sand Layer is $\pi*d^2/4*Q*N_q$	Allowable Safe Pull out Capacity	$Q_{A\text{-}pull}$: Qf/3 (kN) 729.77

Where

Cu=Undrained Shear Strength of Clay
K=Coef. Earth Pressure at Rest
d=Dia. Of Pile
ϕ=Angle of Shearing Resistance
q_i=Effecitve Overburden Pressure at middle of Layer
α=Adhession Factor
N_c=Bearing Capacity Factor = 9
N_q=Bearing Capacity Factor, Ref. Fig.1 of IS: Code Referred above
T_i=Thickness of Layer
Q (i.e) Effecitve Overburden Pressure at pile tip=Effective height of overburden X (γ-10)

GEOMARINE

ESTIMATION OF SAFE LOAD CARRYING CAPACITY OF BORED CAST-INSITU PILES

Type of Pile	Bored	Diameter of Pile		Length of Pile below G.L. (m)	30.0	As Per IS:2911-(P-I,S-2)-2010
Reference Bore Hole	BH-02		500 mm	Surcharge Pressure	0	kPa

Layer No.	Layer Thk. (m) Top. R.L.	Bot. R.L.	Thickness	Type of Strata	Ave. SPT	(γ) kN/m³ of Layer	Ave. upto Layer	Shear Parameters (C_u) kPa	(ϕ) Deg.	Effective Overburden Pressure (kPa) At top of Layer	At Bot. of Layer	At Mid. of Layer	Adhesion Factor (α)	Earth Pressure Coefficient (k)	Skin Friction (Q_f) kN		
1.0	0.0	9.0	9.0	Cut-Off Level													
2.0	9.0	12.0	3.0	Sand	23	18.5	18.5	-	33.9	0.0	25.5	12.8	-	1.2	qf	2	48.3
3.0	12.0	16.0	4.0	Clay	15	20.0	19.3	100	-	25.5	65.5	45.5	0.4	-	qf	3	270.2
4.0	16.0	20.0	4.0	Clay	8	16.5	18.3	53	-	65.5	91.5	78.5	0.9	-	qf	4	299.7
5.0	20.0	22.5	2.5	Clay	20	20.0	18.3	133	-	91.5	116.5	104.0	0.4	-	qf	5	182.8
6.0	22.5	27.5	5.0	Clayey Sand	40	20.0	20.0	-	34.0	116.5	166.5	141.5	-	1.4	qf	6	1081.7
7.0	27.5	30.0	2.5	Sand	50	20.5	20.3	-	36.0	166.5	192.8	179.6	-	1.5	qf	7	768.8

Summation of Positive Skin Resitance (kN) Q_f= 2651.51

Summation of Negative Skin Resistance (kN) -Qf= 0.00

Computation of End Bearing Resistance

		SPT	ϕ	C_u	N_q	N_c			
Bearing Stratum	Shale	60	-	600	-	9	Eff.Ht.of Overburden	8	m
							Effective Overburden Pressure	68.13	kN/m²

End Bearing Resistance (kN) Q_p= 1060.29

Skin Resistance in Clay Layer is $\pi*d*T_i*C_u*\alpha$	Ultimate Load Carrying Capacity (Q_{ult})	$Q_u=Q_f-Q_f+Q_p$ (kN) 3711.79
Skin Resistance in Sand Layer is $\pi*d*T_i*q_i*K*Tan(\phi)$	Safe Load Carrying Capacity (Q_{safe})	$Q_u/2.5$ (kN) 1484.72
End Bearing Resistance in Clay Layer is $\pi*d^2/4*C_u*N_c$	Allowable Safe Load Carrying Capacity	$Q_{A\text{-}safe}$ (kN) 1484.72
End Bearing Resistance in Sand Layer is $\pi*d^2/4*Q*N_q$	Allowable Safe Pull out Capacity	$Q_{A\text{-}pull}$: Qf/3 (kN) 883.84

Where

Cu=Undrained Shear Strength of Clay

K=Coef. Earth Pressure at Rest

d=Dia. Of Pile

ϕ=Angle of Shearing Resistance

q_i=Effecitve Overburden Pressure at middle of Layer

α=Adhesion Factor

N_c=Bearing Capacity Factor = 9

N_q=Bearing Capacity Factor, Ref. Fig.1 of IS: Code Referred above

T_i=Thickness of Layer

Q (i.e) Effecitve Overburden Pressure at pile tip=Effective height of overburden X (γ=10)

GEOMARINE

ESTIMATION OF SAFE LOAD CARRYING CAPACITY OF BORED CAST-INSITU PILES

Type of Pile	Bored	Diameter of Pile			Length of Pile below G.L. (m)	30	As Per IS:2911-(P-I,S-2)-2010	
Reference Bore Hole	BH-03		500	mm	Surcharge Pressure	0	kPa	

Layer No.	Layer Thk. (m) Top. R.L.	Bot. R.L.	Thickness	Type of Strata	Ave. SPT	(γ) kN/m³ of Layer	Ave. upto Layer	Shear Parameters (C_u) kPa	(ϕ) Deg.	Effective Overburden Pressure (kPa) At top of Layer	At Bot. of Layer	At Mid. of Layer	Adhesion Factor (α)	Earth Pressure Coefficient (k)	Skin Friction (Q_f) kN		
1.0	0.0	9.0	9.0	Cut-Off Level													
2.0	9.0	10.5	1.5	Sand	30	19.0	19.0	-	36	0.0	13.5	6.8	-	1.3	qf	2	15.1
3.0	10.5	12.0	1.5	Clay	4	14.5	16.8	27	-	13.5	20.3	16.9	1.0	-	qf	3	63.6
4.0	12.0	16.0	4.0	Clay	15	20.0	17.3	100	-	20.3	60.3	40.3	0.4	-	qf	4	270.2
5.0	16.0	18.0	2.0	Clay	10	17.5	18.8	67	-	60.3	75.3	67.8	0.7	-	qf	5	153.7
6.0	18.0	20.0	2.0	Clay	17	20.0	18.8	113	-	75.3	95.3	85.3	0.4	-	qf	6	138.4
7.0	20.0	25.0	5.0	Clay	44	21.0	20.5	293	-	95.3	150.3	122.8	0.3	-	qf	7	598.3
8.0	25.0	27.5	2.5	Clayey Sand	40	20.0	20.5	-	34.0	150.3	175.3	162.8	-	1.4	qf	8	622.1
9.0	27.5	30.0	2.5	Clayey Sand	50	20.5	20.3	-	36.0	175.3	201.5	188.4	-	1.5	qf	9	806.2

Summation of Positive Skin Resitance (kN) Q_f= 2667.57

Summation of Negative Skin Resistance (kN) -Qf= 0.00

Computation of End Bearing Resistance

		SPT	ϕ	C_u	N_q	N_c			
Bearing Stratum	Shale	60	-	600	-	9	Eff.Ht.of Overburden	8	m
							Effective Overburden Pressure	67.27	kN/m²

End Bearing Resistance (kN) Q_p= 1060.29

Skin Resistance in Clay Layer is $\pi*d*T_i*C_u*\alpha$

Skin Resistance in Sand Layer is $\pi*d*T_i*q_i*K*Tan(\phi)$

End Bearing Resistance in Clay Layer is $\pi*d^2/4*C_u*N_c$

End Bearing Resistance in Sand Layer is $\pi*d^2/4*Q*N_q$

Ultimate Load Carrying Capacity (Q_{ult})	$Q_u=Q_f-Q_f+Q_p$ (kN) 3727.86
Safe Load Carrying Capacity (Q_{safe})	$Q_u/2.5$ (kN) 1491.14
Allowable Safe Load Carrying Capacity	$Q_{A\text{-}safe}$ (kN) 1491.14
Allowable Safe Pull out Capacity	$Q_{A\text{-}pull}$: Qf/3 (kN) 889.19

Where

Cu=Undrained Shear Strength of Clay

ϕ=Angle of Shearing Resistance

N_c=Bearing Capacity Factor = 9

K=Coef. Earth Pressure at Rest

q_i=Effecitve Overburden Pressure at middle of Layer

N_q=Bearing Capacity Factor, Ref. Fig.1 of IS: Code Referred above

d=Dia. Of Pile

α=Adhession Factor

T_i=Thickness of Layer

Q (i.e) Effecitve Overburden Pressure at pile tip=Effective height of overburden X (γ-10)

GEOMARINE

ESTIMATION OF SAFE LOAD CARRYING CAPACITY OF BORED CAST-INSITU PILES

Type of Pile	Bored	Diameter of Pile			Length of Pile below G.L. (m)	30.0	As Per IS:2911-(P-I,S-2)-2010
Reference Bore Hole	BH-04		500	mm	Surcharge Pressure	0	kPa

Layer No.	Layer Thk. (m) Top. R.L.	Bot. R.L.	Thickness	Type of Strata	Ave. SPT	(γ) kN/m³ of Layer	(γ) kN/m³ Ave. upto Layer	Shear Parameters (C_u) kPa	Shear Parameters (ϕ) Deg.	Effective Overburden Pressure (kPa) At top of Layer	At Bot. of Layer	At Mid. of Layer	Adhesion Factor (α)	Earth Pressure Coefficient (K)	Skin Friction (Q_f) kN		
1.0	0.0	9.0	9.0	Cut-Off Level													
2.0	9.0	20.0	11.0	Clay	10	17.5	17.5	67	-	0.0	82.5	41.3	0.7	-	qf	2	845.1
3.0	20.0	22.5	2.5	Clay	34	21.0	19.3	227	-	82.5	110.0	96.3	0.3	-	qf	3	231.8
4.0	22.5	27.5	5.0	Clay	50	21.0	21.0	333	-	110.0	165.0	137.5	0.3	-	qf	4	680.0
5.0	27.5	30.0	2.5	Clay	50	21.0	21.0	333	-	165.0	192.5	178.8	0.3	-	qf	5	340.0

Summation of Positive Skin Resitance (kN) Q_f= 2098.87

Summation of Negative Skin Resistance (kN) -Qf= 0.00

Computation of End Bearing Resistance

		SPT	ϕ	C_u	N_q	N_c			
Bearing Stratum	Shale	60	-	600	-	9	Eff.Ht.of Overburden	8	m
							Effective Overburden Pressure	72.66	kN/m²

End Bearing Resistance (kN) Q_p= 1060.29

Skin Resistance in Clay Layer Is $\pi*d*T_i*C_u*\alpha$

Skin Resistance in Sand Layer is $\pi*d*T_i*q_i*K*Tan(\phi)$

End Bearing Resistance in Clay Layer is $\pi*d^2/4*C_u*N_c$

End Bearing Resistance in Sand Layer is $\pi*d^2/4*Q*N_q$

Ultimate Load Carrying Capacity (Q_{ult})	$Q_u=Q_f+Q_f+Q_p$ (kN) 3157.16
Safe Load Carrying Capacity (Q_{safe})	$Q_u/2.5$ (kN) 1262.86
Allowable Safe Load Carrying Capacity	$Q_{A\text{-}safe}$ (kN) 1262.86
Allowable Safe Pull out Capacity	$Q_{A\text{-}pull}$: Qf/3 (kN) 698.96

Where

Cu=Undrained Shear Strength of Clay

ϕ=Angle of Shearing Resistance

N_c=Bearing Capacity Factor = 9

K=Coef. Earth Pressure at Rest

q_i=Effecitve Overburden Pressure at middle of Layer

N_q=Bearing Capacity Factor, Ref. Fig.1 of IS: Code Referred above

d=Dia. Of Pile

α=Adhession Factor

T_i=Thickness of Layer

Q (i.e) Effecitve Overburden Pressure at pile tip=Effective height of overburden X (γ-10)

GEOMARINE

ESTIMATION OF SAFE LOAD CARRYING CAPACITY OF BORED CAST-INSITU PILES

Type of Pile	Bored	Diameter of Pile			Length of Pile below G.L. (m)	30.0	As Per IS:2911-(P-I,S-2)-2010	
Reference Bore Hole	BH-05		500	mm	Surcharge Pressure	0	kPa	

Layer No.	Layer Thk. (m) Top. R.L.	Bot. R.L.	Thickness	Type of Strata	Ave. SPT	(γ) kN/m³ of Layer	Ave. upto Layer	Shear Parameters (C_u) kPa	(ϕ) Deg.	Effective Overburden Pressure (kPa) At top of Layer	At Bot. of Layer	At Mid. of Layer	Adhesion Factor (α)	Earth Pressure Coefficient (k)	Skin Friction (Q_f) kN		
1.0	0.0	9.0	9.0	Cut-Off Level													
2.0	9.0	12.0	3.0	Sand	9	14.5	14.5	-	29.8	0.0	13.5	6.8	-	1.0	qf	2	18.2
3.0	12.0	18.0	6.0	Clay	2	14.0	14.3	13	-	13.5	37.5	25.5	1.0	-	qf	3	122.5
4.0	18.0	20.0	2.0	Clay	6	15.5	14.8	40	-	37.5	48.5	43.0	1.0	-	qf	4	125.7
5.0	20.0	25.0	5.0	Clay	20	20.0	17.8	133	-	48.5	98.5	73.5	0.4	-	qf	5	365.6
6.0	25.0	27.5	2.5	Clay	45	21.0	20.5	300	-	98.5	126.0	112.3	0.3	-	qf	6	306.3
7.0	27.5	30.0	2.5	Shale	60	22.0	21.5	600	-	126.0	156.0	141.0	0.3	-	qf	7	612.6

Summation of Positive Skin Resitance (kN) Q_f= 1550.92

Summation of Negative Skin Resistance (kN) -Qf= 0.00

Computation of End Bearing Resistance

		SPT	ϕ	C_u	N_q	N_c			
Bearing Stratum	Shale	60	-	600	-	9	Eff.Ht.of Overburden	8	m
							Effective Overburden Pressure	54.06	kN/m²

End Bearing Resistance (kN) Q_p= 1060.29

Skin Resistance in Clay Layer is $\pi*d*T_i*C_u*\alpha$

Skin Resistance in Sand Layer is $\pi*d*T_i*q_i*K*Tan(\phi)$

End Bearing Resistance in Clay Layer is $\pi*d^2/4*C_u*N_c$

End Bearing Resistance in Sand Layer is $\pi*d^2/4*Q*N_q$

Ultimate Load Carrying Capacity (Q_{ult})	$Q_u=Q_f-Q_f+Q_p$ (kN)	2611.21
Safe Load Carrying Capacity (Q_{safe})	$Q_u/2.5$ (kN)	1044.48
Allowable Safe Load Carrying Capacity	$Q_{A\text{-}safe}$ (kN)	1044.48
Allowable Safe Pull out Capacity	$Q_{A\text{-}pull}$: Qf/3 (kN)	516.97

Note: SPT is carried out using automatic trip hammer and the efficiency is equal to 90% to 95% and the N is corrected to 60% efficiency

Where

Cu=Undrained Shear Strength of Clay

ϕ=Angle of Shearing Resistance

N_c=Bearing Capacity Factor = 9

K=Coef. Earth Pressure at Rest

q_i=Effecitve Overburden Pressure at middle of Layer

N_q=Bearing Capacity Factor, Ref. Fig.1 of IS: Code Referred above

d=Dia. Of Pile

α=Adhession Factor

T_i=Thickness of Layer

Q (i.e) Effecitve Overburden Pressure at pile tip=Effective height of overburden X (γ-10)

GEOMARINE

ESTIMATION OF SAFE LOAD CARRYING CAPACITY OF BORED CAST-INSITU PILES

Type of Pile	Bored	Diameter of Pile			Length of Pile below G.L. (m)	30.0	As Per IS:2911-(P-I,S-2)-2010
Reference Bore Hole	BH-08		500	mm	Surcharge Pressure	0	kPa

Layer No.	Layer Thk. (m) Top. R.L.	Bot. R.L.	Thickness	Type of Strata	Ave. SPT	(γ) kN/m³ of Layer	(γ) kN/m³ Ave. upto Layer	Shear Parameters (C_u) kPa	Shear Parameters (ϕ) Deg.	Effective Overburden Pressure (kPa) At top of Layer	At Bot. of Layer	At Mid. of Layer	Adhesion Factor (α)	Earth Pressure Coefficient (k)	Skin Friction (Q_f) kN		
1.0	0.0	9.0	9.0	Cut-Off Level													
2.0	9.0	10.5	1.5	Clay	18	20.0	20.0	120	-	0.0	15.0	7.5	0.4	-	qf	2	107.4
3.0	10.5	18.0	7.5	Clay	11	18.0	19.0	73	-	15.0	75.0	45.0	0.6	-	qf	3	533.2
4.0	18.0	25.0	7.0	Clay	26	20.5	19.3	173	-	75.0	148.5	111.8	0.3	-	qf	4	570.7
5.0	25.0	27.5	2.5	Clay	50	21.0	20.8	333	-	148.5	176.0	162.3	0.3	-	qf	5	340.0
6.0	27.5	30.0	2.5	Clayey Sand	60	20.5	20.8	-	36.0	176.0	202.3	189.1	-	1.5	qf	6	809.4

Summation of Positive Skin Resitance (kN) Q_f= 2360.74

Summation of Negative Skin Resistance (kN) -Qf= 0.00

Computation of End Bearing Resistance

		SPT	ϕ	C_u	N_q	N_c			
Bearing Stratum	Shale	60	-	600	-	9	Eff.Ht.of Overburden	8	m
							Effective Overburden Pressure	74.63	kN/m²

End Bearing Resistance (kN) Q_p= 1060.29

Skin Resistance in Clay Layer is $\pi*d*T_i*C_u*\alpha$	Ultimate Load Carrying Capacity (Q_{ult})	$Q_u=Q_f-Q_f+Q_p$ (kN) 3421.02
Skin Resistance in Sand Layer is $\pi*d*T_i*q_i*K*Tan(\phi)$	Safe Load Carrying Capacity (Q_{safe})	$Q_u/2.5$ (kN) 1368.41
End Bearing Resistance in Clay Layer is $\pi*d^2/4*C_u*N_c$	Allowable Safe Load Carrying Capacity	$Q_{A\text{-}safe}$ (kN) 1368.41
End Bearing Resistance in Sand Layer is $\pi*d^2/4*Q*N_q$	Allowable Safe Pull out Capacity	$Q_{A\text{-}pull}$: Qf/3 (kN) 786.91

Where

Cu=Undrained Shear Strength of Clay
ϕ=Angle of Shearing Resistance
N_c=Bearing Capacity Factor = 9
Q (i.e) Effecitve Overburden Pressure at pile tip=Effective height of overburden X (γ-10)

K=Coef. Earth Pressure at Rest
q_i=Effecitve Overburden Pressure at middle of Layer
N_q=Bearing Capacity Factor, Ref. Fig.1 of IS: Code Referred above

d=Dia. Of Pile
α=Adhession Factor
T_i=Thickness of Layer

GEOMARINE

ESTIMATION OF SAFE LOAD CARRYING CAPACITY OF BORED CAST-INSITU PILES

Type of Pile	Bored	Diameter of Pile			Length of Pile below G.L. (m)	30.0	As Per IS:2911-(P-I,S-2)-2010	
Reference Bore Hole	BH-10		500	mm	Surcharge Pressure	0		kPa

Layer No.	Layer Thk. (m) Top. R.L.	Bot. R.L.	Thickness	Type of Strata	Ave. SPT	(γ) kN/m³ of Layer	Ave. upto Layer	Shear Parameters (C_u) kPa	(ϕ) Deg.	Effective Overburden Pressure (kPa) At top of Layer	At Bot. of Layer	At Mid. of Layer	Adhesion Factor (α)	Earth Pressure Coefficient (k)	Skin Friction (Q_f) kN		
1.0	0.0	9.0	9.0	Cut-Off Level													
2.0	9.0	10.5	1.5	Clay	48	21.0	21.0	320	-	0.0	16.5	8.3	0.3	-	qf	2	196.0
3.0	10.5	18.0	7.5	Clay	11	18.0	19.5	73	-	16.5	76.5	46.5	0.6	-	qf	3	533.2
4.0	18.0	20.0	2.0	Clay	7	16.0	17.0	47	-	76.5	88.5	82.5	0.9	-	qf	4	132.9
5.0	20.0	22.5	2.5	Clay	31	21.0	18.5	207	-	88.5	116.0	102.3	0.3	-	qf	5	211.4
6.0	22.5	25.0	2.5	Clay	42	21.0	21.0	280	-	116.0	143.5	129.8	0.3	-	qf	6	285.9
7.0	25.0	30.0	5.0	Sand	50	20.5	20.8	-	36.0	143.5	196.0	169.8	-	1.5	qf	7	1453.0

Summation of Positive Skin Resitance (kN) Q_f= 2812.32

Summation of Negative Skin Resistance (kN) -Qf= 0.00

Computation of End Bearing Resistance

		SPT	ϕ	C_u	N_q	N_c			
Bearing Stratum	Shale	60	-	600	-	9	Eff.Ht.of Overburden	8	m
							Effective Overburden Pressure	72.19	kN/m²

End Bearing Resistance (kN) Q_p= 1060.29

Skin Resistance in Clay Layer is $\pi * d * T_l * C_u * \alpha$

Skin Resistance in Sand Layer is $\pi * d * T_l * q_l * K * Tan(\phi)$

End Bearing Resistance in Clay Layer is $\pi * d^2/4 * C_u * N_c$

End Bearing Resistance in Sand Layer is $\pi * d^2/4 * Q * N_q$

Ultimate Load Carrying Capacity (Q_{ult})	$Q_u = Q_f - Q_f + Q_p$ (kN)	3872.61
Safe Load Carrying Capacity (Q_{safe})	$Q_u/2.5$ (kN)	1549.04
Allowable Safe Load Carrying Capacity	$Q_{A\text{-}safe}$ (kN)	1549.04
Allowable Safe Pull out Capacity	$Q_{A\text{-}pull}$: Qf/3 (kN)	937.44

Where

Cu=Undrained Shear Strength of Clay

ϕ=Angle of Shearing Resistance

N_c=Bearing Capacity Factor = 9

K=Coef. Earth Pressure at Rest

q_l=Effecitve Overburden Pressure at middle of Layer

N_q=Bearing Capacity Factor, Ref. Fig.1 of IS: Code Referred above

d=Dia. Of Pile

α=Adhession Factor

T_l=Thickness of Layer

Q (i.e) Effecitve Overburden Pressure at pile tip=Effective height of overburden X (γ-10)

GEOMARINE

ESTIMATION OF SAFE LOAD CARRYING CAPACITY OF BORED CAST-INSITU PILES

Type of Pile	Bored	Diameter of Pile			Length of Pile below G.L. (m)	30.0	As Per IS:2911-(P-I,S-2)-2010
Reference Bore Hole	BH-11		500	mm	Surcharge Pressure	0	kPa

Layer No.	Layer Thk. (m) Top. R.L.	Bot. R.L.	Thickness	Type of Strata	Ave. SPT	(γ) kN/m³ of Layer	(γ) kN/m³ Ave. upto Layer	Shear Parameters (C_u) kPa	Shear Parameters (ϕ) Deg.	Effective Overburden Pressure (kPa) At top of Layer	At Bot. of Layer	At Mid. of Layer	Adhession Factor (α)	Earth Pressure Coefficient (k)	Skin Friction (Q_f) kN		
1.0	0.0	9.0	9.0	Cut-Off Level													
2.0	9.0	10.5	1.5	Clay	26	20.5	20.5	173	-	0.0	15.8	7.9	0.3	-	qf	2	122.3
3.0	10.5	12.0	1.5	Clay	6	15.5	18.0	40	-	15.8	24.0	19.9	1.0	-	qf	3	94.2
4.0	12.0	20.0	8.0	Clay	11	18.0	16.8	73	-	24.0	88.0	56.0	0.6	-	qf	4	568.8
5.0	20.0	22.5	2.5	Clay	20	20.0	19.0	133	-	88.0	113.0	100.5	0.4	-	qf	5	182.8
6.0	22.5	27.5	5.0	Clay	45	21.0	20.5	300	-	113.0	168.0	140.5	0.3	-	qf	6	612.6
7.0	27.5	30.0	2.5	Sand	50	20.5	20.8	-	36.0	168.0	194.3	181.1	-	1.5	qf	7	775.2

Summation of Positive Skin Resitance (kN) Q_f= 2355.88

Summation of Negative Skin Resistance (kN) -Qf= 0.00

Computation of End Bearing Resistance

		SPT	ϕ	C_u	N_q	N_c			
Bearing Stratum	Shale	60	-	600	-	9	Eff.Ht.of Overburden	8	m
							Effective Overburden Pressure	69.38	kN/m²

End Bearing Resistance (kN) Q_p= 1060.29

Skin Resistance in Clay Layer is $\pi*d*T_i*C_u*\alpha$

Skin Resistance in Sand Layer is $\pi*d*T_i*q_i*K*Tan(\phi)$

End Bearing Resistance in Clay Layer is $\pi*d^2/4*C_u*N_c$

End Bearing Resistance in Sand Layer is $\pi*d^2/4*Q*N_q$

Where

Cu=Undrained Shear Strength of Clay

ϕ=Angle of Shearing Resistance

N_c=Bearing Capacity Factor = 9

Q (i.e) Effective Overburden Pressure at pile tip=Effective height of overburden X (γ-10)

K=Coef. Earth Pressure at Rest

q_i=Effective Overburden Pressure at middle of Layer

N_q=Bearing Capacity Factor, Ref. Fig.1 of IS: Code Referred above

d=Dia. Of Pile

α=Adhesion Factor

T_i=Thickness of Layer

Ultimate Load Carrying Capacity (Q_{ult})	$Q_u=Q_f-Q_i+Q_p$ (kN)	3416.17
Safe Load Carrying Capacity (Q_{safe})	$Q_u/2.5$ (kN)	1366.47
Allowable Safe Load Carrying Capacity	Q_{A-safe} (kN)	1366.47
Allowable Safe Pull out Capacity	Q_{A-pull}: Qf/3 (kN)	785.29

GEOMARINE

ESTIMATION OF SAFE LOAD CARRYING CAPACITY OF BORED CAST-INSITU PILES

Type of Pile	Bored	Diameter of Pile			Length of Pile below G.L. (m)	30.0	As Per IS:2911-(P-I,S-2)-2010	
Reference Bore Hole	BH-12		500	mm	Surcharge Pressure	0	kPa	

Layer No.	Layer Thk. (m) Top. R.L.	Bot. R.L.	Thickness	Type of Strata	Ave. SPT	(γ) kN/m³ of Layer	Ave. upto Layer	Shear Parameters (C_u) kPa	(ϕ) Deg.	Effective Overburden Pressure (kPa) At top of Layer	At Bot. of Layer	At Mid. of Layer	Adhesion Factor (α)	Earth Pressure Coefficient (k)	Skin Friction (Q_f) kN		
1.0	0.0	9.0	9.0	Cut-Off Level													
2.0	9.0	10.5	1.5	Clay	14	19.5	19.5	93	-	0.0	14.3	7.1	0.5	-	qf	2	103.0
3.0	10.5	12.0	1.5	Sand	15	17.5	18.5	-	31.5	14.3	25.5	19.9	-	1.1	qf	3	30.9
4.0	12.0	20.0	8.0	Clay	11	18.0	17.8	73	-	25.5	89.5	57.5	0.6	-	qf	4	568.8
5.0	20.0	22.5	2.5	Clay	22	20.5	19.3	147	-	89.5	115.8	102.6	0.3	-	qf	5	173.2
6.0	22.5	25.0	2.5	Clay	36	21.0	20.8	240	-	115.8	143.3	129.5	0.3	-	qf	6	245.0
7.0	25.0	27.5	2.5	Clayey Sand	45	20.0	20.5	-	34.0	143.3	168.3	155.8	-	1.5	qf	7	618.8
8.0	27.5	30.0	2.5	Clay	50	21.0	20.5	333	-	168.3	195.8	182.0	0.3	-	qf	8	340.0

Summation of Positive Skin Resitance (kN) Q_f= 2079.67

Summation of Negative Skin Resistance (kN) -Qf= 0.00

Computation of End Bearing Resistance

		SPT	ϕ	C_u	N_q	N_c			
Bearing Stratum	Shale	60	-	600	-	9	Eff.Ht.of Overburden	8	m
							Effective Overburden Pressure	71.52	kN/m²

End Bearing Resistance (kN) Q_p= 1060.29

Skin Resistance In Clay Layer is $\pi*d*T_i*C_u*\alpha$

Skin Resistance in Sand Layer is $\pi*d*T_i*q_i*K*Tan(\phi)$

End Bearing Resistance in Clay Layer is $\pi*d^2/4*C_u*N_c$

End Bearing Resistance in Sand Layer is $\pi*d^2/4*Q*N_q$

Ultimate Load Carrying Capacity (Q_{ult})	$Q_u=Q_f-Q_f+Q_p$ (kN)	3139.96
Safe Load Carrying Capacity (Q_{safe})	$Q_u/2.5$ (kN)	1255.98
Allowable Safe Load Carrying Capacity	Q_{A-safe} (kN)	1255.98
Allowable Safe Pull out Capacity	Q_{A-pull}: Qf/3 (kN)	693.22

Where

Cu=Undrained Shear Strength of Clay

ϕ=Angle of Shearing Resistance

N_c=Bearing Capacity Factor = 9

K=Coef. Earth Pressure at Rest

q_i=Effecitve Overburden Pressure at middle of Layer

N_q=Bearing Capacity Factor, Ref. Fig.1 of IS: Code Referred above

d=Dia. Of Pile

α=Adhession Factor

T_i=Thickness of Layer

Q (i.e) Effecitve Overburden Pressure at pile tip=Effective height of overburden X (γ-10)

GEOMARINE

LATERAL LOAD CARRYING CAPACITY OF BORED CAST- SITU PILES

Reference Bore Hole : BH-05

1.0 Geometrical Data

Type of Pile Head Considered	Fixed	
Diameter of Pile (d) :	0.60	m
Free standing Length of Pile (e) :	0	m
Length of Pile below E.G.L (Le) :	30.0	m
Cut-Off Level From E.G.L :	9.0	
Length of Pile below Cut-Off Level (Le) :	21.0	m
Grade of Concrete (M) :	25	MN/m^2
Young's Modulus of Concrete (E) :	25000000	kN/m^2
Momemnt of Inertia (I) :	0.006362	m^4

2.0 Determination of Depth of Fixity

Type of Soil Strata :	Sand	
Ground Water Condition :	Submerged	
Design SPT "N" Value :	7	
T=(EI/nh)1/5		

(n can be read as h in the above and below equation in case of Sand)

nh= :	800	kN/m^3
In Case of Sand :	-	kN/m^4
T= :	2.88	m
L1/T :	0.00	
Lf/T :	2.20	
Depth of Fixity below Cut off (z_f) :	6.34	m

3.0 Determincation of Lateral Load and Moment Carrying Capacity for 0.005 m Lateral Deflection:

Allowable Lateral Deflection (Y) :	0.005	m
Lateral Load Carrying Capacity (H)= Y*12EI/(e+zf)^3 :	37.44	kN
Recommended Design Lateral Load carrying Capacity :	**37**	**kN**
Fixed End Moment,M_F=H(e+z_f)/2	119	
Reduction Factor (L_1/T) :	0.83	m
Actual Moment (Fixed End Moment/Reduction Factor),M_F	**99**	kN-m

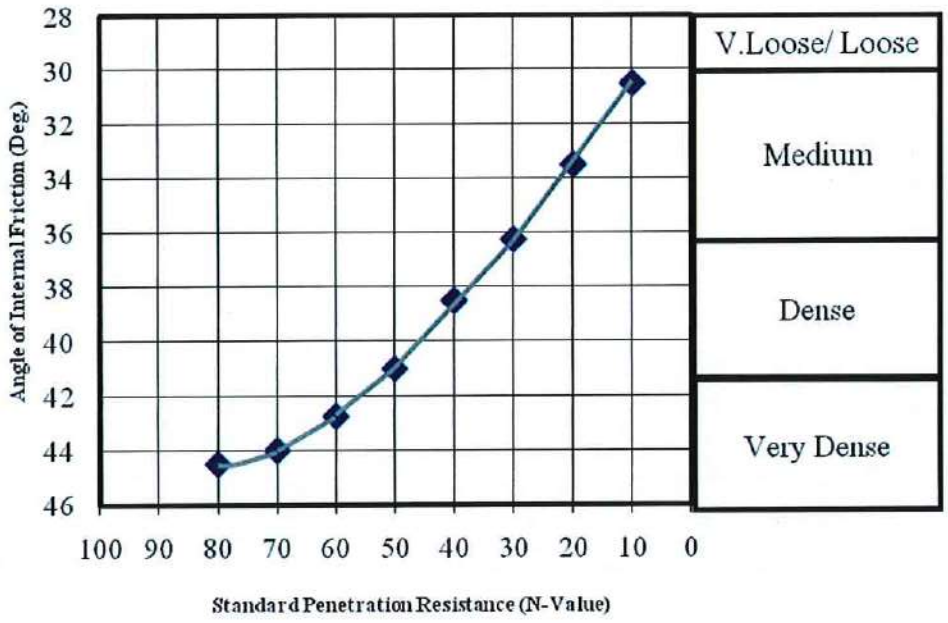


FIG. A1 Relation Ship between Angle of Internal Friction & N-value (Reproduced from IS:6403-1981)

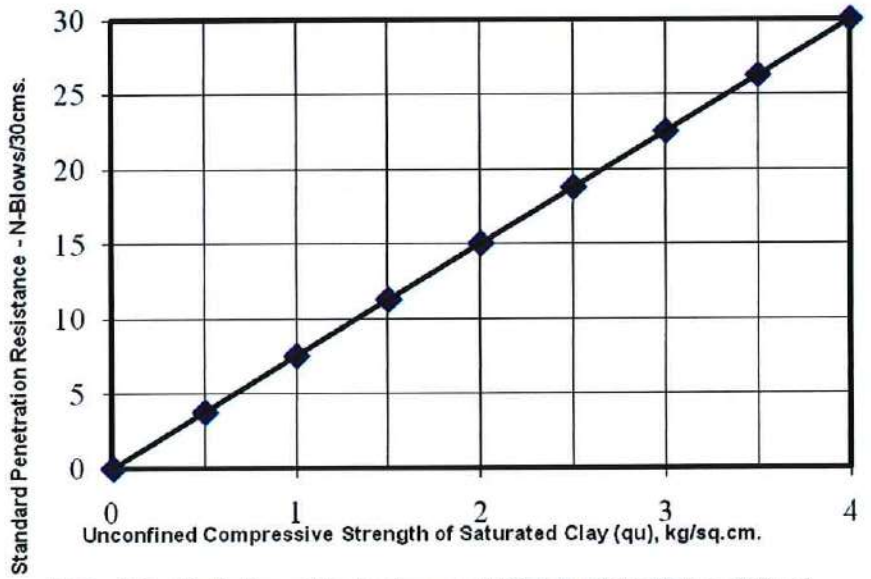


FIG. A2 : Relationship between UCC & SPT-Value (N) of Saturated Clay (AfterTerzhagi & Peck, 1948)

ANNEXURE-II

LIQUEFACTION ANALYSIS RESULTS

GEOMARINE

ANNEXURE-II SIMPLIFIED PROCEDURE FOR EVALUATION OF LIQUEFACTION POTENTIAL AS PER IS 1893 (PART-1)- 2016 BASED ON SPT "N"

Zone Factor / Horizontal ground acceleration (Z or a_{max}/g): 0.16 | Location of Ground Water Table: 3.0 m | C_{HT} 1 | C_{SS} 1

Atmospheric Pressure: 100.00 kPa | Magnitude, Mw = 6 | C_{BD} 1 | C_{HW} 1 | C_{RL} 1

Borehole: BH-01

Depth (m)	"N" SPT Value	Type of Soil	γ (kN/m3)	Fines Content FC	σ_o (kPa)	σ_o' (kPa)	$\sigma_o/\sigma o'$	r_d	CSR $(0.65*(a_{max}/g)*(\sigma o/\sigma o')*r_d)$	C_{60}	$N_{60}=NC_{60}$	C_N	$(N_1)_{60}=C_N \cdot NC_{60}$	α	β	$(N_1)_{60CS}=\alpha+\beta(N_1)_{60}$	$CRR_{7.5}$	CRR	Factor of Safety FOS=1 CRR/CSR	Possiblity of Liquefaction
1.00	16	Filled up Soil	18.00	44	18	18	1.00	0.99	0.10	1.00	16	1.70	27	0.50	1.20	33.1	1.40	2.48	24.07	Non-Liquefiable
2.00	9	Silty Clay	17.00	63	35	35	1.00	0.98	0.10	1.00	9	1.69	15	0.50	1.20	18.8	0.20	0.35	3.46	Non-Liquefiable
4.00	28	Silty Sand	19.00	30	73	53	1.37	0.97	0.14	1.00	28	1.37	38	4.70	1.15	48.9	0.29	0.51	3.73	Non-Liquefiable
5.00	35	Silty Sand	19.50	11	93	63	1.47	0.96	0.15	1.00	35	1.26	44	1.07	1.02	46.2	0.26	0.45	3.09	Non-Liquefiable
6.00	45	Silty Sand	20.00	15	113	73	1.54	0.95	0.15	1.00	45	1.17	53	2.41	1.05	57.4	0.38	0.67	4.39	Non-Liquefiable
7.50	45	Silty Sand	20.00	13	143	89	1.61	0.94	0.16	1.00	45	1.06	48	1.91	1.04	51.5	0.32	0.57	3.59	Non-Liquefiable
9.00	17	Silty Sand	18.00	7	170	101	1.68	0.93	0.16	1.00	17	1.00	17	0.09	1.01	17.1	0.18	0.32	1.98	Non-Liquefiable
10.50	21	Silty Sand	18.50	30	197	114	1.73	0.89	0.16	1.00	21	0.94	20	4.73	1.16	27.5	0.35	0.62	3.88	Non-Liquefiable
12.00	9	Silty Clay	17.00	98	223	125	1.79	0.85	0.16	1.00	9	0.90	8	0.50	1.20	10.2	0.11	0.20	1.28	Non-Liquefiable
14.00	11	Silty Clay	18.00	100	259	141	1.83	0.80	0.15	1.00	11	0.84	9	0.50	1.20	11.6	0.13	0.23	1.48	Non-Liquefiable
16.00	7	Silty Clay	16.00	100	291	153	1.90	0.75	0.15	1.00	7	0.81	6	0.50	1.20	7.3	0.09	0.16	1.08	Non-Liquefiable
18.00	10	Silty Clay	17.50	100	326	169	1.93	0.69	0.14	1.00	10	0.77	8	0.50	1.20	9.7	0.11	0.20	1.41	Non-Liquefiable
20.00	14	Silty Clay	19.50	100	365	188	1.94	0.64	0.13	1.00	14	0.73	10	0.50	1.20	12.7	0.14	0.24	1.90	Non-Liquefiable
22.50	21	Clayey Sand	18.50	24	411	210	1.96	0.57	0.12	1.00	21	0.69	14	4.20	1.11	20.3	0.22	0.39	3.32	Non-Liquefiable
25.00	50	Silty Clay	21.00	85	464	238	1.95	0.51	0.10	1.00	50	0.65	32	0.50	1.20	39.4	0.10	0.18	-	Non-Liquefiable
27.50	84	Silty Sand	21.00	27	516	266	1.94	0.44	0.09	1.00	84	0.61	52	4.44	1.13	62.5	0.42	0.75	8.43	Non-Liquefiable
33.00	>100	Shale	22.00	100	637	333	1.91	0.29	0.06	1.00	100	0.55	55	0.50	1.20	66.3	0.46	0.81	13.82	Non-Liquefiable

GEOMARINE

ANNEXURE-II SIMPLIFIED PROCEDURE FOR EVALUATION OF LIQUEFACTION POTENTIAL AS PER IS 1893 (PART-1)- 2016 BASED ON SPT "N"

Zone Factor / Horizontal ground acceleration (Z or a_{max}/g): 0.16 | Location of Ground Water Table: 3.0 m | C_{HT} 1 | C_{SS} 1

Atmospheric Pressure: 100.00 kPa | Magnitude, Mw = 6 | C_{BD} 1 | C_{HW} 1 | C_{AL} 1

Borehole: BH-02

Depth (m)	"N" SPT Value	Type of Soil	γ (kN/m3)	Fines Content FC	σ_o (kPa)	σ_o' (kPa)	$\sigma_o/\sigma o'$	r_d	CSR $(0.65*(a_{max}/g)*(\sigma o/\sigma o')*r_d)$	C_{60}	$N_{60}=NC_{60}$	C_N	$(N_1)_{60}=C_N.NC_{60}$	α	β	$(N_1)_{60CS}=\alpha+\beta(N_1)_{60}$	$CRR_{7.5}$	CRR	Factor of Safety FOS=1 CRR/CSR	Possibility of Liquefaction
1.00	27	Silty Clay	20.50	54	21	21	1.00	0.99	0.10	1.00	27	1.70	46	0.50	1.20	55.6	0.36	0.64	6.18	Non-Liquefiable
2.00	23	Silty Clay	20.50	100	41	41	1.00	0.98	0.10	1.00	23	1.56	36	0.50	1.20	43.6	0.21	0.38	3.70	Non-Liquefiable
3.00	22	Silty Clay	20.50	100	62	62	1.00	0.98	0.10	1.00	22	1.28	28	0.50	1.20	34.2	-5.85	-10.35	-	Non-Liquefiable
4.00	22	Silty Sand	18.50	40	80	70	1.14	0.97	0.11	1.00	22	1.19	26	0.50	1.20	32.0	0.74	1.30	11.33	Non-Liquefiable
5.00	37	Clayey Sand	19.50	33	100	80	1.25	0.96	0.12	1.00	37	1.12	41	4.89	1.18	53.8	0.34	0.61	4.87	Non-Liquefiable
6.00	34	Silty Sand	19.50	15	119	90	1.33	0.95	0.13	1.00	34	1.06	36	2.60	1.05	40.3	0.14	0.24	1.82	Non-Liquefiable
7.50	23	Silty Sand	18.50	9	147	103	1.43	0.94	0.14	1.00	23	0.99	23	0.60	1.02	23.7	0.27	0.47	3.39	Non-Liquefiable
9.00	18	Silty Sand	18.00	10	174	115	1.51	0.93	0.15	1.00	18	0.93	17	0.81	1.02	18.0	0.19	0.34	2.31	Non-Liquefiable
10.50	27	Silty Sand	19.00	41	202	129	1.57	0.89	0.15	1.00	27	0.88	24	0.50	1.20	29.1	0.41	0.73	5.01	Non-Liquefiable
12.00	15	Silty Clay	20.00	82	232	144	1.61	0.85	0.14	1.00	15	0.83	13	0.50	1.20	15.5	0.17	0.29	2.04	Non-Liquefiable
14.00	14	Silty Clay	19.50	100	271	163	1.66	0.80	0.14	1.00	14	0.78	11	0.50	1.20	13.6	0.15	0.26	1.88	Non-Liquefiable
18.00	8	Silty Clay	16.50	100	337	190	1.77	0.69	0.13	1.00	8	0.73	6	0.50	1.20	7.5	0.09	0.16	1.27	Non-Liquefiable
20.00	20	Silty Clay	20.00	100	377	210	1.79	0.64	0.12	1.00	20	0.69	14	0.50	1.20	17.0	0.18	0.32	2.69	Non-Liquefiable
22.50	36	Clayey Sand	19.50	41	426	235	1.82	0.57	0.11	1.00	36	0.65	23	0.50	1.20	28.7	0.40	0.70	6.49	Non-Liquefiable
25.00	44	Clayey Sand	20.00	41	476	260	1.83	0.51	0.10	1.00	44	0.62	27	0.50	1.20	33.2	1.55	2.74	-	Non-Liquefiable
27.50	>100	Silty Sand	21.00	33	529	288	1.83	0.44	0.08	1.00	100	0.59	59	4.88	1.18	74.3	0.52	0.92	10.99	Non-Liquefiable
30.00	>100	Silty Clay	22.00	100	584	319	1.83	0.37	0.07	1.00	100	0.56	56	0.50	1.20	67.7	0.47	0.83	11.64	Non-Liquefiable
33.00	63	Shale	22.00	100	650	355	1.83	0.29	0.06	1.00	63	0.53	33	0.50	1.20	40.6	0.14	0.26	4.60	Non-Liquefiable

GEOMARINE

ANNEXURE-II SIMPLIFIED PROCEDURE FOR EVALUATION OF LIQUEFACTION POTENTIAL AS PER IS 1893 (PART-1)- 2016 BASED ON SPT "N"

Zone Factor / Horizontal ground acceleration (Z or a_{max}/g): 0.16 | Location of Ground Water Table: 3.0 m | C_{HT} 1 | C_{SS} 1

Atmospheric Pressure: 100.00 kPa | Magnitude, Mw = 6 | C_{BD} 1 | C_{HW} 1 | C_{RL} 1

Borehole: BH-03

Depth (m)	"N" SPT Value	Type of Soil	γ (kN/m3)	Fines Content FC	σ_o (kPa)	σ_o' (kPa)	$\sigma_o/\sigma o'$	r_d	CSR $(0.65*(a_{max}/g)*(\sigma o/\sigma o')*r_d)$	C_{60}	$N_{60}=NC_{60}$	C_N	$(N_1)_{60}=C_N*NC_{60}$	α	β	$(N_1)_{60CS}=\alpha+\beta(N_1)_{60}$	$CRR_{7.5}$	CRR	Factor of Safety FOS=1 CRR/CSR	Possiblity of Liquefaction
1.00	24	Sandy Clay	20.50	63	21	21	1.00	0.99	0.10	1.00	24	1.70	41	0.50	1.20	49.5	0.30	0.53	5.09	Non-Liquefiable
2.00	31	Sandy Clay	21.00	100	42	42	1.00	0.98	0.10	1.00	31	1.55	48	0.50	1.20	58.2	0.39	0.68	6.66	Non-Liquefiable
3.00	33	Silty Clay	21.00	100	63	63	1.00	0.98	0.10	1.00	33	1.26	42	0.50	1.20	50.6	0.31	0.55	5.39	Non-Liquefiable
4.00	22	Sandy Clay	20.50	71	83	73	1.13	0.97	0.11	1.00	22	1.17	26	0.50	1.20	31.4	0.61	1.07	9.39	Non-Liquefiable
5.00	50	Silty Sand	20.50	13	104	84	1.23	0.96	0.12	1.00	50	1.09	55	1.77	1.03	58.3	0.39	0.68	5.53	Non-Liquefiable
6.00	40	Silty Sand	20.00	14	124	94	1.31	0.95	0.13	1.00	40	1.03	41	2.21	1.04	45.2	0.24	0.43	3.27	Non-Liquefiable
7.50	32	Silty Sand	19.50	10	153	109	1.41	0.94	0.14	1.00	32	0.96	31	0.89	1.02	32.3	0.81	1.44	10.42	Non-Liquefiable
9.00	30	Silty Sand	19.00	9	181	122	1.48	0.93	0.14	1.00	30	0.90	27	0.43	1.02	28.0	0.37	0.65	4.54	Non-Liquefiable
10.50	4	Silty Clay	14.50	100	203	129	1.57	0.89	0.15	1.00	4	0.88	4	0.50	1.20	4.7	0.07	0.12	-	Non-Liquefiable
12.00	16	Silty Clay	20.00	100	233	145	1.61	0.85	0.14	1.00	16	0.83	13	0.50	1.20	16.5	0.18	0.31	2.17	Non-Liquefiable
14.00	14	Silty Clay	19.50	100	272	164	1.66	0.80	0.14	1.00	14	0.78	11	0.50	1.20	13.6	0.15	0.26	1.88	Non-Liquefiable
16.00	10	Silty Clay	17.50	100	307	179	1.71	0.75	0.13	1.00	10	0.75	7	0.50	1.20	9.5	0.11	0.19	1.44	Non-Liquefiable
18.00	17	Silty Clay	20.00	100	347	200	1.74	0.69	0.13	1.00	17	0.71	12	0.50	1.20	14.9	0.16	0.28	2.25	Non-Liquefiable
20.00	32	Silty Clay	21.00	100	389	222	1.75	0.64	0.12	1.00	32	0.67	21	0.50	1.20	26.3	0.32	0.56	4.85	Non-Liquefiable
22.50	56	Silty Clay	22.00	76	444	253	1.76	0.57	0.10	1.00	56	0.63	35	0.50	1.20	42.8	0.20	0.35	3.35	Non-Liquefiable
25.00	40	Clayey Sand	20.00	41	494	278	1.78	0.51	0.09	1.00	40	0.60	24	0.50	1.20	29.3	0.42	0.75	8.02	Non-Liquefiable
27.50	>100	Clayey Sand	21.00	32	547	306	1.79	0.44	0.08	1.00	100	0.57	57	4.82	1.17	71.6	0.50	0.88	10.82	Non-Liquefiable
30.00	>100	Silty Clay	22.00	100	602	337	1.79	0.37	0.07	1.00	100	0.55	55	0.50	1.20	65.9	0.45	0.80	11.54	Non-Liquefiable
33.00	>100	Silty Clay	22.00	100	675	381	1.77	0.29	0.05	1.00	100	0.51	51	0.50	1.20	62.0	0.42	0.74	13.72	Non-Liquefiable

GEOMARINE

ANNEXURE-II SIMPLIFIED PROCEDURE FOR EVALUATION OF LIQUEFACTION POTENTIAL AS PER IS 1893 (PART-1)- 2016 BASED ON SPT "N"

Zone Factor / Horizontal ground acceleration (Z or a_{max}/g): 0.16 | Location of Ground Water Table: 3.0 m | C_{HT} 1 | C_{SS} 1

Atmospheric Pressure: 100.00 kPa | Magnitude, Mw = 6 | C_{BD} 1 | C_{HW} 1 | C_{RL} 1

Borehole: BH-04

Depth (m)	"N" SPT Value	Type of Soil	γ (kN/m3)	Fines Content FC	σ_o (kPa)	σ_o' (kPa)	$\sigma_o/\sigma o'$	r_d	CSR $(0.65*(a_{max}/g)*(\sigma o/\sigma o')*r_d)$	C_{60}	$N_{60}=NC_{60}$	C_N	$(N_1)_{60}=C_N*NC_{60}$	α	β	$(N_1)_{60CS}=\alpha+\beta(N_1)_{60}$	$CRR_{7.5}$	CRR	Factor of Safety FOS=1 CRR/CSR	Possiblity of Liquefaction
1.00	19	Silty Clay	20.00	100	20	20	1.00	0.99	0.10	1.00	19	1.70	32	0.50	1.20	39.3	0.10	0.17	1.65	Non-Liquefiable
2.00	14	Silty Clay	19.50	100	40	40	1.00	0.98	0.10	1.00	14	1.59	22	0.50	1.20	27.2	0.34	0.61	5.96	Non-Liquefiable
3.00	17	Silty Clay	20.00	55	60	60	1.00	0.98	0.10	1.00	17	1.30	22	0.50	1.20	26.9	0.34	0.60	5.87	Non-Liquefiable
4.00	10	Silty Sand	15.00	56	75	65	1.15	0.97	0.12	1.00	10	1.24	12	0.50	1.20	15.4	0.16	0.29	2.50	Non-Liquefiable
5.00	34	Silty Sand	19.50	27	94	74	1.26	0.96	0.13	1.00	34	1.16	39	4.46	1.13	49.0	0.29	0.52	4.08	Non-Liquefiable
6.00	38	Silty Sand	19.50	10	114	84	1.35	0.95	0.13	1.00	38	1.09	41	0.92	1.02	43.3	0.21	0.37	2.75	Non-Liquefiable
7.50	30	Silty Sand	19.00	8	142	98	1.45	0.94	0.14	1.00	30	1.01	30	0.29	1.01	31.0	0.56	0.99	6.95	Non-Liquefiable
9.00	9	Silty Clay	17.00	100	168	109	1.54	0.93	0.15	1.00	9	0.96	9	0.50	1.20	10.9	0.12	0.21	1.43	Non-Liquefiable
10.50	9	Silty Clay	17.00	100	193	119	1.62	0.89	0.15	1.00	9	0.92	8	0.50	1.20	10.4	0.12	0.21	1.37	Non-Liquefiable
12.00	11	Silty Clay	18.00	100	220	132	1.67	0.85	0.15	1.00	11	0.87	10	0.50	1.20	12.0	0.13	0.23	1.57	Non-Liquefiable
14.00	10	Silty Clay	17.50	100	255	147	1.73	0.80	0.14	1.00	10	0.82	8	0.50	1.20	10.4	0.12	0.21	1.43	Non-Liquefiable
16.00	9	Silty Clay	17.00	100	289	161	1.79	0.75	0.14	1.00	9	0.79	7	0.50	1.20	9.0	0.10	0.18	1.33	Non-Liquefiable
18.00	13	Silty Clay	19.00	100	327	180	1.82	0.69	0.13	1.00	13	0.75	10	0.50	1.20	12.1	0.13	0.23	1.79	Non-Liquefiable
20.00	34	Silty Clay	21.00	100	369	202	1.82	0.64	0.12	1.00	34	0.70	24	0.50	1.20	29.2	0.42	0.74	6.11	Non-Liquefiable
22.50	55	Silty Clay	22.00	92	424	233	1.82	0.57	0.11	1.00	55	0.66	36	0.50	1.20	43.8	0.22	0.38	3.54	Non-Liquefiable
25.00	70	Silty Clay	22.00	77	479	263	1.82	0.51	0.10	1.00	70	0.62	43	0.50	1.20	52.3	0.33	0.58	6.05	Non-Liquefiable
27.50	>100	Clayey Sand	21.00	63	532	291	1.83	0.44	0.08	1.00	100	0.59	59	0.50	1.20	70.8	0.49	0.87	10.44	Non-Liquefiable
30.00	63	Silty Clay	22.00	100	587	322	1.82	0.37	0.07	1.00	63	0.56	35	0.50	1.20	42.7	0.20	0.35	4.89	Non-Liquefiable
33.00	63	Silty Clay	22.00	100	655	361	1.82	0.29	0.06	1.00	63	0.53	33	0.50	1.20	40.3	0.14	0.24	4.33	Non-Liquefiable

GEOMARINE

ANNEXURE-II SIMPLIFIED PROCEDURE FOR EVALUATION OF LIQUEFACTION POTENTIAL AS PER IS 1893 (PART-1)- 2016 BASED ON SPT "N"

Zone Factor / Horizontal ground acceleration (Z or a_{max}/g): 0.16 | Location of Ground Water Table: 3.0 m | C_{HT} 1 | C_{SS} 1

Atmospheric Pressure: 100.00 kPa | Magnitude, Mw = 6 | C_{BD} 1 | C_{HW} 1 | C_{RL} 1

Borehole: BH-05

Depth (m)	"N" SPT Value	Type of Soil	γ (kN/m3)	Fines Content FC	σ_o (kPa)	σ_o' (kPa)	$\sigma_o/\sigma o'$	r_d	CSR $(0.65*(a_{max}/g)*(\sigma o/\sigma o')*r_d)$	C_{60}	$N_{60}=NC_{60}$	C_N	$(N_1)_{60}=C_N*NC_{60}$	α	β	$(N_2)_{60CS}=\alpha+\beta(N_2)_{60}$	$CRR_{7.5}$	CRR	Factor of Safety FOS=1 CRR/CSR	Possiblity of Liquefaction
1.00	9	Silty Clay	17.00	100	17	17	1.00	0.99	0.10	1.00	9	1.70	15	0.50	1.20	18.9	0.20	0.36	3.46	Non-Liquefiable
2.00	6	Silty Clay	15.50	100	33	33	1.00	0.98	0.10	1.00	6	1.70	10	0.50	1.20	12.7	0.14	0.24	2.39	Non-Liquefiable
3.00	12	Silty Sand	16.00	42	49	49	1.00	0.98	0.10	1.00	12	1.44	17	0.50	1.20	21.2	0.23	0.41	4.02	Non-Liquefiable
4.00	6	Silty Sand	14.50	43	63	53	1.18	0.97	0.12	1.00	6	1.37	8	0.50	1.20	10.4	0.12	0.21	1.73	Non-Liquefiable
5.00	15	Silty Sand	17.50	18	81	61	1.32	0.96	0.13	1.00	15	1.28	19	3.31	1.07	23.9	0.27	0.48	3.63	Non-Liquefiable
6.00	13	Silty Sand	16.50	10	97	68	1.44	0.95	0.14	1.00	13	1.22	16	0.96	1.02	17.1	0.18	0.32	2.26	Non-Liquefiable
7.50	15	Silty Sand	17.50	10	123	79	1.56	0.94	0.15	1.00	15	1.12	17	0.72	1.02	17.9	0.19	0.34	2.21	Non-Liquefiable
9.00	4	Silty Sand	13.50	23	144	85	1.70	0.93	0.16	1.00	4	1.09	4	4.00	1.10	8.8	0.10	0.18	1.10	Non-Liquefiable
10.50	7	Silty Sand	14.50	12	165	92	1.80	0.89	0.17	1.00	7	1.04	7	1.40	1.03	8.9	0.10	0.18	1.10	Non-Liquefiable
12.00	0	Silty Clay	13.00	100	185	96	1.92	0.85	0.17	1.00	0	1.02	0	0.50	1.20	0.5	0.05	0.09	-	Non-Liquefiable
14.00	2	Silty Clay	14.00	100	213	105	2.03	0.80	0.17	1.00	2	0.98	2	0.50	1.20	2.8	0.06	0.10	-	Non-Liquefiable
16.00	2	Silty Clay	14.00	100	241	113	2.13	0.75	0.17	1.00	2	0.94	2	0.50	1.20	2.8	0.06	0.10	-	Non-Liquefiable
18.00	4	Silty Clay	14.50	100	270	123	2.20	0.69	0.16	1.00	4	0.90	4	0.50	1.20	4.8	0.07	0.13	-	Non-Liquefiable
20.00	11	Silty Clay	18.00	100	306	139	2.20	0.64	0.15	1.00	11	0.85	9	0.50	1.20	11.7	0.13	0.23	1.55	Non-Liquefiable
22.50	15	Silty Clay	20.00	100	356	164	2.16	0.57	0.13	1.00	15	0.78	12	0.50	1.20	14.5	0.16	0.28	2.13	Non-Liquefiable
25.00	30	Clayey Sand	19.00	68	403	187	2.15	0.51	0.11	1.00	30	0.73	22	0.50	1.20	26.8	0.33	0.59	5.20	Non-Liquefiable
27.50	63	Silty Clay	22.00	100	458	218	2.10	0.44	0.10	1.00	63	0.68	43	0.50	1.20	51.7	0.32	0.57	5.92	Non-Liquefiable
30.00	52	Silty Clay	22.00	100	513	248	2.07	0.37	0.08	1.00	52	0.63	33	0.50	1.20	40.1	0.13	0.23	2.83	Non-Liquefiable
32.50	52	Silty Clay	22.00	100	568	279	2.04	0.31	0.06	1.00	52	0.60	31	0.50	1.20	37.9	0.02	0.03	-	Non-Liquefiable
35.00	52	Silty Clay	22.00	100	631	317	1.99	0.24	0.05	1.00	52	0.56	29	0.50	1.20	35.6	-0.38	-0.68	-	Non-Liquefiable

GEOMARINE

ANNEXURE-II SIMPLIFIED PROCEDURE FOR EVALUATION OF LIQUEFACTION POTENTIAL AS PER IS 1893 (PART-1)- 2016 BASED ON SPT "N"

Zone Factor / Horizontal ground acceleration (Z or a_{max}/g): 0.16 | Location of Ground Water Table: 3.0 m | C_{HT} 1 | C_{SS} 1

Atmospheric Pressure: 100.00 kPa | Magnitude, Mw = 6 | C_{BD} 1 | C_{HW} 1 | C_{RL} 1

Borehole: BH-08

Depth (m)	"N" SPT Value	Type of Soil	γ (kN/m3)	Fines Content FC	σ_o (kPa)	σ_o' (kPa)	$\sigma_o/\sigma o'$	r_d	CSR $(0.65*(a_{max}/g)*(\sigma o/\sigma o')*r_d)$	C_{60}	$N_{60}=NC_{60}$	C_N	$(N_1)_{60}=C_N*NC_{60}$	α	β	$(N_1)_{60CS}=\alpha+\beta(N_1)_{60}$	$CRR_{7.5}$	CRR	Factor of Safety FOS=1 CRR/CSR	Possibility of Liquefaction
1.00	16	Silty Clay	20.00	100	20	20	1.00	0.99	0.10	1.00	16	1.70	27	0.50	1.20	33.1	1.40	2.48	24.07	Non-Liquefiable
2.00	15	Silty Clay	20.00	100	40	40	1.00	0.98	0.10	1.00	15	1.58	24	0.50	1.20	29.0	0.41	0.72	7.06	Non-Liquefiable
4.00	14	Silty Clay	19.50	45	79	59	1.33	0.97	0.13	1.00	14	1.30	18	0.50	1.20	22.3	0.25	0.44	3.25	Non-Liquefiable
5.00	41	Silty Sand	20.00	15	99	70	1.42	0.96	0.14	1.00	41	1.20	49	2.42	1.05	53.9	0.34	0.61	4.27	Non-Liquefiable
6.00	28	Silty Sand	19.00	13	118	79	1.50	0.95	0.15	1.00	28	1.13	32	2.02	1.04	34.8	-1.00	-1.76	-11.87	Liquefiable
7.50	31	Silty Sand	19.50	9	147	93	1.58	0.94	0.15	1.00	31	1.04	32	0.69	1.02	33.4	1.91	3.37	21.79	Non-Liquefiable
9.00	18	Silty Clay	20.00	100	177	109	1.63	0.93	0.16	1.00	18	0.96	17	0.50	1.20	21.2	0.23	0.41	2.59	Non-Liquefiable
10.50	14	Silty Clay	19.50	100	207	123	1.68	0.89	0.16	1.00	14	0.90	13	0.50	1.20	15.6	0.17	0.29	1.89	Non-Liquefiable
12.00	10	Silty Clay	17.50	100	233	135	1.73	0.85	0.15	1.00	10	0.86	9	0.50	1.20	10.8	0.12	0.21	1.39	Non-Liquefiable
14.00	8	Silty Clay	16.50	100	266	148	1.80	0.80	0.15	1.00	8	0.82	7	0.50	1.20	8.4	0.10	0.18	1.18	Non-Liquefiable
18.00	23	Silty Clay	20.50	100	348	191	1.82	0.69	0.13	1.00	23	0.72	17	0.50	1.20	20.5	0.22	0.39	2.98	Non-Liquefiable
20.00	28	Silty Clay	20.50	100	389	212	1.83	0.64	0.12	1.00	28	0.69	19	0.50	1.20	23.6	0.27	0.47	3.86	Non-Liquefiable
22.50	26	Silty Clay	20.50	100	440	239	1.84	0.57	0.11	1.00	26	0.65	17	0.50	1.20	20.7	0.22	0.40	3.61	Non-Liquefiable
25.00	>100	Sandy Clay	22.00	63	495	269	1.84	0.51	0.10	1.00	100	0.61	61	0.50	1.20	73.6	0.52	0.91	9.42	Non-Liquefiable
27.50	>100	Clayey Sand	21.00	24	548	297	1.84	0.44	0.08	1.00	100	0.58	58	4.18	1.11	68.4	0.47	0.84	9.94	Non-Liquefiable
30.00	>100	Silty Clay	22.00	100	603	328	1.84	0.37	0.07	1.00	100	0.55	55	0.50	1.20	66.8	0.46	0.81	11.40	Non-Liquefiable

GEOMARINE

ANNEXURE-II SIMPLIFIED PROCEDURE FOR EVALUATION OF LIQUEFACTION POTENTIAL AS PER IS 1893 (PART-1)- 2016 BASED ON SPT "N"

Zone Factor / Horizontal ground acceleration (Z or a_{max}/g): 0.16 Location of Ground Water Table: 3.0 m C_{HT} 1 C_{SS} 1

Atmospheric Pressure: 100.00 kPa Magnitude, Mw = 6 C_{BD} 1 C_{HW} 1 C_{RL} 1

Borehole: BH-10

Depth (m)	"N" SPT Value	Type of Soil	γ (kN/m3)	Fines Content FC	σ_o (kPa)	σ_o' (kPa)	$\sigma_o/\sigma o'$	r_d	CSR $(0.65*(a_{max}/g)*(\sigma o/\sigma o')*r_d)$	C_{SD}	$N_{60}=NC_{60}$	C_N	$(N_1)_{60}=C_N*NC_{60}$	α	β	$(N_1)_{60CS}=\alpha+\beta(N_1)_{60}$	$CRR_{7.5}$	CRR	Factor of Safety FOS=1 CRR/CSR	Possibility of Liquefaction
1.00	25	Silty Clay	20.50	92	21	21	1.00	0.99	0.10	1.00	25	1.70	43	0.50	1.20	51.5	0.32	0.57	5.48	Non-Liquefiable
2.00	12	Silty Clay	18.50	100	39	39	1.00	0.98	0.10	1.00	12	1.60	19	0.50	1.20	23.6	0.27	0.47	4.60	Non-Liquefiable
3.00	17	Silty Clay	20.00	100	59	59	1.00	0.98	0.10	1.00	17	1.30	22	0.50	1.20	27.1	0.34	0.60	5.92	Non-Liquefiable
4.00	42	Silty Sand	20.00	16	79	69	1.14	0.97	0.12	1.00	42	1.20	50	2.86	1.06	56.2	0.37	0.65	5.63	Non-Liquefiable
5.00	34	Silty Sand	19.50	12	99	79	1.25	0.96	0.12	1.00	34	1.13	38	1.60	1.03	41.1	0.16	0.28	2.26	Non-Liquefiable
6.00	26	Silty Sand	19.00	11	118	88	1.33	0.95	0.13	1.00	26	1.07	28	1.11	1.03	29.5	0.44	0.77	5.83	Non-Liquefiable
7.50	43	Silty Sand	20.00	14	148	103	1.43	0.94	0.14	1.00	43	0.98	42	2.10	1.04	46.1	0.25	0.45	3.22	Non-Liquefiable
9.00	48	Silty Clay	21.00	100	179	120	1.49	0.93	0.14	1.00	48	0.91	44	0.50	1.20	53.1	0.34	0.59	4.12	Non-Liquefiable
10.50	13	Silty Clay	19.00	100	208	134	1.55	0.89	0.14	1.00	13	0.86	11	0.50	1.20	14.0	0.15	0.27	1.84	Non-Liquefiable
12.00	10	Silty Clay	17.50	86	234	145	1.61	0.85	0.14	1.00	10	0.83	8	0.50	1.20	10.4	0.12	0.21	1.45	Non-Liquefiable
16.00	9	Silty Clay	17.00	100	302	174	1.73	0.75	0.13	1.00	9	0.76	7	0.50	1.20	8.7	0.10	0.18	1.34	Non-Liquefiable
18.00	7	Silty Clay	16.00	100	334	187	1.79	0.69	0.13	1.00	7	0.73	5	0.50	1.20	6.6	0.08	0.15	1.16	Non-Liquefiable
20.00	31	Silty Clay	21.00	100	376	209	1.80	0.64	0.12	1.00	31	0.69	21	0.50	1.20	26.2	0.32	0.56	4.71	Non-Liquefiable
22.50	42	Silty Clay	21.00	100	428	237	1.81	0.57	0.11	1.00	42	0.65	27	0.50	1.20	33.2	1.56	2.76	25.62	Non-Liquefiable
25.00	>100	Silty Sand	21.00	20	481	265	1.81	0.51	0.10	1.00	100	0.61	61	3.54	1.08	69.7	0.48	0.86	8.95	Non-Liquefiable
27.50	>100	Silty Sand	21.00	11	533	293	1.82	0.44	0.08	1.00	100	0.58	58	1.17	1.03	61.1	0.41	0.73	8.73	Non-Liquefiable
30.00	>100	Silty Clay	22.00	100	588	323	1.82	0.37	0.07	1.00	100	0.56	56	0.50	1.20	67.2	0.46	0.82	11.61	Non-Liquefiable

GEOMARINE

ANNEXURE-II SIMPLIFIED PROCEDURE FOR EVALUATION OF LIQUEFACTION POTENTIAL AS PER IS 1893 (PART-1)- 2016 BASED ON SPT "N"

Zone Factor / Horizontal ground acceleration (Z or a_{max}/g): 0.16 | Location of Ground Water Table: 3.0 m | C_{HT} 1 | C_{SS} 1

Atmospheric Pressure: 100.00 kPa | Magnitude, Mw = 6 | C_{BD} 1 | C_{HW} 1 | C_{RL} 1

Borehole: BH-11

Depth (m)	"N" SPT Value	Type of Soil	γ (kN/m3)	Fines Content FC	σ_o (kPa)	σ_o' (kPa)	$\sigma_o/\sigma o'$	r_d	CSR $(0.65*[a_{max}/g]*(\sigma o/\sigma o']*r_d]$	C_{60}	N_{60w} NC_{60}	C_N	$(N_1)_{60w}$ $C_N NC_{60}$	α	β	$(N_1)_{60CS}$= $\alpha+\beta(N_1)_{60}$	$CRR_{7.5}$	CRR	Factor of Safety FOS=1 CRR/CSR	Possiblity of Liquefaction
1.00	27	Silty Sand	19.00	38	19	19	1.00	0.99	0.10	1.00	27	1.70	46	0.50	1.20	55.6	0.36	0.64	6.18	Non-Liquefiable
2.00	30	Silty Sand	19.00	26	38	38	1.00	0.98	0.10	1.00	30	1.62	49	4.42	1.13	59.2	0.39	0.70	6.80	Non-Liquefiable
3.00	41	Silty Sand	20.00	30	58	58	1.00	0.98	0.10	1.00	41	1.31	54	4.72	1.16	66.9	0.46	0.82	8.02	Non-Liquefiable
4.00	37	Silty Sand	19.50	16	78	68	1.14	0.97	0.12	1.00	37	1.22	45	2.80	1.05	50.2	0.31	0.54	4.69	Non-Liquefiable
5.00	77	Silty Sand	21.00	9	99	79	1.25	0.96	0.12	1.00	77	1.13	87	0.56	1.02	88.7	0.63	1.12	8.98	Non-Liquefiable
6.00	40	Silty Sand	20.00	8	119	89	1.33	0.95	0.13	1.00	40	1.06	42	0.29	1.01	43.2	0.21	0.37	2.77	Non-Liquefiable
7.50	29	Silty Sand	19.00	10	147	103	1.43	0.94	0.14	1.00	29	0.99	29	0.80	1.02	30.0	0.47	0.83	5.90	Non-Liquefiable
9.00	26	Silty Clay	20.50	90	178	119	1.50	0.93	0.14	1.00	26	0.92	24	0.50	1.20	29.1	0.42	0.74	5.08	Non-Liquefiable
10.50	6	Silty Clay	15.50	100	201	127	1.58	0.89	0.15	1.00	6	0.89	5	0.50	1.20	6.9	0.09	0.15	1.05	Non-Liquefiable
12.00	10	Silty Clay	17.50	100	227	139	1.64	0.85	0.15	1.00	10	0.85	8	0.50	1.20	10.7	0.12	0.21	1.45	Non-Liquefiable
14.00	10	Silty Clay	17.50	100	262	154	1.70	0.80	0.14	1.00	10	0.80	8	0.50	1.20	10.2	0.11	0.20	1.43	Non-Liquefiable
16.00	11	Silty Clay	18.00	100	298	171	1.75	0.75	0.14	1.00	11	0.77	8	0.50	1.20	10.6	0.12	0.21	1.55	Non-Liquefiable
18.00	13	Silty Clay	19.00	100	336	189	1.78	0.69	0.13	1.00	13	0.73	9	0.50	1.20	11.8	0.13	0.23	1.79	Non-Liquefiable
20.00	20	Silty Clay	20.00	100	376	209	1.80	0.64	0.12	1.00	20	0.69	14	0.50	1.20	17.1	0.18	0.32	2.69	Non-Liquefiable
22.50	41	Silty Clay	21.00	100	429	237	1.81	0.57	0.11	1.00	41	0.65	27	0.50	1.20	32.4	0.87	1.54	14.33	Non-Liquefiable
25.00	48	Silty Clay	21.00	100	481	265	1.81	0.51	0.10	1.00	48	0.61	29	0.50	1.20	35.9	-0.28	-0.49	-	Non-Liquefiable
27.50	>100	Silty Sand	21.00	17	534	293	1.82	0.44	0.08	1.00	100	0.58	58	3.06	1.06	65.0	0.44	0.79	9.45	Non-Liquefiable
30.00	>100	Fissile Clay	21.00	100	586	321	1.82	0.37	0.07	1.00	100	0.56	56	0.50	1.20	67.4	0.46	0.82	11.62	Non-Liquefiable
33.00	>100	Fissile Clay	21.00	100	649	355	1.83	0.29	0.06	1.00	100	0.53	53	0.50	1.20	64.2	0.44	0.77	13.90	Non-Liquefiable

GEOMARINE

ANNEXURE-II SIMPLIFIED PROCEDURE FOR EVALUATION OF LIQUEFACTION POTENTIAL AS PER IS 1893 (PART-1)- 2016 BASED ON SPT "N"

Zone Factor / Horizontal ground acceleration (Z or a_{max}/g): 0.16 | Location of Ground Water Table: 3.0 m | C_{NT} 1 | C_{SS} 1

Atmospheric Pressure: 100.00 kPa | Magnitude, Mw = 6 | C_{60} 1 | C_{HW} 1 | C_{RL} 1

Borehole: BH-12

Depth (m)	"N" SPT Value	Type of Soil	γ (kN/m3)	Fines Content FC	σ_o (kPa)	σ_o' (kPa)	$\sigma_o/\sigma o'$	r_d	CSR $(0.65*(a_{max}/g)*(\sigma o/\sigma o')*r_d)$	C_{60}	$N_{60}=NC_{60}$	C_N	$(N_1)_{60}=C_N*NC_{60}$	α	β	$(N_1)_{60CS}=\alpha+\beta(N_1)_{60}$	$CRR_{7.5}$	CRR	Factor of Safety FOS=1 CRR/CSR	Possiblity of Liquefaction
1.00	27	Silty Clay	20.50	79	21	21	1.00	0.99	0.10	1.00	27	1.70	46	0.50	1.20	55.6	0.36	0.64	6.18	Non-Liquefiable
3.00	15	Silty Clay	20.00	69	61	61	1.00	0.98	0.10	1.00	15	1.29	19	0.50	1.20	23.6	0.27	0.47	4.66	Non-Liquefiable
4.00	8	Silty Clay	16.50	90	77	67	1.15	0.97	0.12	1.00	8	1.22	10	0.50	1.20	12.2	0.13	0.24	2.04	Non-Liquefiable
5.00	44	Silty Sand	20.00	12	97	77	1.25	0.96	0.13	1.00	44	1.14	50	1.70	1.03	53.4	0.34	0.60	4.79	Non-Liquefiable
6.00	41	Silty Sand	20.00	16	117	88	1.34	0.95	0.13	1.00	41	1.07	44	2.83	1.06	49.1	0.29	0.52	3.90	Non-Liquefiable
7.50	30	Silty Sand	19.00	17	146	101	1.44	0.94	0.14	1.00	30	0.99	30	3.01	1.06	34.6	-1.41	-2.50	-	Non-Liquefiable
9.00	14	Silty Clay	19.50	100	175	116	1.51	0.93	0.15	1.00	14	0.93	13	0.50	1.20	16.1	0.17	0.30	2.08	Non-Liquefiable
10.50	15	Silty Sand	17.50	47	201	127	1.58	0.89	0.15	1.00	15	0.89	13	0.50	1.20	16.4	0.17	0.31	2.11	Non-Liquefiable
14.00	11	Silty Clay	18.00	100	264	156	1.69	0.80	0.14	1.00	11	0.80	9	0.50	1.20	11.1	0.12	0.22	1.54	Non-Liquefiable
16.00	10	Silty Clay	17.50	100	299	171	1.74	0.75	0.14	1.00	10	0.76	8	0.50	1.20	9.7	0.11	0.19	1.44	Non-Liquefiable
18.00	11	Silty Clay	18.00	100	335	188	1.78	0.69	0.13	1.00	11	0.73	8	0.50	1.20	10.1	0.11	0.20	1.57	Non-Liquefiable
20.00	22	Silty Clay	20.50	78	376	209	1.80	0.64	0.12	1.00	22	0.69	15	0.50	1.20	18.8	0.20	0.35	2.97	Non-Liquefiable
22.50	36	Silty Clay	21.00	63	429	237	1.81	0.57	0.11	1.00	36	0.65	23	0.50	1.20	28.5	0.39	0.69	6.42	Non-Liquefiable
25.00	45	Clayey Sand	20.00	39	479	263	1.82	0.51	0.10	1.00	45	0.62	28	0.50	1.20	33.8	5.74	10.16	105.93	Non-Liquefiable
27.50	109	Silt Clay	21.00	100	531	291	1.83	0.44	0.08	1.00	100	0.59	59	0.50	1.20	70.9	0.49	0.87	10.44	Non-Liquefiable
30.00	>100	Fissile Clay	21.00	100	584	319	1.83	0.37	0.07	1.00	100	0.56	56	0.50	1.20	67.7	0.47	0.83	11.64	Non-Liquefiable
33.00	>100	Fissile Clay	21.00	100	647	352	1.84	0.29	0.06	1.00	100	0.53	53	0.50	1.20	64.4	0.44	0.78	13.91	Non-Liquefiable

ANNEXURE-III

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No. 01
PAGE No. 1

PROJECT NAME: RAMANIYAM
DIA OF BORE HOLE: 150mm / 100mm
LOCATION: Nerulcundram | MACHINE No.: HRO1 | CHAINAGE (m):
STRUCTURE: | DRILLING METHOD: Rotary | CO-ORDINATES: N, E
JOB CODE: | FLUSHING MEDIUM: Bentonite
BORE START DATE: 24/05/2022
BORE END DATE: 25/05/2022
TOTAL DRILLING DAYS:

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC/TCB/DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	Layer Data: Depth (m)	Geotechnical Description
1		11	00												M.DENIC, BROWNISH, FM-GRA / SANDYSILT WITH BRICKS.
		11	08	AM			2	8	8	16	1				
		11	20												
2		11	25				3	4	5	9	2		SSC		STIFF, MOIST, BROWNISH, COMPA SILTY CLAY
		11	40												
		11	46							27	3				UNDISTURBE SAMPLES.
	PM	12	05	SSC											
		12	09				8	13	15	28	4				M.DENSE, FM GRAIN, COMPACT SANDYSILT
		12	25												
5		12	26				15	20	15	35	5				DENSE, BROWNISH, FM-MEDIUM WAVIER GRAIN SAND,
		12	50												
		12	54				18	25	20	45	6				SAND
		2	00												
7		2	06	RC			12	20	25	45	7.5		Split spoon samples		DENSE, GREY, FM GRAIN. SILT SAND.
		2	25												
8		2	29												
9							12	8	9	17	9				M.DENSE, BROWNISH, MEDIUM COARSE GRAIN SAND.
		2	55												
10		2	59												
							19	13	8	21	10.50				M.DENSE, GREY FM GRAIN. SILTY SAND.

CS - Core Sample
SS - Split Spoon Sample
UDS - Undisturbed Sample
WS - Wash Sample

DS - Disturbed Sample
SC - Soil Cutter
TCB - Tungsten Carbide Bit
DB - Diamond Bit

SUPERVISOR NAME: R. Sivakumar
SIGNATURE:
DATE: 24/05/2022
CLIENT IN-CHARGE:

PROJECT SITE DETAILS
GROUND LEVEL (m):
WATER TABLE (m):
CASING DEPTH (m):

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No. 1
PAGE No. 2
DIA OF BORE HOLE 150mm / 100mm
BORE START DATE 24/05/2022
BORE END DATE 25/05/2022
TOTAL DRILLING DAYS

PROJECT NAME	RAMANIYAM				
LOCATION	Nerkundram	MACHINE No.	HR01	CHAINAGE (m)	
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N
JOB CODE		FLUSHING MEDIUM	Bentonite		E

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
1		3	20												
		3	23												Stiff, moist, Blackish Compact · CLAY
2							3	4	5	9	12				
3		3	47	CS											
		3	52												
4							2	5	6	11	14				Stiff, moist, Blackish, Compact · CLAY
5		4	29										Disturbed samples		
		4	33												
6							1	3	4	7	16				M. Stiff, moist, Blackish, com CLAY
7		5	05	CS											
		5	09												
8							3	6	4	10	18				Stiff, moist, Blackish, Compact · CLAY
9		5	37												
		5	42												
0							4	6	8	14	20				Stiff, moist, Blackish Compact · CLAY with Muscovite

CS - Core Sample
SS - Split Spoon Sample
UDS - Undisturbed Sample
WS - Wash Sample

DS - Disturbed Sample
SC - Soil Cutter
TCB - Tungsten Carbide Bit
DB - Diamond Bit

SUPERVISOR NAME K. Jaya Sankaran
SIGNATURE
DATE 24/05/2022
CLIENT IN-CHARGE

PROJECT SITE DETAILS
GROUND LEVEL (m)
WATER TABLE (m)
CASING DEPTH (m)

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No. 02
PAGE No. 1

PROJECT NAME: RAMANIYAM.

LOCATION: Nerukundram | MACHINE No.: HR-01 | CHAINAGE (m):
STRUCTURE: | DRILLING METHOD: Rotary | CO-ORDINATES: N
JOB CODE: | FLUSHING MEDIUM: Bentonite | E

DIA OF BORE HOLE: 150mm / 100mm
BORE START DATE: 20/05/2022
BORE END DATE: 23/05/2022
TOTAL DRILLING DAYS: 3

Depth below E.G.L (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	Layer Data: Depth (m)	Geotechnical Description
0	20/05/2022	2	00 PM	SC			7	12	15	27	1		Split spoon samples	1	Dense, V. Fine grain Brownish, SANDY SILT
		2	12												
1		2	37				8	11	12	23	2			2	V. Stiff, Brownish, compact CLAY
		2	41												
2		3	00				6	11	11	22	3			3	V. Stiff, Brownish, compact CLAY
		3	09												
3		3	30				9	12	10	22	4			4	M. Dense, fine grain. SILTY SAND.
		3	38												
4		3	55				4	10	27	37	5			5	Grey-Brownish, CLAY with SILTY SAND.
		3	59												
5		4	17				6	9	25	34	6			6	M. Dense, Brownish, Fine grain SILTY SAND
		4	22												
6		4	50	SC										7	
		4	56				8	11	12	23	7.50				M. Dense, Greyish, Fine-Medium Coarse grains SILTY SAND.
7		5	20												
		5	24	PM											
8	21/05/2022	11	05	PM			6	9	10	19	9			9	M Dense, Greyish, medium Coarse grains SILTY SAND
		11	10												
9							3	11	16	27					M. Dense, V. fine grain. Greyish-Grey (Mix). SILTY SAND
10															

CS - Core Sample
SS - Split Spoon Sample
UDS-Undisturbed Sample
WS - Wash Sample

DS - Disturbed Sample
SC - Soil Cutter
TCB - Tungsten Carbide Bit
DB - Diamond Bit

SUPERVISOR NAME: K. Sivasankaran
SIGNATURE:
DATE: 21/05/2022
CLIENT IN-CHARGE:

PROJECT SITE DETAILS
GROUND LEVEL (m):
WATER TABLE (m):
CASING DEPTH (m):

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	02
PAGE No.	2
DIA OF BORE HOLE	150mm / 100mm
BORE START DATE	20/05/2022
BORE END DATE	22/05/2022
TOTAL DRILLING DAYS	3

PROJECT NAME	RAMANIYAM				
LOCATION	Nonalcundram	MACHINE No.		CHAINAGE (m)	
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N
JOB CODE		FLUSHING MEDIUM	Bentonite		E

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
1		11	29												
		11	34												
2							3	6	9	25	12				V. stiff, moist, Blackish. compact. CLAY
3		11	56	SC									SPT		
		11	59												stiff, moist, Blackish, compact CLAY
4							4	7	7	14	14				
5		12	25	pm											
		12	29												
6							UDS				16		UDS failed		Sample tube Slipped.
7		12	54	SC											
		1	00												
8							3	3	5	8	18				stiff, moist, Blackish, compact CLAY
9		2	00										SPT		
		2	10	pm											
10							4	8	12	20	20				V. Stiff, moist, Blackish compact. CLAY - SHALE

C - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	K Srinivasan	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	K. Srinivasan	GROUND LEVEL (m)	
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	21/05/2022	WATER TABLE (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	02
PAGE No.	3
DIA OF BORE HOLE	150mm / 100mm
BORE START DATE	20/05/2022
BORE END DATE	23/05/2022
TOTAL DRILLING DAYS	3

PROJECT NAME: RAMANIYAM

LOCATION: Nanthiyandram | MACHINE No.: | CHAINAGE (m):

STRUCTURE: | DRILLING METHOD: Rotary | CO-ORDINATES: N

JOB CODE: | FLUSHING MEDIUM: Bentonite | E

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Layer Data: Geotechnical Description
1	23/05/2022	10	40												
2		10	49	SC			11	17	19	36	22.5				V. stiff - HARD, moist, Greyish Greenish (mix) Compact SANDY SILTY CLAY
3		11	27												
4		11	35												
5							13	19	25	44	25		Split spoon samples		V. stiff - HARD, Greyish, Compact SANDY SILTY CLAY
6		12	35												
7		12	49	SC											
8		2	06				27	60/10cm	(100)		27.5				V. Dense, Brownish - Yellowish (mix) medium coarse grained SAND with Pebbles. Gravel
9		2	28												
0							47	55/5cm	(100)		30				V. HARD, Greyish, Compact V. thinly bedded SHALE

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	K. SIVA SANKARAN	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	23/05/2022	WATER TABLE (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	02.
PAGE No.	4
DIA OF BORE HOLE	150mm / 100mm
BORE START DATE	20/05/2022
BORE END DATE	23/05/2022
TOTAL DRILLING DAYS	3

PROJECT NAME	RAMANIYAM						
LOCATION	Nemilicundram	MACHINE No.			CHAINAGE (m)		
STRUCTURE		DRILLING METHOD	Rotary		CO-ORDINATES	N	
JOB CODE		FLUSHING MEDIUM	Bentonite			E	

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
1		3	35	SC											
		3	55												
2		4	12												
		4	28												
3							27	55/7cm	(>100)		33.00		85		V. HARD, Greyish, Compact, V. thinly bedded SHALE
4															
5															
6															
7															
8															
9															
0															Bore hole terminated at 33.00 mts

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	K. Thangarasu
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	K.
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	23/05/22
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE	

PROJECT SITE DETAILS	
GROUND LEVEL (m)	
WATER TABLE (m)	
CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	03		
PAGE No.	01		
DIA OF BORE HOLE	150mm	↓	
	100mm		
BORE START DATE	18/05/2022		
BORE END DATE	19/05/2022		
TOTAL DRILLING DAYS			

PROJECT NAME	Ramaniyam site at Nerkundram					
LOCATION		MACHINE No.	HR-01	CHAINAGE (m)		
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N	
JOB CODE		FLUSHING MEDIUM	Bentonite		E	

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Layer Data: Geotechnical Description
0	18/05/2022	11.00 TO 11.02					7	11	13	24	1.00	1	SS	1.00	TOPSOIL Brownish silty sandyclay
1		11.10 TO 10.12					8	13	18	31	2.00	2	SS	2.00	Brownish Medium Dense Silty Sandy Silty clay
2		11.21 TO 11.30					9	15	18	33	3.00	3	SS	3.00	Brownish Sandy Hard clay
3		11.42 TO 11.50					2	11	11	22	4.00	4	SS	4.00	Brownish Hard clay
4		12.01 TO 12.06					16	27	23	50	5.00	5	SS	5.00	Brownish stiff clay with sand patches
5		12.18 TO 12.20					22	20	20	40	6.00	6	SS	6.00	Brownish Dense to very Dense Fine & Medium Sand
6		12.31 TO 12.34					10	16	16	32	7.50	7	SS	7.50	Brownish Dense to very Dense Fine & Medium Coarse Sand
7															— DO —
8		12.48 TO 12.50					19	18	12	30	9.00	8	SS	9.00	Brownish Dense Fine to Medium Coarse Sand.
9		2.05 TO 2.08					3	2	2	4	10.50	9	SS	10.50	Blackish soft clay with sand patches

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	D. VENUGOPAL	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	D. Venu	GROUND LEVEL (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	19/05/22	WATER TABLE (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	03
PAGE No.	02
DIA OF BORE HOLE	150mm ✓ / 100mm
BORE START DATE	18/05/2022
BORE END DATE	19/05/2022
TOTAL DRILLING DAYS	

PROJECT NAME: Ramanigam site at Nerkundram

LOCATION | MACHINE No. | CHAINAGE (m)

STRUCTURE | DRILLING METHOD: Rotary | CO-ORDINATES N / E

JOB CODE | FLUSHING MEDIUM: Bentonite

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	Layer Data: Depth (m)	Geotechnical Description
1	18/05/2022	2	20												
			10												
		2	24												
2							3	6	10	16	12.00	10	SS	12.00	Blackish Very stiff clay
		2	36												
			10												
3		2	40												
4							2	6	8	14	14.00	11	SS	14.00	Blackish stiff clay
		2	54												
			10												
5		3	00												
6							2	5	5	10	16.00	12	SS	16.00	Blackish Sandy stiff clay,
		3	15												
			10												
7		3	20												
8							5	8	9	17	18.00	13	SS	18.00	Blackish Very stiff clay with shells.
		3	38												
			10												
9		3	46												
0							9	13	19	32	20.00	14	SS	20.00	Dark Greenish Dense Sandy clay

				PROJECT SITE DETAILS	
CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	D. VENUGOPAL	GROUND LEVEL (m)	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		WATER TABLE (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	19/05/22	CASING DEPTH (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE			

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	03
PAGE No.	03
DIA OF BORE HOLE	150mm ✓ / 100mm
BORE START DATE	18/05/2022
BORE END DATE	19/05/2022
TOTAL DRILLING DAYS	

PROJECT NAME	Ramaniyam site at Nerkundram						
LOCATION		MACHINE No.		CHAINAGE (m)			
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N		
JOB CODE		FLUSHING MEDIUM	Bentonite		E		

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Layer Data: Geotechnical Description
0	18/05/2022	4.05													
		4.19													
1		4.24													
		4.30													
2							15	27	29	56	22.50	15	SS	22.50	Light Greenish Dense to Very Dense Sandy clay.
		9.50													
3		10.00													
		10.10													
4		10.15													
		10.50													
5		11.00					19	20	20	40	25.00	16	SS	25.00	Greenish yellowish Dense to very Dense Clayey Sand
		11.05													
6		11.15													
7	19/05/2022.						45	100/50 blws		N>100	27.50	17	SS	27.50	— DO —
		12.00													
8		12.15													
		12.25													
9		1.00													
							40	10cm / 50 blws		N>100	30.00			30.00	Brownish Very Hard Compacted clay (Shale)

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	D. VENUGOPAL	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	19/05/2022	WATER TABLE (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	03
PAGE No.	04
DIA OF BORE HOLE	150mm ✓ / 100mm
BORE START DATE	18/05/2022
BORE END DATE	19/05/2022
TOTAL DRILLING DAYS	

PROJECT NAME	Ramaniyam Site at Nerkundram					
LOCATION		MACHINE No.		CHAINAGE (m)		
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N	
JOB CODE		FLUSHING MEDIUM	Bentonite		E	

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
1	19/05/2022	2	05												
		2	20												
		2	50												
2															
3							45	8cm	50blw	N>100	33.00	19	SS	33.00	Brownish Very Hard Compacted clay
4															Borehole terminated at 33.00 depth in below GL.
5															
6															
7															
8															
9															
0															

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	D. VENUGOPAL	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	19/05/22	WATER TABLE (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	04		
PAGE No.	01		
PROJECT NAME	Ramaniyam site at Nerkundram	DIA OF BORE HOLE	150mm / 100mm: L
LOCATION		MACHINE No.	HR-01
STRUCTURE		DRILLING METHOD	Rotary
JOB CODE		FLUSHING MEDIUM	Bentonite
CHAINAGE (m)		CO-ORDINATES	N / E
BORE START DATE	12/05/2022		
BORE END DATE	14/05/2022		
TOTAL DRILLING DAYS			

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Layer Data: Geotechnical Description
0	12/05/2022	10	50 TO 10 54												Top Soil. Brownish Sandy clay
1		11	08 TO 11 12				4	8	11	19	1.00	1	SS	1.00	Brownish M. Dense silty Sandy clay
2		11	25 TO 11 28				4	6	8	14	2.00	2	SS	2.00	Brownish stiff clay with sand patches
3		11	57 TO 11 53				8	8	9	17	3.00	3	SS	3.00	Brownish M. Dense clayey silty Fine Sand
4		12	15 TO 12 17				4	5	5	10	4.00	4	SS	4.00	Brownish Loose Silty Fine Sand
5		4	00 TO 4 02				8	16	18	34	5.00	5	SS	5.00	Brownish Dense Silty Fine Sand with clay binder
6		4	15 TO 4 17				16	18	20	38	6.00	6	SS	6.00	Light Greenish to Brownish Dense Fine to M. ~~Dense~~ Sand
7		4	32 TO 4 34				12	14	16	30	7.50	7	SS	7.50	— DO —
8		4	51 TO 4 55				3	4	5	9	9.00	8	SS	9.00	Blackish stiff clay
9							3	4	5	9	10.50	9	SS	10.50	— DO —
10															

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	D. VENUGOPAL	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	D. Venu	GROUND LEVEL (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	14/05/2022	WATER TABLE (m)	4.00 m
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

m

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No. 04
PAGE No. 02
DIA OF BORE HOLE 150mm L / 100mm
BORE START DATE 12/05/2022
BORE END DATE 14/05/2022
TOTAL DRILLING DAYS

PROJECT NAME: Ramaniyam site at Nerkundram
LOCATION
STRUCTURE
JOB CODE
MACHINE No.
DRILLING METHOD: Rotary
FLUSHING MEDIUM: Bentonite
CHAINAGE (m)
CO-ORDINATES: N, E

Depth below E.G.L (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	Layer Data: Depth (m)	Geotechnical Description
1	12/05/22	5	10												
			10												
		5	14												
2							3	5	6	11	-12.00	10	SS	-12.00	Blackish Shift clay with sand patches
		9	55												
			10												
3		9	00												
4							2	5	5	10	-14.00	11	SS	-14.00	Blackish shift clay
		9	25												
			10												
5		9	30												
6							2	4	5	9	-16.00	12	SS	-16.00	Blackish sandy shift clay
			10												
	13/05/2022		00												
7			10												
		10	06												
8							2	5	8	13	-18.00	13	SS	-18.00	Blackish shift clay with shell.
		10	45												
			10												
9		10	51												
0							9	13	21	34	-20.00	14	SS	-20.00	Light Greenish Hard Compacted clay.

CS - Core Sample
SS - Split Spoon Sample
UDS-Undisturbed Sample
WS - Wash Sample

DS - Disturbed Sample
SC - Soil Cutter
TCB - Tungsten Carbide Bit
DB - Diamond Bit

SUPERVISOR NAME: D. VENUGOPAL.
SIGNATURE: D. Venu
DATE: 14/05/22
CLIENT IN-CHARGE

PROJECT SITE DETAILS
GROUND LEVEL (m)
WATER TABLE (m): 4.00m
CASING DEPTH (m)

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	04
PAGE No.	03
DIA OF BORE HOLE	150mm ✓ / 100mm
BORE START DATE	12/05/2022
BORE END DATE	14/05/2022
TOTAL DRILLING DAYS	

PROJECT NAME: Ramaniyam site at Nerkundram

LOCATION:

STRUCTURE:

JOB CODE:

MACHINE No.:

DRILLING METHOD: Rotary

FLUSHING MEDIUM: Bentonite

CHAINAGE (m):

CO-ORDINATES: N / E

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	Layer Data: Depth (m)	Geotechnical Description
1	13/05/2022	11	35 TO 50												
2		12	50 TO 1.00				18	20	35	55	22.50	15	SS	22.50	Greyish Hard compacted clay with gravel pieces
3		2	30 TO 2.35												
4															
5		3	15 TO 3.35				26	35	35	70	25.00	16	SS	25.00	Greyish & Yellowish. Dense & V. Dense clayey Sand.
6															
7							33	41	7cm/50blw	N>100	27.50	17	SS	27.50	Greyish Dense & very Dense clayey Sand.
8	14/05/2022	8	55 TO 9.55												
9															
0							50	12cm/5blw		N>100	30.00	18	SS	30.00	Brownish to yellowish V. Hard compacted clay

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	D. VENUGOPAL	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	D. Venu.	GROUND LEVEL (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	14/05/2022	WATER TABLE (m)	4.00m
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH		
PAGE No.	04		
DIA OF BORE HOLE	150mm	1	
	100mm		
BORE START DATE	12/05/2022		
BORE END DATE	14/05/2022		
TOTAL DRILLING DAYS			

PROJECT NAME	Ramaniyam Site at Nerkundram						
LOCATION		MACHINE No.		CHAINAGE (m)			
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N		
JOB CODE		FLUSHING MEDIUM	Bentonite		E		

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Layer Data: Geotechnical Description
1	14/05/2022	10	48												
		70													
2		12	20												
3							60	70cm / 50blw		N>100	33.00	19	SS	33.00	Greyish to yellowish v. Hard Compacted clay (shale).
4							Borehole terminated at 33.00m depth in below GL.								
5															
6															
7															
8															
9															
0															

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	D. VENUGOPAL	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	14/05/2022	WATER TABLE (m)	4.00m
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	05
PAGE No.	1
DIA OF BORE HOLE	150mm ✓ / 100mm

PROJECT NAME	Ramaniyam - Porkundram					BORE START DATE	02/05/22
LOCATION		MACHINE No.		CHAINAGE (m)		BORE END DATE	05/05/22
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N	TOTAL DRILLING DAYS	4.
JOB CODE		FLUSHING MEDIUM	Bentonite		E		

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Layer Data: Geotechnical Description
1	02/05/2022.	14	11	SC											
		14	18		-	-	3	4	5	9	1.00	1	SS		Brown, stiff sandy silty clay
		14	42												
2		14	49	SC	-	-	2	3	3	6	2.00	2	SS		Brown, m. stiff silty clay.
3		15	17	SC	-	-	2	6	6	12	3.00	3	SS		Brown grey, m. dense silty sand.
		15	23												
4		15	44	SC	-	-	2	1	5	6	4.00	4	SS		Brown clayey silty sand.
		15	50												
5		16	12	SC	-	-	5	7	8	15	5.00	5	SS		Brown, m. dense sand.
		16	17												
6		16	37	SC	-	-	5	6	7	13	6.00	6	SS		-DO-
		16	41												
7															
8		17	18	SC	-	-	5	7	8	15	7.50	7	SS		Gray, m. dense sand.
		17	23												
9	03/05/2022.	09	05	SC	-	-	2	2	2	4	9.00	8	SS		Gray, v. loose sand.
		09	11												
0		09	34	SC	-	-									
		09	40												

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	Karthik Prabu.	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	P Karthik.	GROUND LEVEL (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	2/5/22	WATER TABLE (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	05
PAGE No.	2
DIA OF BORE HOLE	150mm ✓ / 100mm
BORE START DATE	02/05/22
BORE END DATE	05/05/22
TOTAL DRILLING DAYS	4.

PROJECT NAME	Ramaniyam - Nerkundram.				
LOCATION		MACHINE No.		CHAINAGE (m)	
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N
JOB CODE		FLUSHING MEDIUM	Bentonite		E

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Layer Data: Geotechnical Description
1	03/05/2022.	10	37	SC	-	-	5	4	3	7	10.5	9	SS		grey Loose sand.
2		10	25				1	0	0	0	12	10	SS		Black, clay with fine sand mix.
3		11	12	SC	-	-									
4		11	18				1	1	1	2	14	11	SS		Black, v.soft clay
5		12	06	SC	-	-									
6		12	13				1	1	1	2	16	12	SS		- DO -
7		12	40	SC	-	-									
8		12	52				2	2	2	4	18	13	SS		Black soft clay.
9		14	20	SC	-	-									
0		14	31				2	5	6	11	20	14	SS		Grey green, lateral stiff silty clay.

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	Karthik Prabu.	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	P. Karthik.	GROUND LEVEL (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	03/05/2022	WATER TABLE (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	05
PAGE No.	3
DIA OF BORE HOLE	150mm ✓ / 100mm
BORE START DATE	02/05/22
BORE END DATE	05/05/22
TOTAL DRILLING DAYS	4

PROJECT NAME	Ramaniyam - Perumbakkam				
LOCATION		MACHINE No.		CHAINAGE (m)	
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N
JOB CODE		FLUSHING MEDIUM	Bentonite		E

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill BR (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
1	03/05/2022	15	48	SC	-	-									
		15	51												
2															
3							4	6	9	15	22.5	15	SS		grey brown, stiff sandy silty clay.
		16	36	SC	-	-									
4		16	48												
5							8	14	16	30	25	16	SS		Brown grey dense cemented sand.
6															
		09	23	SC	-	-									
7		10	04												
	04/05/2022						25	30	33	63	27.5	17	SS		Hard, [redacted] Brown shale.
8															
9		11	09	SC	-	-									
		11	53												
0							16	22	30	52	30	18	SS		Brown [redacted] shale (Hard)

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	Kaushik Prabu.	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	P Kaushik.	GROUND LEVEL (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	04/05/2022	WATER TABLE (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	05
PAGE No.	4
DIA OF BORE HOLE	150mm ✓ / 100mm
BORE START DATE	02/05/22
BORE END DATE	05/05/22
TOTAL DRILLING DAYS	4

PROJECT NAME	Ramanïyam - Nerkundram						
LOCATION		MACHINE No.		CHAINAGE (m)			
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N		
JOB CODE		FLUSHING MEDIUM	Bentonite		E		

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
1	04/05/2022	02	27	SC	-	-									
2		03	34												
3							16	22	30	52	32.5	19	SS		Hard, Brown slate.
4	05/05/2022	9	11	SC	-	-									
5		11	37				20	25	27	52	35	20	SS.		Hard, Brown slate.
6															
7															Bore hole Terminated at 35.00m below E.G.L.
8															
9															
0															

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	Koushik Prabu.	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	P. Koushik.	GROUND LEVEL (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	05/05/2022	WATER TABLE (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE

SITE INVESTIGATION RECORD

PROJECT NAME: RAMNYAM

BOREHOLE NO.: 06

PAGE No.: 1

LOCATION: NAGERCOIL

CO-ORDINATES: 11°-01

DIA OF BOREHOLE: 150mm

CONTRACTOR:

DRILLING METHOD:

RUN:

CO-ORDINATES: N 12

BORE START DATE: 13-6-97

BORE END DATE:

TOTAL DRILLING DEPTH:

Core Recovery	Core Recovery (%)	Rock Quality Designation (RQD)	Rock Description	Fracture Index	Spacing (cm)	Core Diameter	Strength Value	Depth (m)	Sample No.	Sample Type	Graphic Log	Geotechnical Description
1	28	12	15	3<	3<	4	6	16	16	1	SS	Brown, Stiff clayey Silt
2	28	12	16									
3	30	10	33	3<	9<	5	6	9	15	2	SS	Brownish grey Stiff clay
4	30	12	34									
5		12	30	5<						3	DOS	Undisturbed Sample
6		12	30									
7			2	3	6<	4<	7	4	10	14	4	SS
8			3	15								
9			2	4	12	4<	7	23	41	6	5	SS
10			3	5								
11			3	6	8	5<	7	6	12	24	6	SS
12			3	6								
13			3	8	12	5<	7	15	19	28	7	SS
14			3	8								
15			3	8	12	5<	7	16	20	28	8	SS
16			3	8								
17			3	8	12	5<	7	16	20	28	9	SS
18			3	8								
19			3	8	12	5<	7	16	20	28	10	SS
20			3	8								
21			3	8	12	5<	7	16	20	28	11	SS
22			3	8								
23			3	8	12	5<	7	16	20	28	12	SS
24			3	8								
25			3	8	12	5<	7	16	20	28	13	SS
26			3	8								
27			3	8	12	5<	7	16	20	28	14	SS
28			3	8								
29			3	8	12	5<	7	16	20	28	15	SS
30			3	8								

Medium dense brownish grey fine Sand

Brownish grey Sand with clay

Medium dense brownish grey fine Sand

Brownish grey Stiff clay

Coloured Coarse Sand

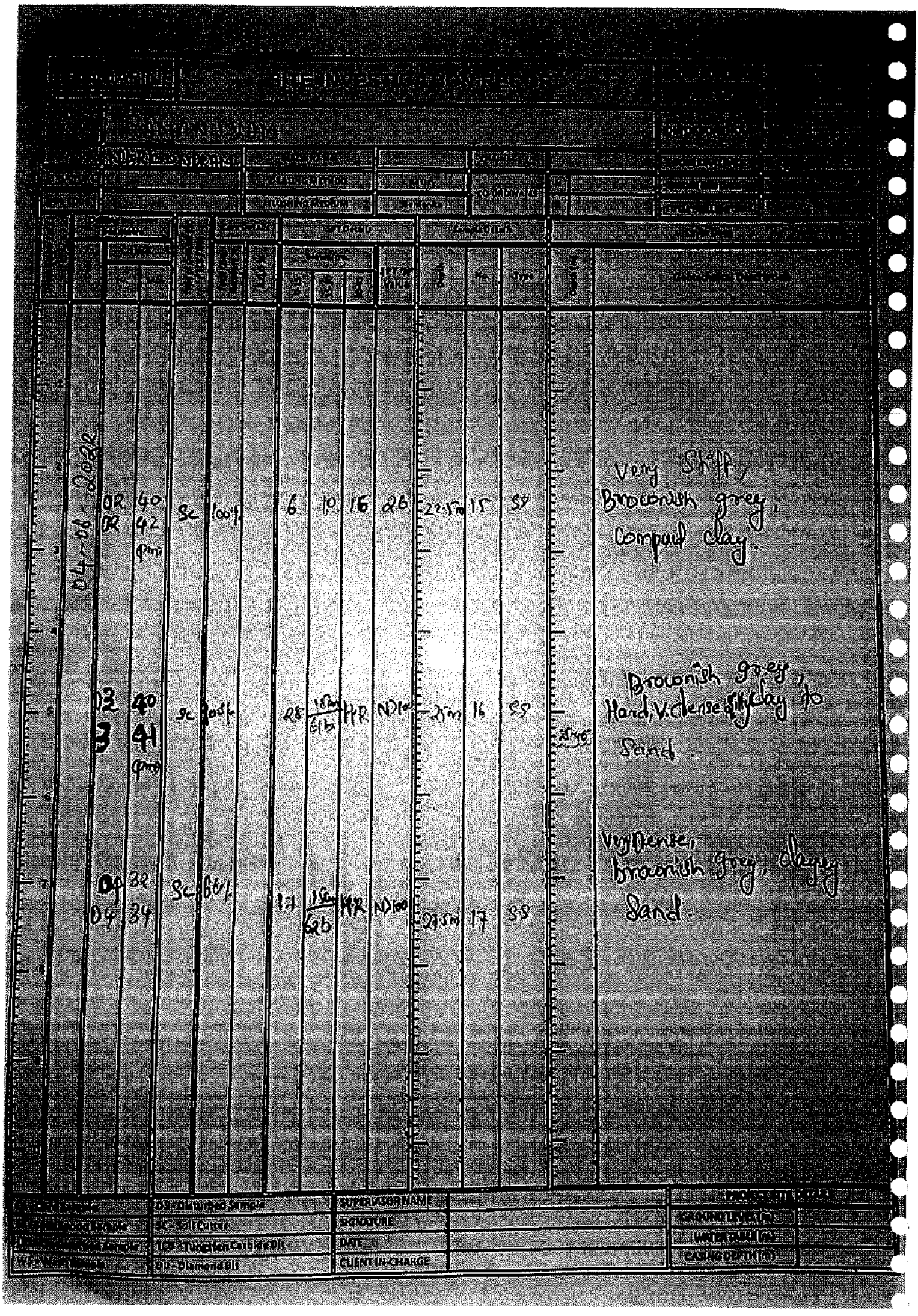
Medium dense light grey fine Sand with Coarse Sand

Very Stiff clay coloured clay

SITE INVESTIGATION RECORD

Date	Time (from)	Time (to)	Sample type	Recovery	Blows 1	Blows 2	Blows 3	N value	Depth	Sample No.	Type	Description
04-6-2[illegible]	09 51	09 52	SC	100%	5	6	8	14	10.5m	9	SS	Stiff, grey coloured clay
	10 05	10 06	SC	99%	4	4	6	10	12m	10	SS	Stiff, dark grey coloured clay
	10 48	10 49	SC	100%	3	4	4	8	14m	11	SS	Stiff, dark grey coloured compact clay
	11 45	11 49	SC						16m	12	UDS	Undisturbed Sample
	11 59	12 00	SC	100%	18	10	13	23	18m	13	SS	very stiff, brownish grey clay
	12 38	12 40		98%	13	14	14	28	20m	14	SS	very stiff, brownish grey clay with silt [illegible]

CS - Core Sample	DS - Disturbed Sample	SUPERVISON NAME	GROUND LEVEL (m)
SS - Split Spoon Sample	SC - Shell Cutter	SIGNATURE	WATER LEVEL (m)
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	CASING DEPTH (m)
WS - Wash Sample	DB - Diamond Bit	CLIENT IN CHARGE	


Very Stiff, Brownish grey, Compact clay.
Brownish grey, Hard, V. dense silty clay to Sand.
very dense, brownish grey, clay Sand.

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No. 10
PAGE No. 1

PROJECT NAME	RAMANIYAM					DIA OF BORE HOLE	150mm / 100mm
LOCATION	Navalcudram	MACHINE No.	HR07	CHAINAGE (m)		BORE START DATE	1/06/2022
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N	BORE END DATE	
JOB CODE		FLUSHING MEDIUM	Bentonite		E	TOTAL DRILLING DAYS	

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
1		8.00		SC			4	12	13	25	1		Split-spoon samples		V. stiff, moist, Grey-Blackish (mix) compact. SILTY CLA
		8.09													
2		8.30					3	5	7	12	2				stiff, moist, Grey-Blackish (mix) compact SILTY CLAY
		8.39													
3		8.54					4	7	10	17	3				SILTY CLAY
		8.59		SC											
4		9.15					12	19	23	42	4				Dense, Brownish, Fine-medium grain SILTY SAND.
		9.17													
5		9.38					12	15	19	34	5				Dense, Grey Fine-medium grain SILTY SAND
		9.43													
6		10.40					6	6	20	26	6				SILTY SAND
		10.44													
7		11.05		SC			9	15	28	43	7.5				Dense, Grey-Fine-grain. SILTY SAND
		11.08													
8		11.28													
9		11.32					5	24	22	48	9				V. Fine grain Greyish-Blackish CLAYEY SILT
10		12.00					4	6	7	13	10.5D				stiff, moist, Blackish, Compact SILTY CLAY with Layey sand
		12.04													

CS - Core Sample
SS - Split Spoon Sample
UDS - Undisturbed Sample
WS - Wash Sample

DS - Disturbed Sample
SC - Soil Cutter
TCB - Tungsten Carbide Bit
DB - Diamond Bit

SUPERVISOR NAME: K. Sivagnanavan
SIGNATURE:
DATE: 1/06/2022
CLIENT IN-CHARGE:

PROJECT SITE DETAILS
GROUND LEVEL (m):
WATER TABLE (m):
CASING DEPTH (m):

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	10
PAGE No.	2
DIA OF BORE HOLE	150mm / 100mm
BORE START DATE	1/06/2022
BORE END DATE	
TOTAL DRILLING DAYS	

PROJECT NAME	RAMANIYAM						
LOCATION	Nonkunjram	MACHINE No.		CHAINAGE (m)			
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N		
JOB CODE		FLUSHING MEDIUM	Bentonite		E		

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
1		12	30												
		12	37												m. stiff, moist, compact SILTY CLAY
2							5	5	5	10	12		SPT		
3		2	00												
		2	09	TCB											
4							-	-	-	-	14				UNDISTURBE SAMPLES.
5		2	35												
		2	42												
6							4	5	4	9	16				stiff - moist, Blackish compact: SILTY CLAY
7		3	25	SC											
		3	30												
		4	pm												
8							2	3	4	7	18		SPT		m. stiff, moist, Blackish compact SILTY CLAY
9															
0															

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	R. Jayavel (Geologist)	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE		WATER TABLE (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No. 10
PAGE No. 03

PROJECT NAME: Ramaniyam Site at Nerkundram

DIA OF BORE HOLE: 150mm ~~100mm~~

LOCATION | MACHINE No. | CHAINAGE (m) | BORE START DATE: 2/06/2022

STRUCTURE | DRILLING METHOD: Rotary | CO-ORDINATES N | BORE END DATE: 2/06/2022

JOB CODE | FLUSHING MEDIUM: Bentonite | E | TOTAL DRILLING DAYS

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	Layer Data: Depth (m)	Geotechnical Description
0	21/06/2022	10	00	SC			10	14	17	31	20.00			20.00	Dark Greenish Red Hard Compacted clay
		10	20												
1		11	00												
		11	20												
2				SC			10	20	22	42	22.50			22.50	Light Greenish Dense to very dense Sandy clay.
		12	00												
3															
		12	10												
4															
5				SC			50	10cm / 50blys		N > 100	25.00			25.00	Dark Greenish Dense to V. Dense silty fine Sand
		12	50												
6		13	50												
		2	10												
7		2	40												
				SC			10cm / 50blys			N > 100	27.50			27.50	Brownish Dense to very Dense Coarse Sand with gravel.
8		3	05												
		3	10												
9		3	21												
		3	45												
10				SC			45	10cm / 50blys		N > 100	30.00			30.00	Brownish very Hard Shale (compacted clay).

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	D. VENUGOPAL	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	2/06/22	WATER TABLE (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No. 11
PAGE No. 1

PROJECT NAME: RAMANIYAM
DIA OF BORE HOLE: 150mm / 100mm
LOCATION: Nanilcumbaram | MACHINE No.: HR-01 | CHAINAGE (m):
STRUCTURE: | DRILLING METHOD: Rotary | CO-ORDINATES: N, E:
JOB CODE: | FLUSHING MEDIUM: Bentonite
BORE START DATE: 30/05/2022
BORE END DATE: 31/05/2022
TOTAL DRILLING DAYS:

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	Layer Data: Depth (m)	Geotechnical Description
1		8	50												
		9	00 AM												
		9	17				9	11	16	27	1				M. Dense, Brownish, F.M. grained SANDY SILT
2		9	23				7	13	17	30	2				Dense, Brownish, Fine grained SILTI SAND
		9	40												
		9	42												
3		10	00	SC			10	18	23	41	3				Dense, Brownish, Fine grained SILTY SAND
		10	03												
4							11	17	20	37	4				SILTY SAND.
		10	15												
		10	17												
5							19	44	33	77	5				V. Dense, Brownish, F.M. - Med Coarser grained SAND
		10	35												
		10	37												
6							17	20	20	40	6				Dense, Brownish, medium Coarser grained SAND
		10	55												
		10	57												
7				SPT			12	14	15	29	7.5				Greyish, F.M. - medium grained SAND. (M. Dence)
8		11	14												
		11	17												
9							3	5	21	26	9				Greyish-Blackish (Mix) SILTY CLAY with SILTY SAND
		11	32												
		11	35												
0							2	3	3	6	10.5				Blackish, Moist, Compact Silty SILTY CLAY

Split spoon sample

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	K. Selvasankaravan	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Spil Cutter	SIGNATURE		GROUND LEVEL (m)	
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	30/05/2022	WATER TABLE (m)	3.80
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No. 11
PAGE No. 2

PROJECT NAME	RAMANIYAM					DIA OF BORE HOLE	150mm / 100mm
LOCATION	Nerkundram	MACHINE No.		CHAINAGE (m)		BORE START DATE	30/05/2022
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N	BORE END DATE	31/05/2022
JOB CODE		FLUSHING MEDIUM	Bentonite		E	TOTAL DRILLING DAYS	

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
1		11.55													
		12.00													
2							4	4	6	10	12				m.stiff - stiff, moist, compact SILTY CLAY
3		12.23		TCB											
		12.27													
4							2	4	6	10	14				stiff, moist, blackish, compac SILTY CLAY
5		12.49													
		12.50													
6							3	5	6	11	16				stiff, moist, blackish to compa SILTY CLAY
7		1.25		DB											
		1.35													
8							3	6	7	13	18				SILTY CLAY
9		2.25													
		2.30													
10							5	7	13	20	20				v.stiff - blackish - greenish coarse) compact. CLAY

split spoon samples

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	K. Sivasankaran	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	30/05/2022	WATER TABLE (m)	3.80.
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No. 4
PAGE No. 3

PROJECT NAME: RAMANIYAM
DIA OF BORE HOLE: 150mm / 100mm

LOCATION: Nanguneri | MACHINE No. | CHAINAGE (m)
STRUCTURE | DRILLING METHOD: Rotary | CO-ORDINATES: N, E
JOB CODE | FLUSHING MEDIUM: Bentonite

BORE START DATE: 30/05/2022
BORE END DATE: 31/05/2022
TOTAL DRILLING DAYS:

Depth below E.G.L (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Layer Data: Geotechnical Description
1		9	05 AM												
2		9	25												
3	30/05/2022	10	15	SC			9	19	22	41	22.5		split spoon samples		HARD, Greyish-Greenish Compact CLAY
4		10	40												
5							13	21	27	48	25				HARD, Greyish, Compact V. thinly bedded CLAY ST
6		11	20												
7		11	29	SC			HAMMERED 23	58	(>100) 150/0		27.5				V. Dence, Brownish, Medium Coarsen grains. SAND
8															
9		12	17												
10		12	37				HAMMERED 39	58	(>100) 150m		30.00				X. HARD, Greyish, V. thinny bedded SHALE

				PROJECT SITE DETAILS	
CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	K. Sivasankaran	GROUND LEVEL (m)	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	K. Sivasankaran	WATER TABLE (m)	3.80
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	31/05/2022	CASING DEPTH (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE			

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	11
PAGE No.	4
DIA OF BORE HOLE	150mm / 100mm
BORE START DATE	30/05/2022
BORE END DATE	31/05/2022
TOTAL DRILLING DAYS	

PROJECT NAME	RAMANIYAM					
LOCATION	Nanguneri	MACHINE No.		CHAINAGE (m)		
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N	
JOB CODE		FLUSHING MEDIUM	Bentonite		E	

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
1		2	00												
2		2	35												
3				SC			58/10cm	(>100)			33.00		SS		V. HARD, Greyish, V thinly Bedded SHALE
4															
5															
6															
7															
8															
9															Bore hole terminated at 33m Depth
0															

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	K. Sivasankaran
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	31/05/2022
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE	

PROJECT SITE DETAILS	
GROUND LEVEL (m)	
WATER TABLE (m)	3.00
CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	12
PAGE No.	1
DIA OF BORE HOLE	150mm / 100mm
BORE START DATE	26/05/2022
BORE END DATE	28/05/2022
TOTAL DRILLING DAYS	

PROJECT NAME	RAMANIYAM						
LOCATION	Nonakundram	MACHINE No.	HA01	CHAINAGE (m)			
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N		
JOB CODE		FLUSHING MEDIUM	Bentonite		E		

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	Blows/cm. 15-30	Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	Layer Data: Depth (m)	Geotechnical Description
1		11	05	AM			9	12	15	27	1		SSS		V. stiff, moist, Brownish, compact. CLAY
		11	20												
		11	35												
		11	45							22					
2											2				UNDISTURBED SAMPLES
		12	05	PM											
		12	15												
3							3	7	8	15	3				V. stiff, moist, Brownish compact. CLAY
		12	35												
		12	40												
4							3	3	5	8	4				M. stiff - Brownish - Grey clay, compact. CLAY
		12	56												
		12	58												
5							13	18	26	44	5				Dense, Brownish, medium grain. SAND.
		2	00												
		2	03												
6							9	18	23	41	6				Dense, Brownish, Fine - medium grain SAND
		2	18												
		2	20												
7							7	15	15	30	7.5				Dense, Brownish, Fine - medium grain. SAND.
		2	40												
8		2	44												
9							3	5	9	14	9				Stiff, moist, Blackish compact clay
		3	05												
10		3	09				8	8	7	15	10.5				In. dense moist, Grey-Black V. Fine grain silty SAND

Split spoon samples

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	K. Srivasankaran	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	28/05/2022	WATER TABLE (m)	3.80
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	12
PAGE No.	2
DIA OF BORE HOLE	150mm / 100mm
BORE START DATE	26/05/2022
BORE END DATE	28/05/2022
TOTAL DRILLING DAYS	

PROJECT NAME	RAMANIYAM				
LOCATION	Nanjundram	MACHINE No.	HR65	CHAINAGE (m)	
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N
JOB CODE		FLUSHING MEDIUM	Bentonite		E

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	Blows/cm. 15-30	Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	Layer Data: Depth (m)	Geotechnical Description
1		3.32											SS		
		3.37													
2				DC						23	12				UNDISTURBED SAMPLES
3	26/05/2022	4.08													
		4.14													
4							3	5	6	11	14				m. stiff, moist, Blackish Compact. CLAY
5		4.48													
		4.49													
6				SC			5	5	5	10	16				m. stiff, moist, Blackish Compact. CLAY
7		5.15													
		5.19													
8							3	5	6	11	18				m. stiff, moist, Blackish Compact. CLAY
9		5.46													
		5.55													
10		7 m.					8	7	15	22	20				m. stiff, moist, Blackish, Compact. CLAY

Split spoon samples

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	K. Arul Sundaram	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	K. Arul	GROUND LEVEL (m)	
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	28/05/2022	WATER TABLE (m)	3.80
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No. 12
PAGE No. 3

PROJECT NAME: RAMANIYAM.
DIA OF BORE HOLE: 150mm / 100mm
LOCATION: Nerkundram | MACHINE No.: HR01 | CHAINAGE (m):
STRUCTURE: | DRILLING METHOD: Rotary | CO-ORDINATES: N, E
JOB CODE: | FLUSHING MEDIUM: Bentonite
BORE START DATE: 26/05/2022
BORE END DATE: 28/05/2022
TOTAL DRILLING DAYS:

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	Layer Data: Depth (m)	Geotechnical Description
0	27/05/2022	6	35	150									Split spoon Samples		
1		6	49												
		AM													
2															V. stiff - HAND, Greyish Ash colour V. thinly bedded SHALE
							9	16	20	36	22.5				
3															
4		7	30												
		7	42												
5							13	17	28	45	25				V. HAND, Greyish - Brown (mix) Compact. V. thinly bedded SANDY CLAY
6															
		8	12												
7		8	22	150											
							29	52	57	109	27.5				V. HAND, Greyish - Brownish (mix), Compact. V. thinly bedded SANDY SILTY CLAY
8															
		9	20												
9		9	55												
							27	57 (>100)			30.00				V. HAND, Greyish, Compact V. thinly bedded SHALE
10								12cm							

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	Srivasankaran K	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	28/05/2022	WATER TABLE (m)	3.80
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

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SITE INVESTIGATION RECORD

BORE HOLE No.	12		
PAGE No.	4		
PROJECT NAME	RAMANIYAM	DIA OF BORE HOLE	150mm / 100mm
LOCATION	Nanthencadavu	MACHINE No.	HNO1
STRUCTURE		DRILLING METHOD	Rotary
JOB CODE		FLUSHING MEDIUM	Bentonite
CHAINAGE (m)		CO-ORDINATES	N / E
BORE START DATE	26/05/2022		
BORE END DATE	28/05/2022		
TOTAL DRILLING DAYS			

Depth below E.G.L (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
1	28/05/22	3	45	SC											
		4	15												
		4	35												
2		5	15												
3							57			(>100)	33.00		SS		V. HARD, Greyish, V. thinly Bedded, compact. SHALE
4							15cm								
5															
6															
7															
8															
9															
10															Bore hole terminated at 33.00mts

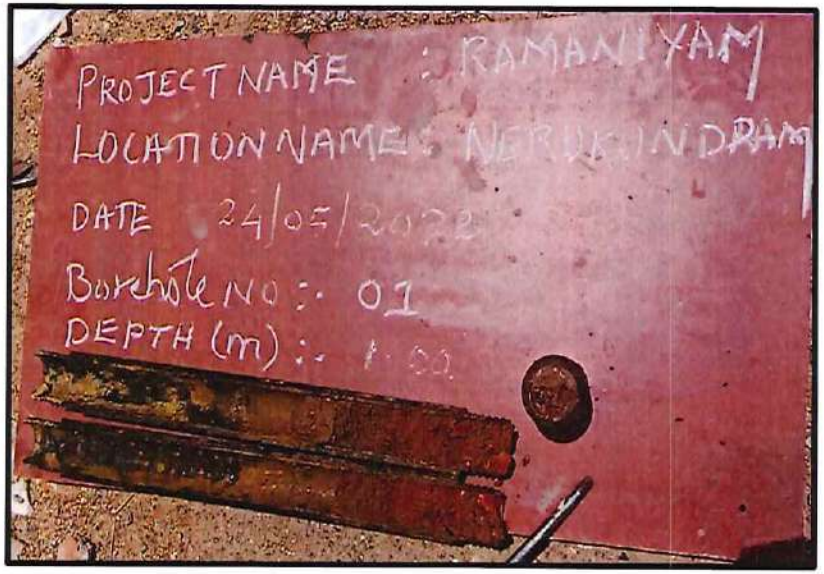
CS - Core Sample
SS - Split Spoon Sample
UDS - Undisturbed Sample
WS - Wash Sample

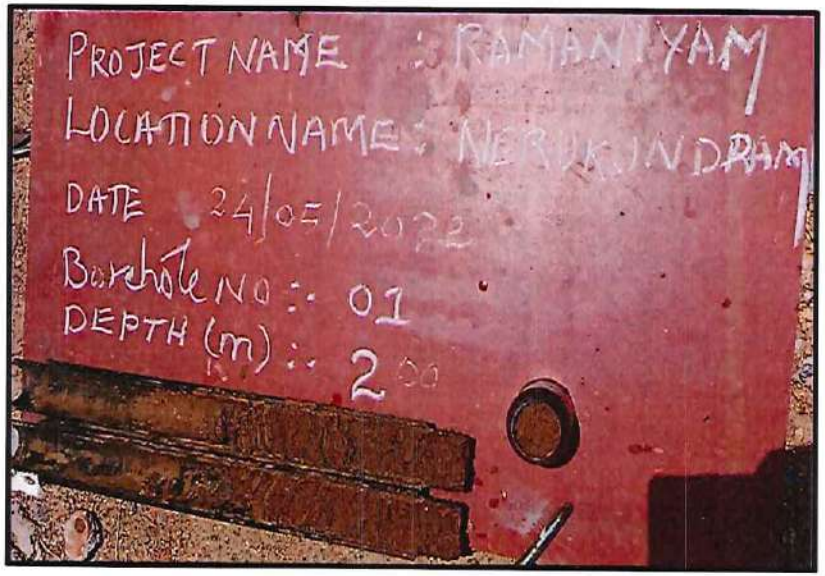
DS - Disturbed Sample
SC - Soil Cutter
TCB - Tungsten Carbide Bit
DB - Diamond Bit

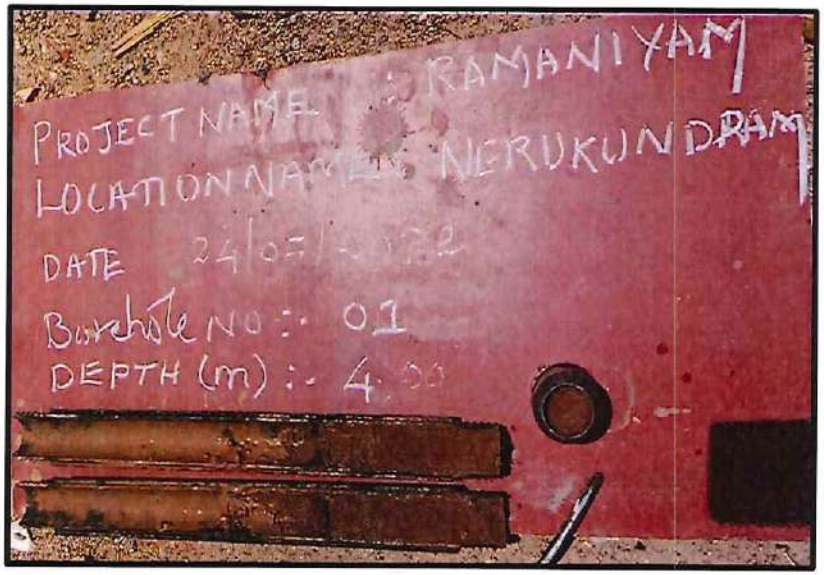
SUPERVISOR NAME	K. Shivasankaran
SIGNATURE	
DATE	28/05/2022
CLIENT IN-CHARGE	

PROJECT SITE DETAILS	
GROUND LEVEL (m)	
WATER TABLE (m)	3.80
CASING DEPTH (m)	

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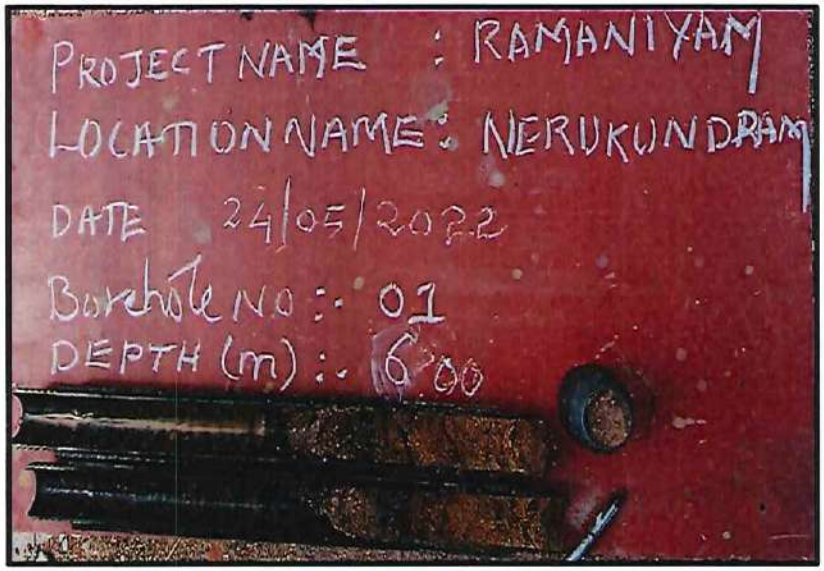


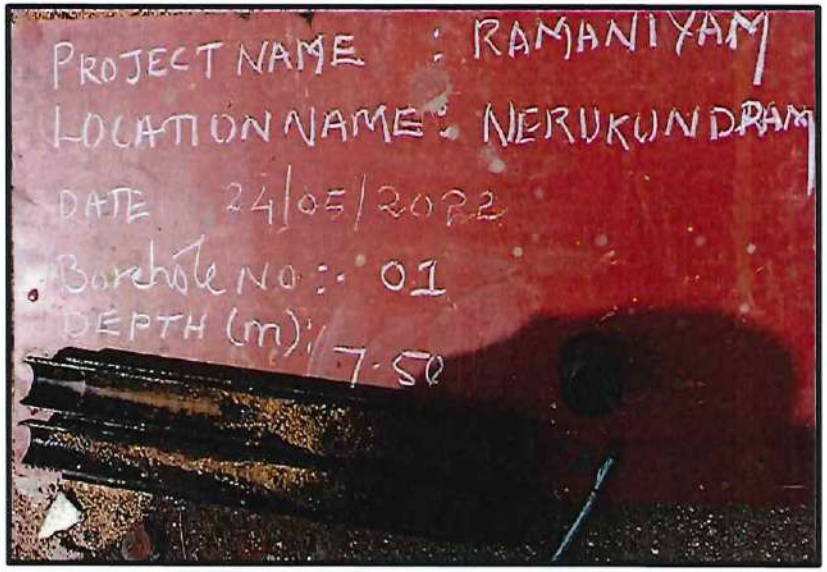


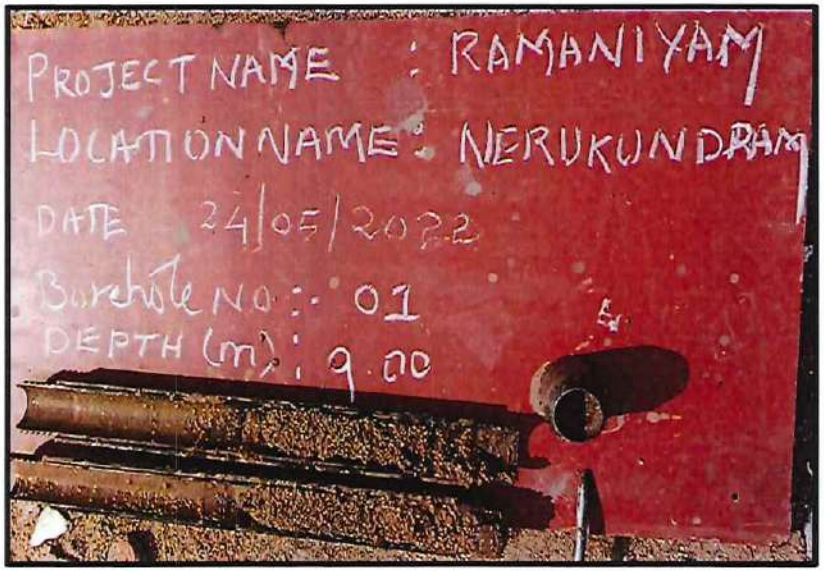




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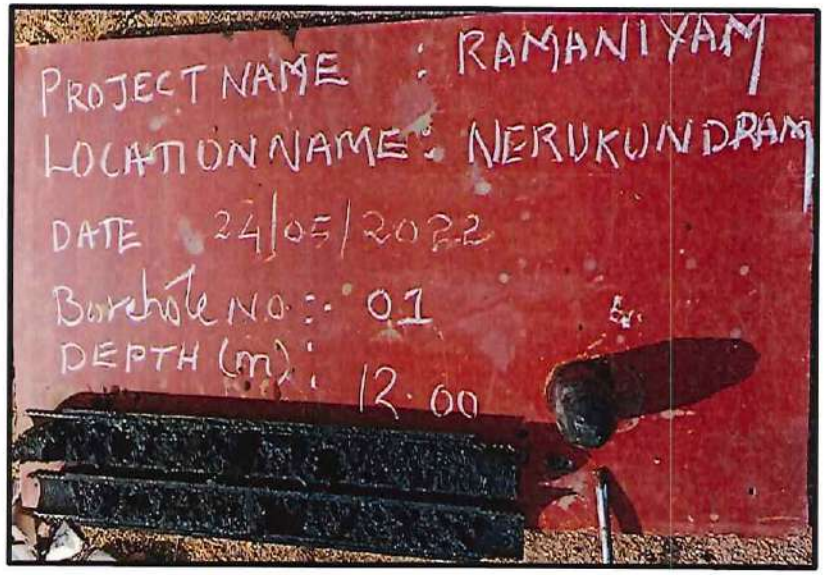




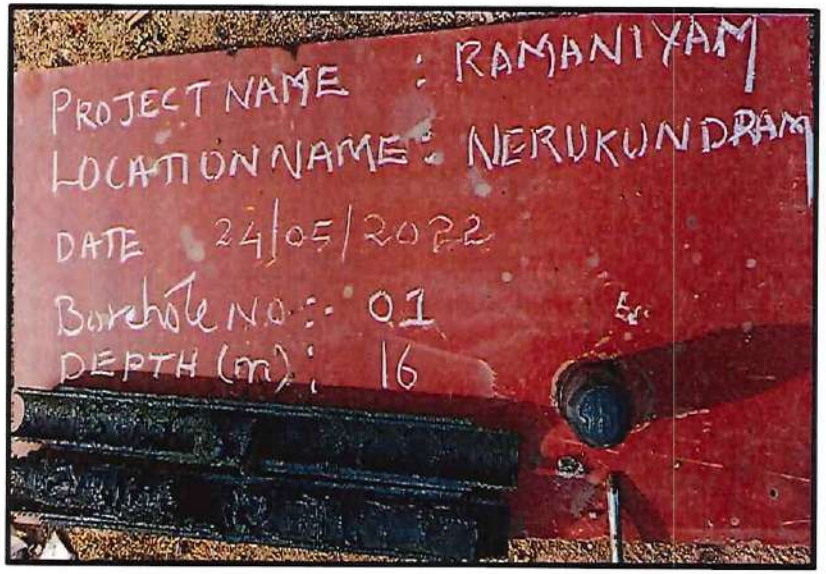


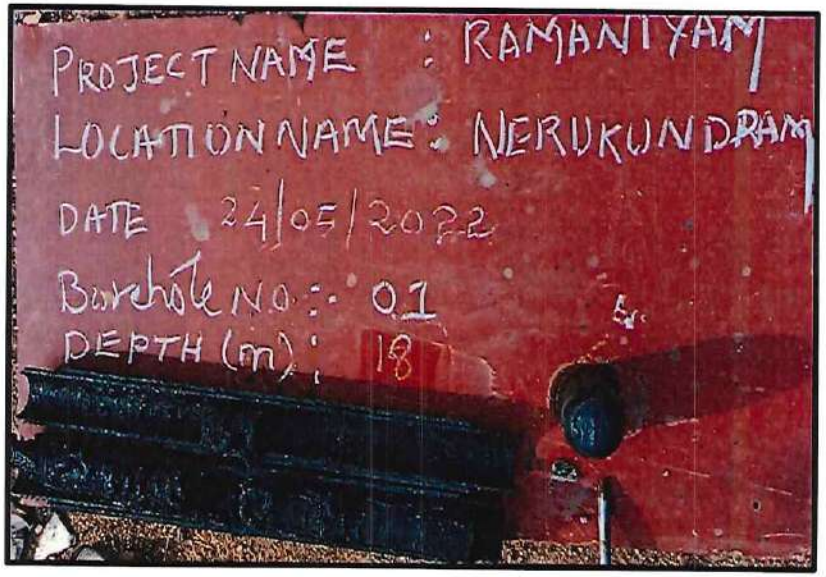


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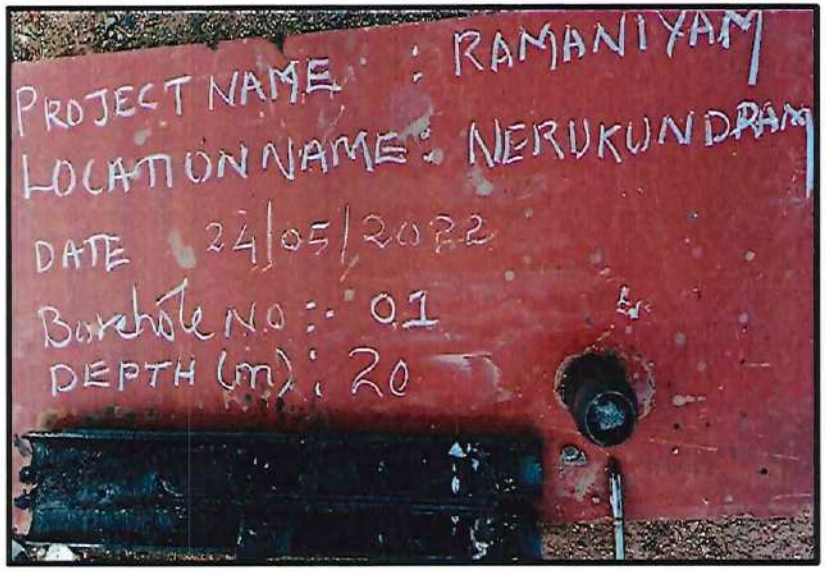


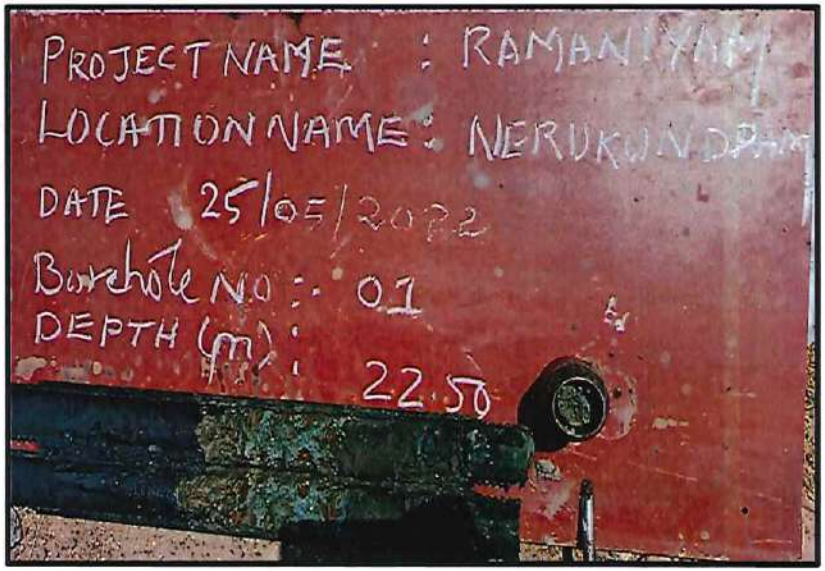


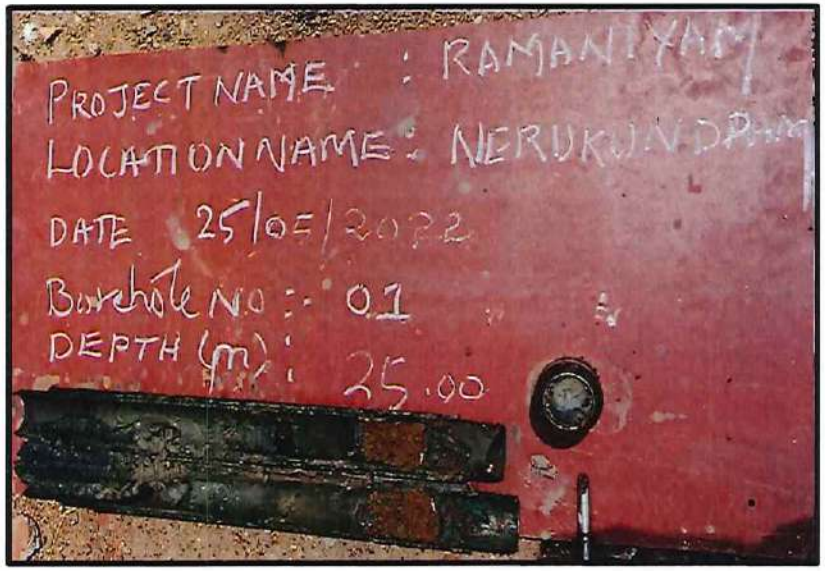




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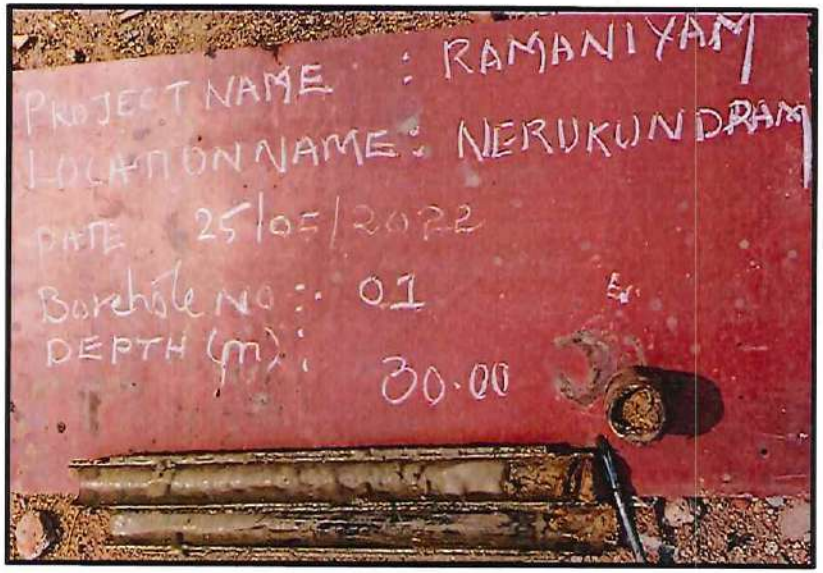


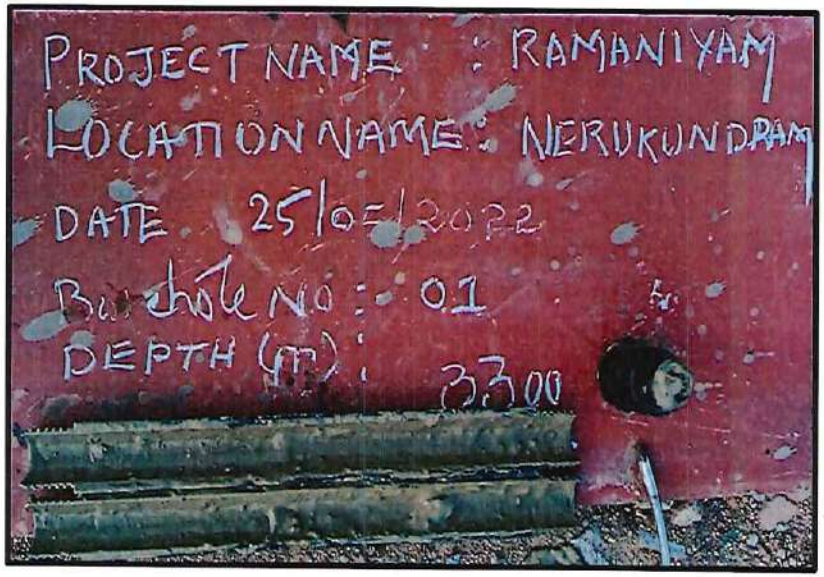






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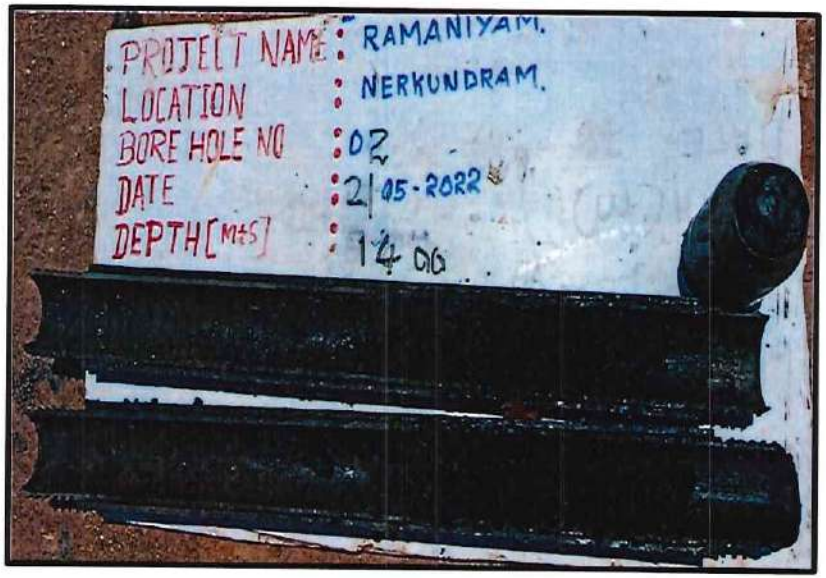


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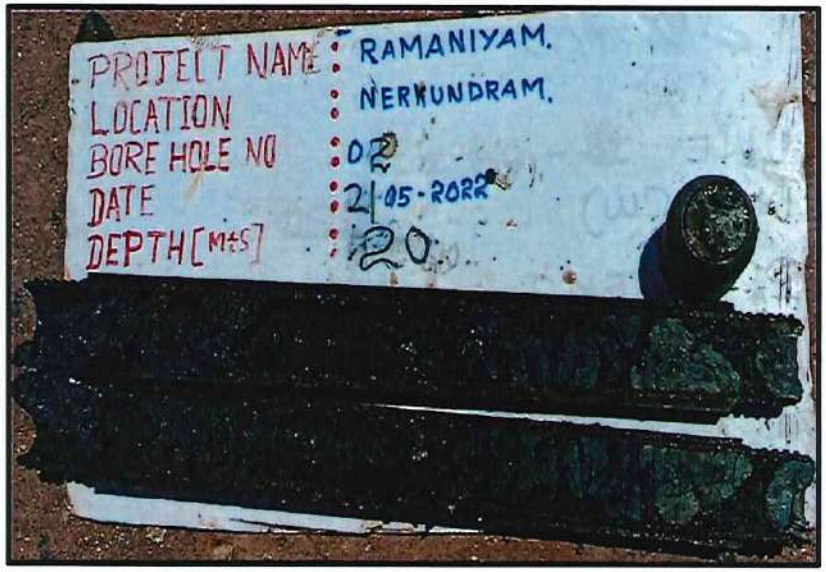


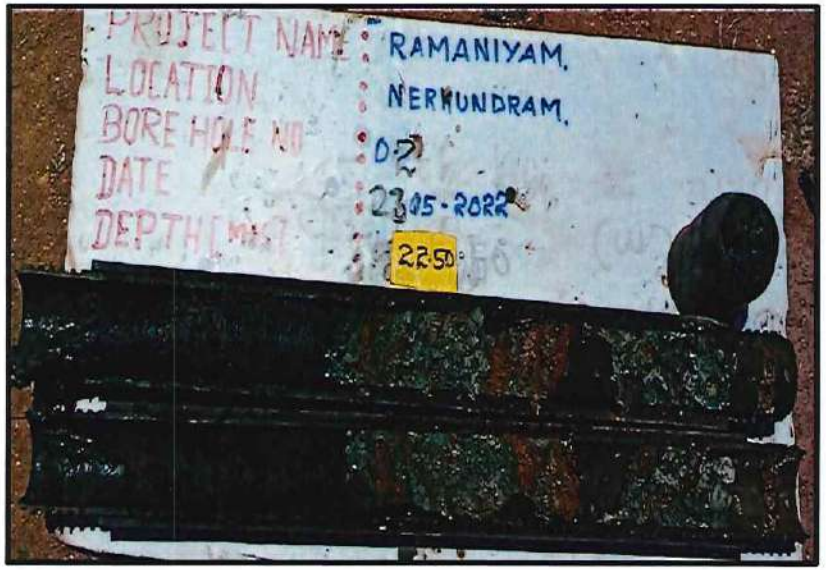




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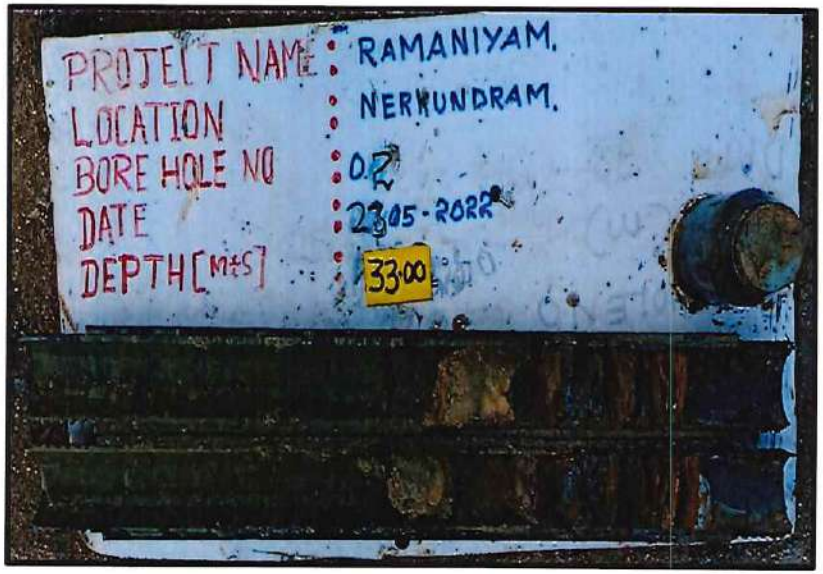




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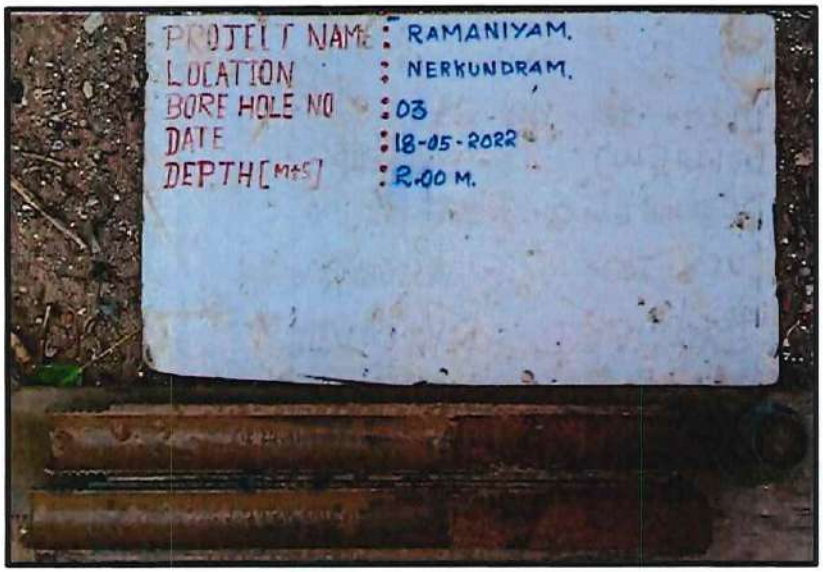


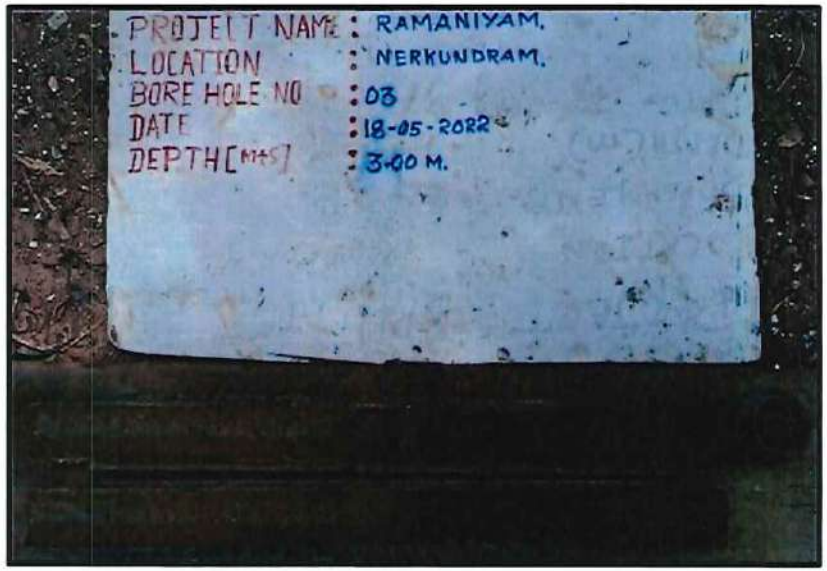


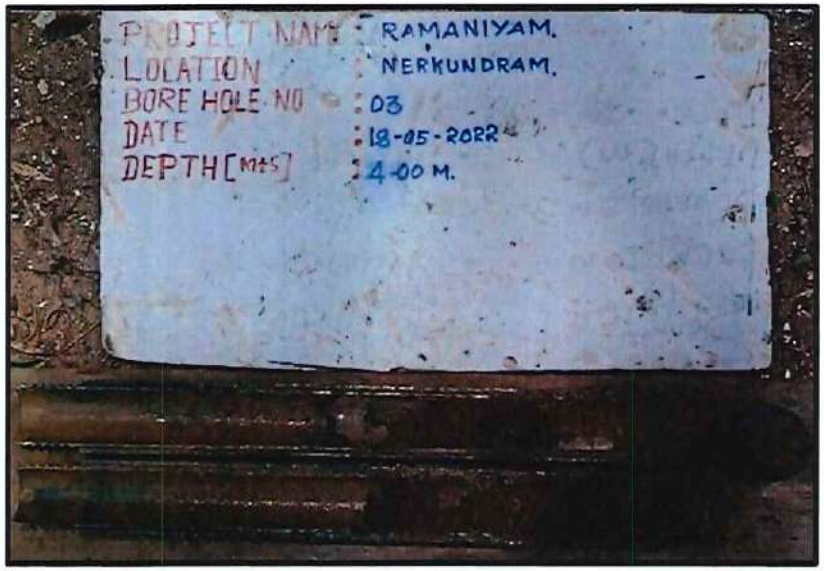


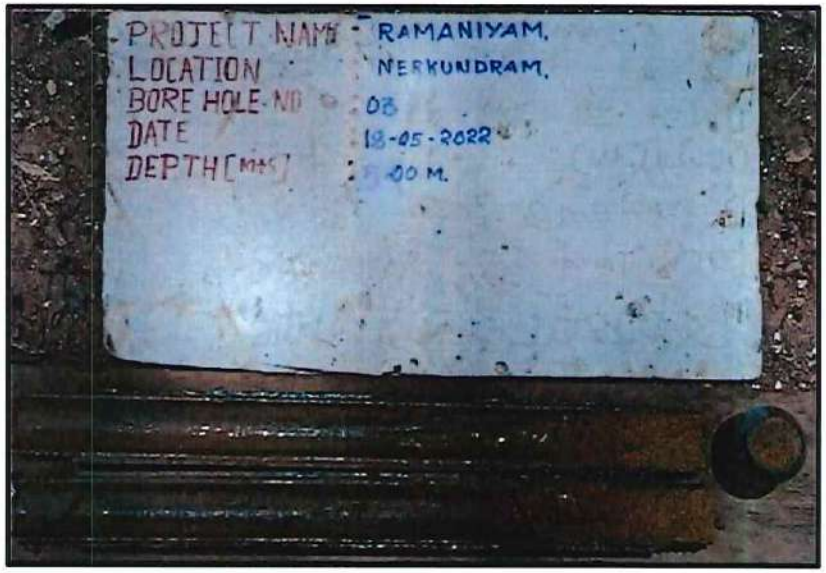


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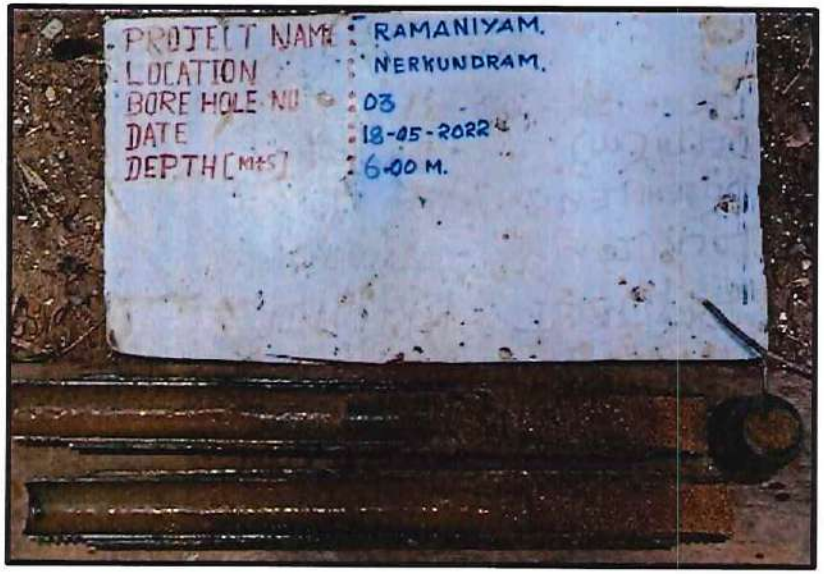


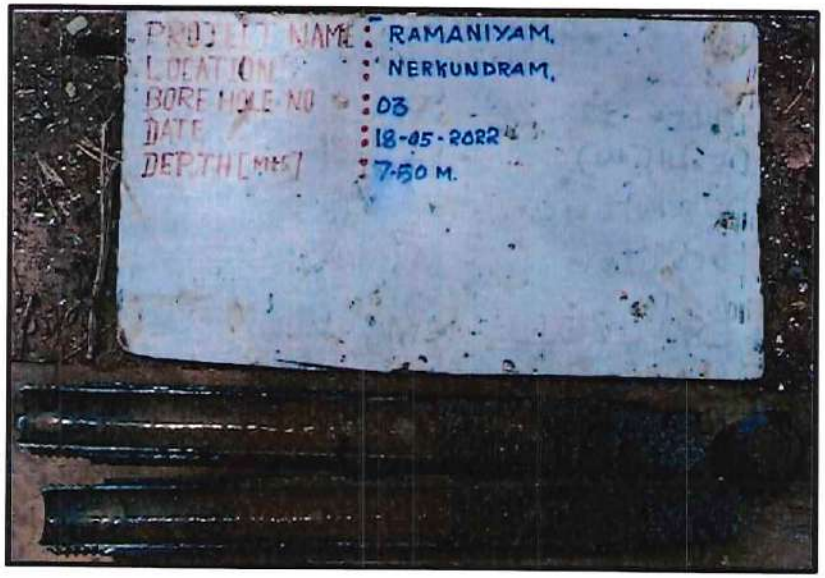


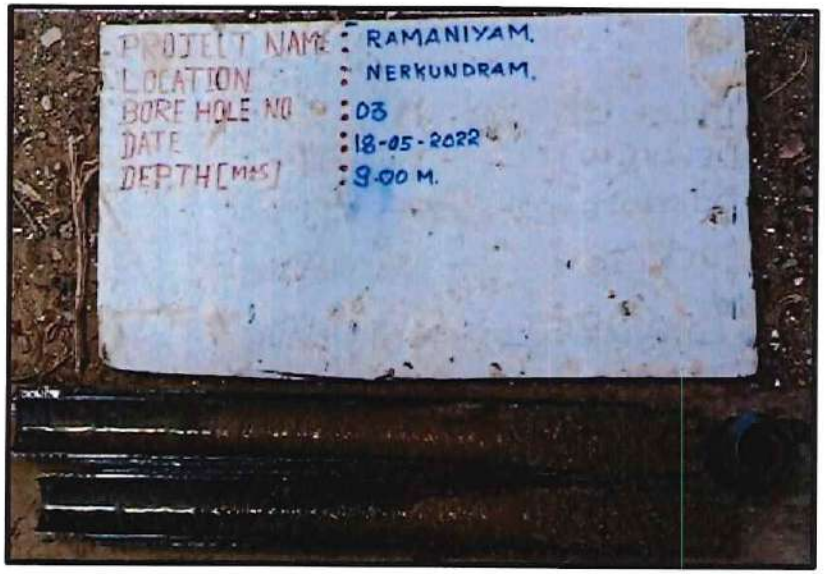




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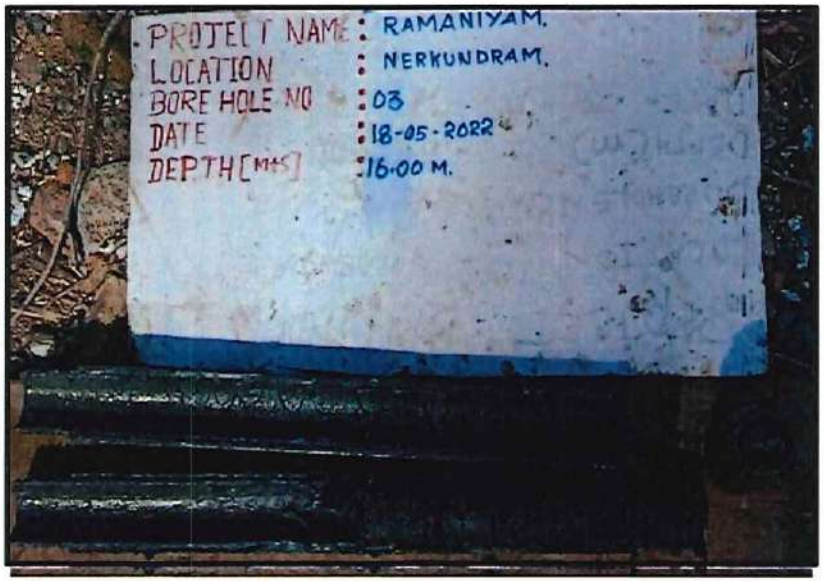


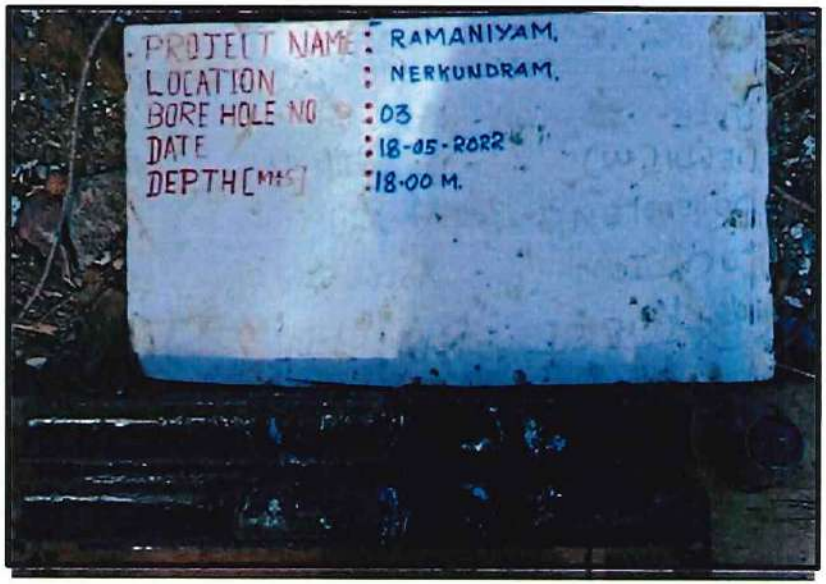


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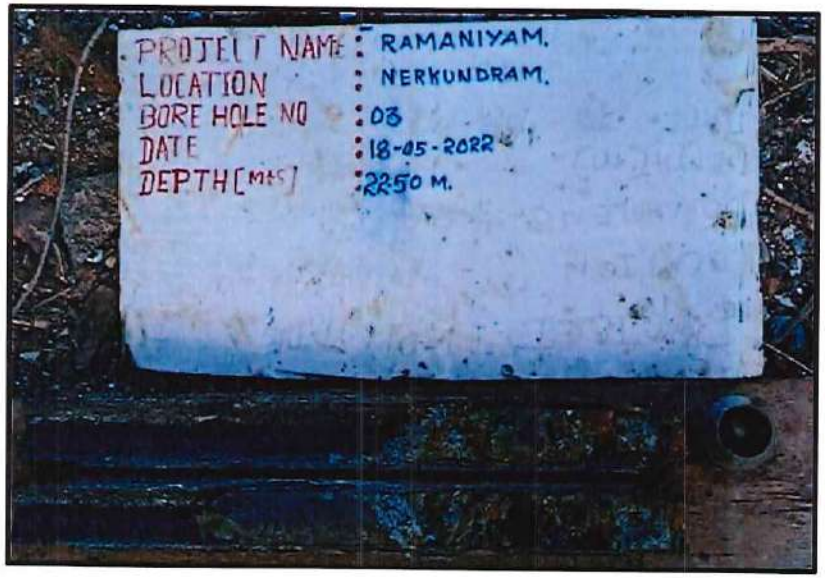


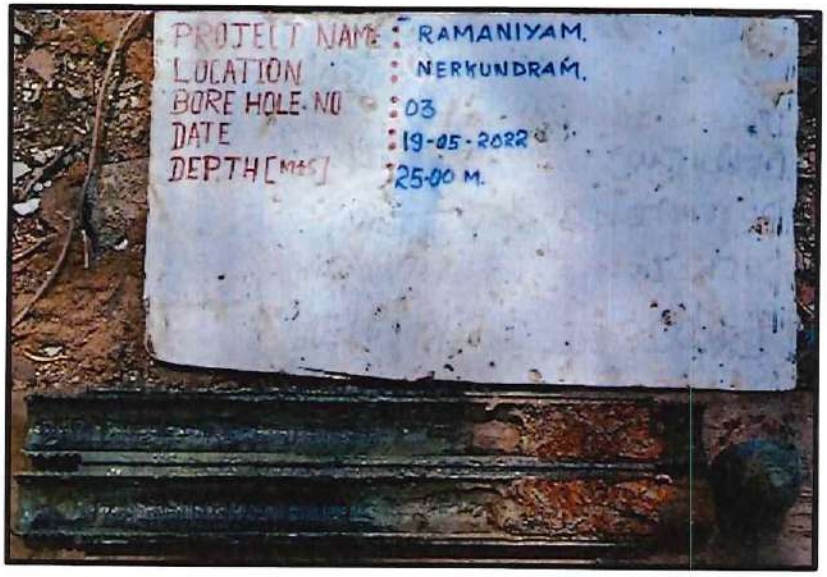


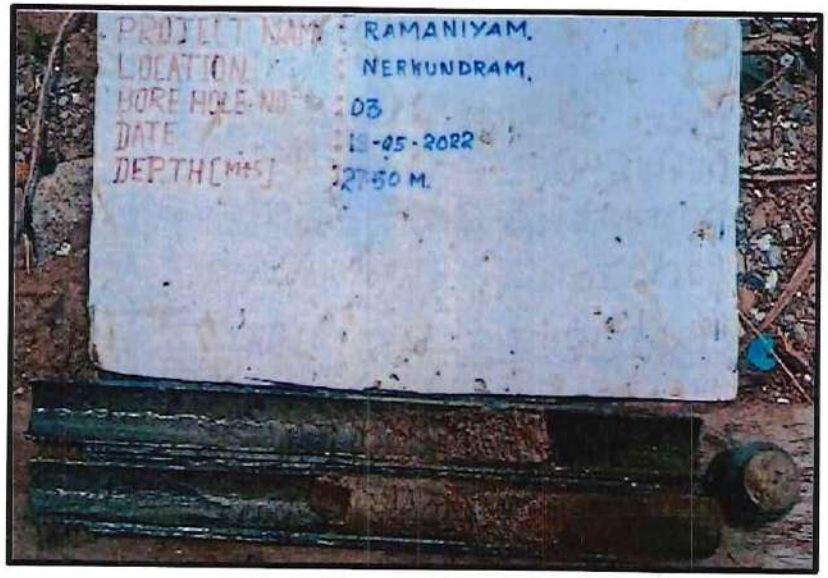


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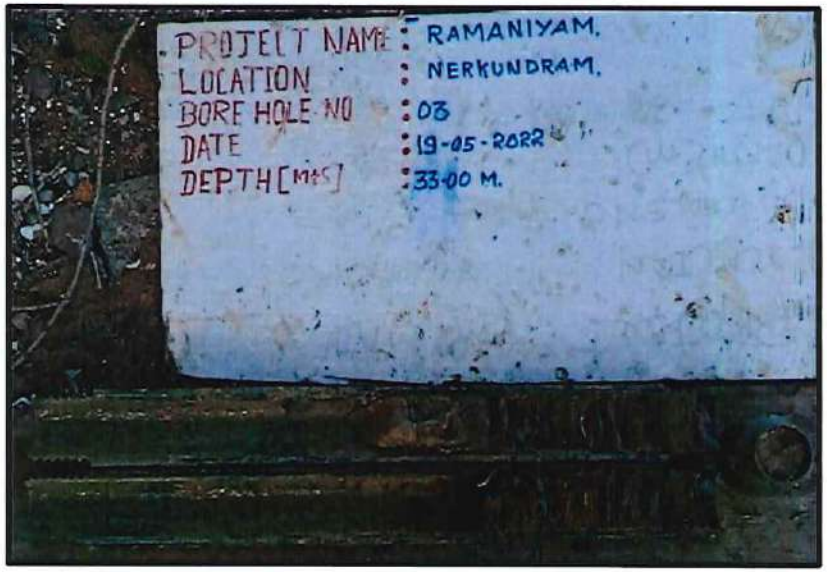


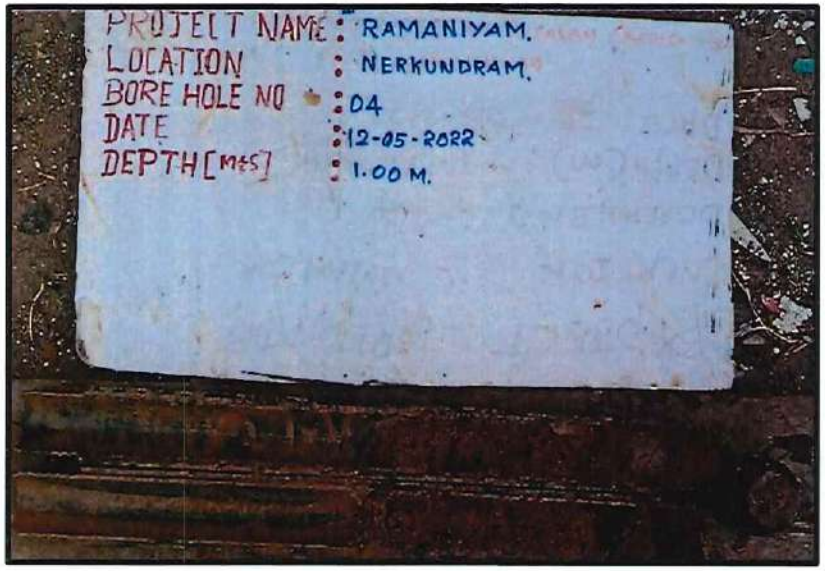


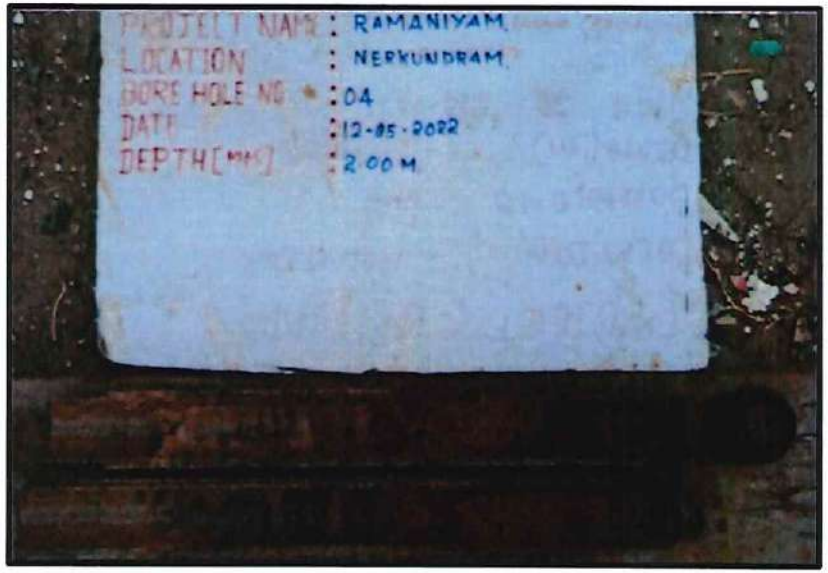


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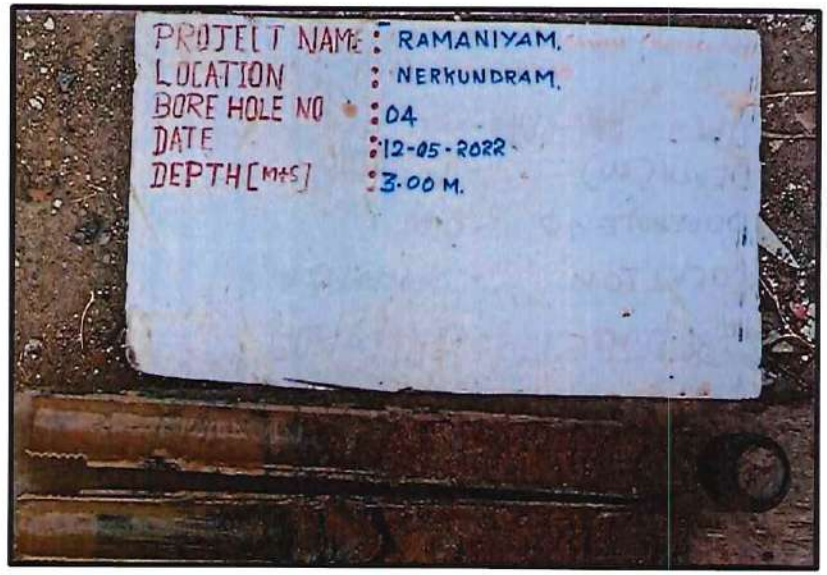




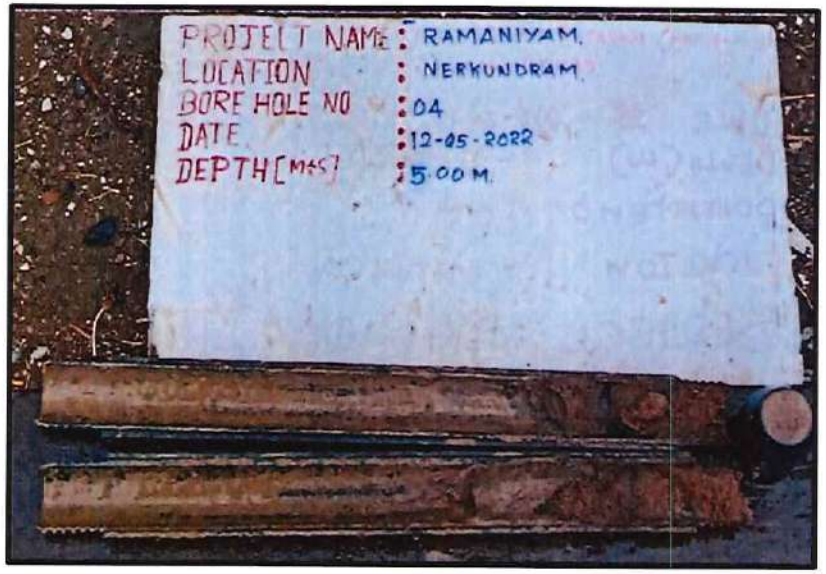


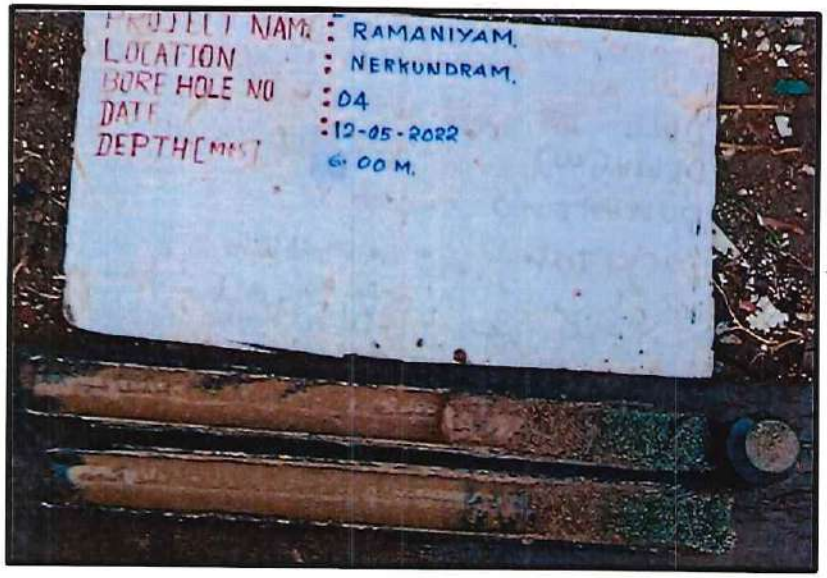


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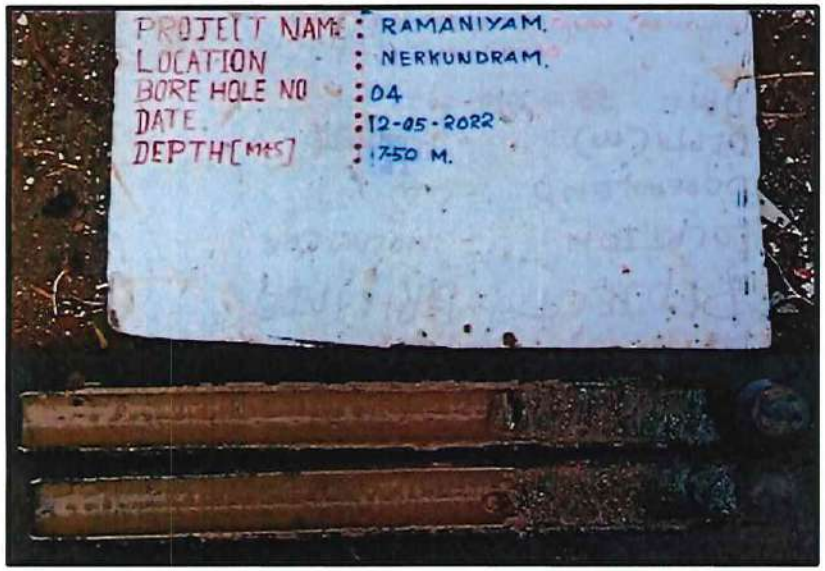




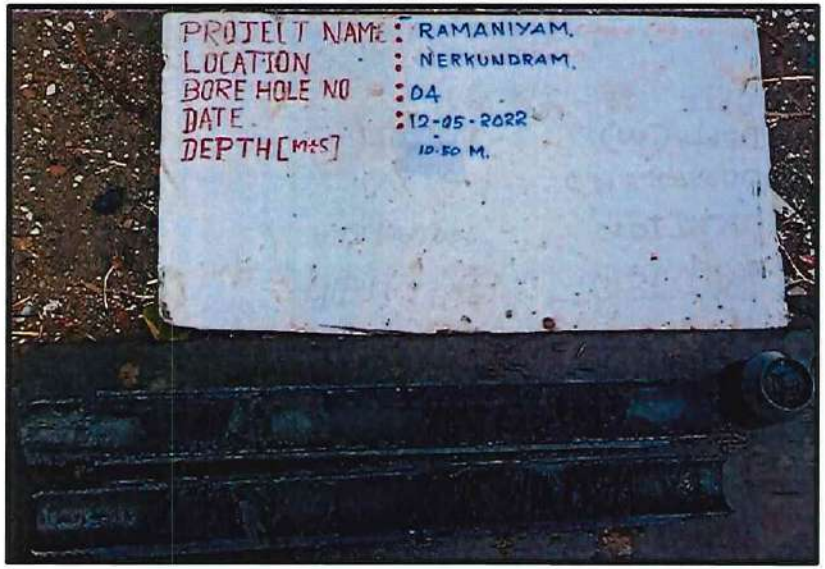




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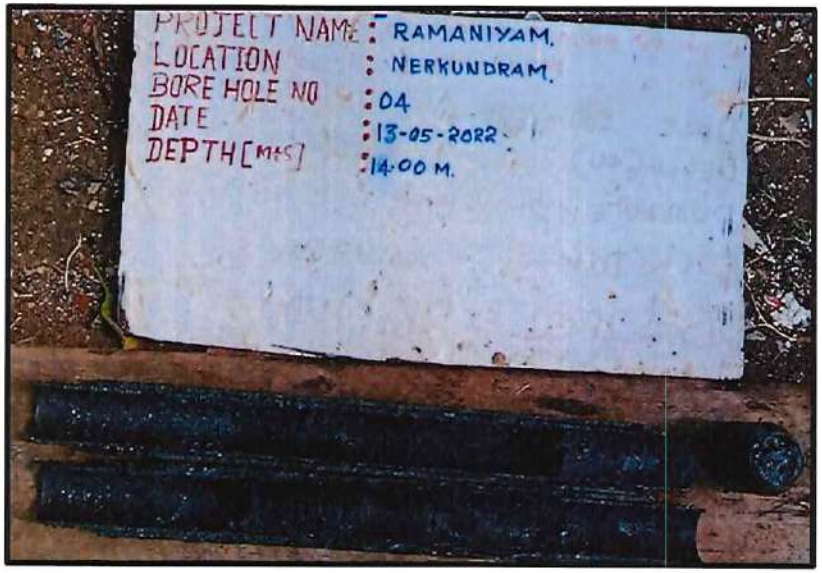




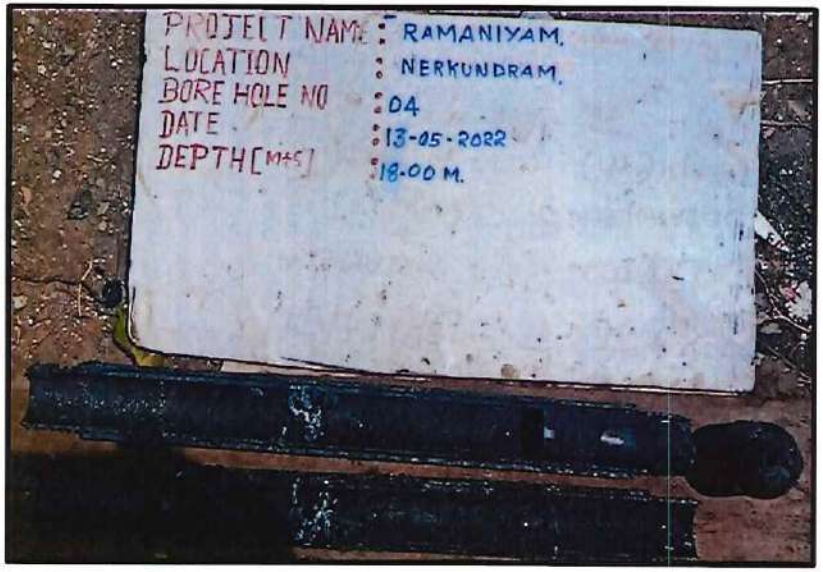


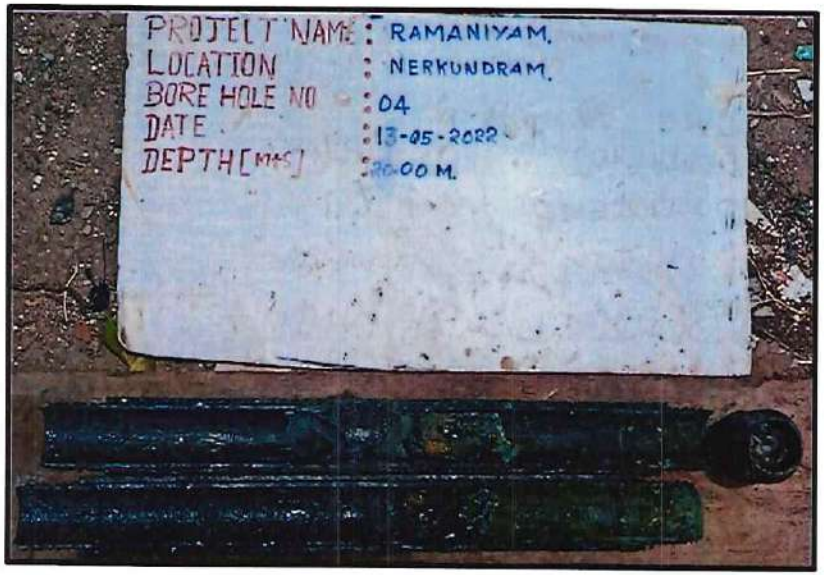


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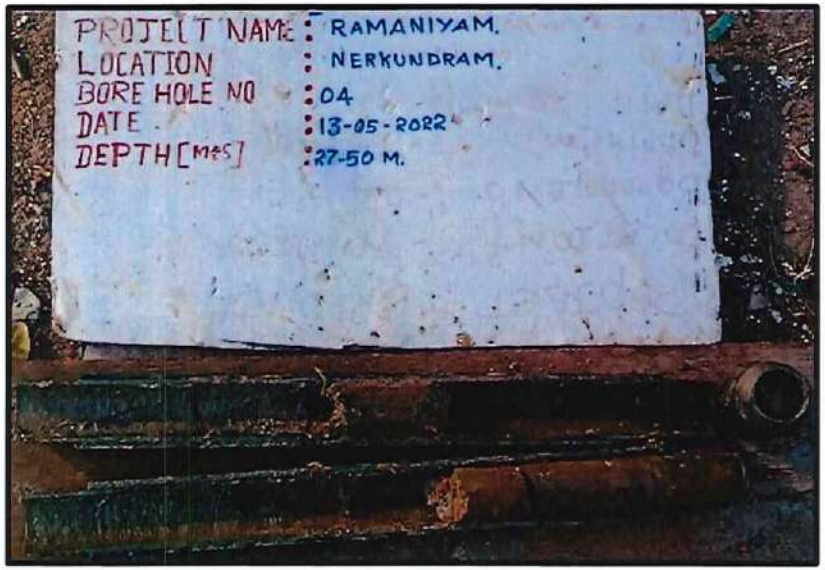


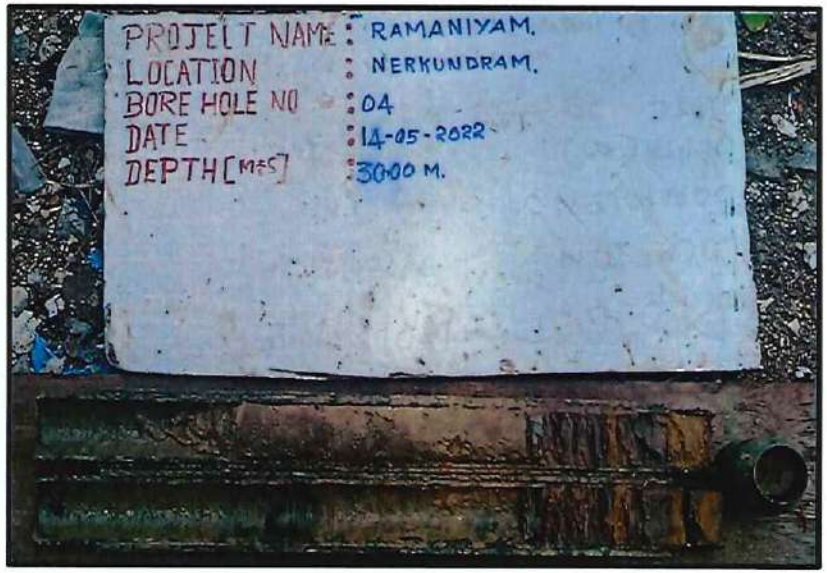


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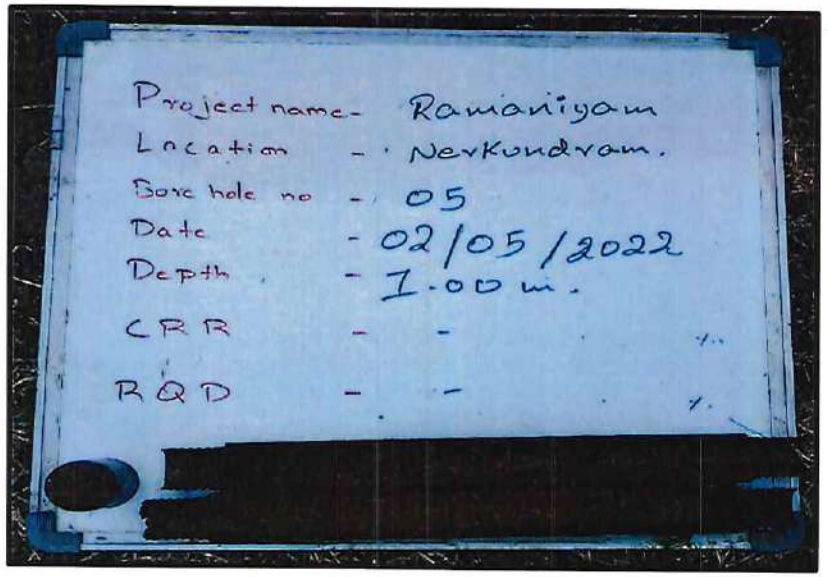


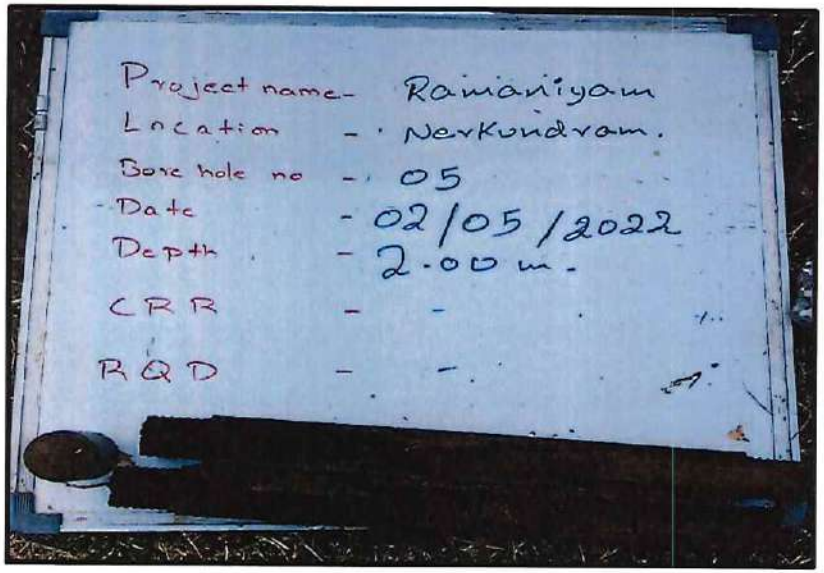


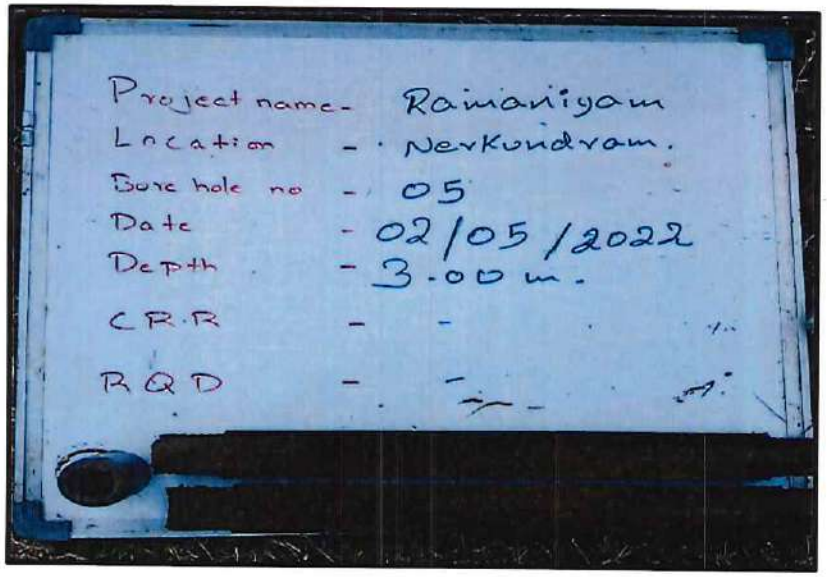


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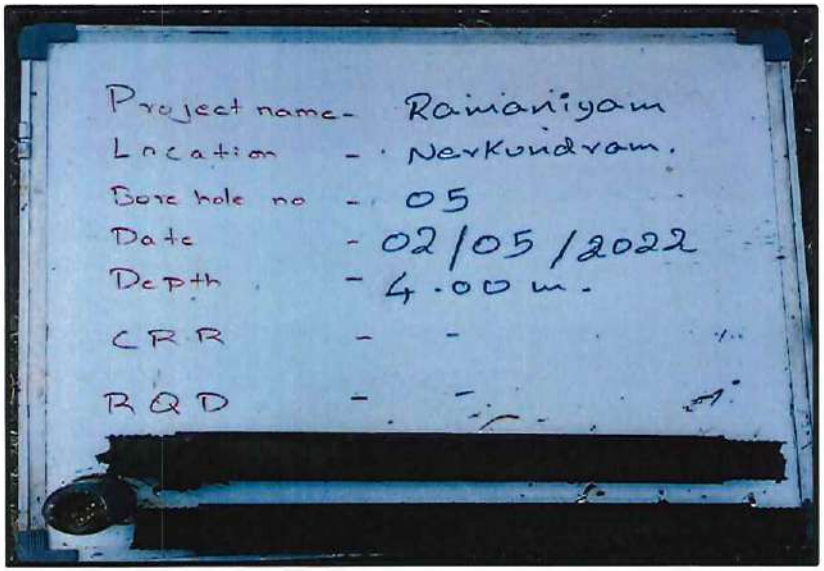


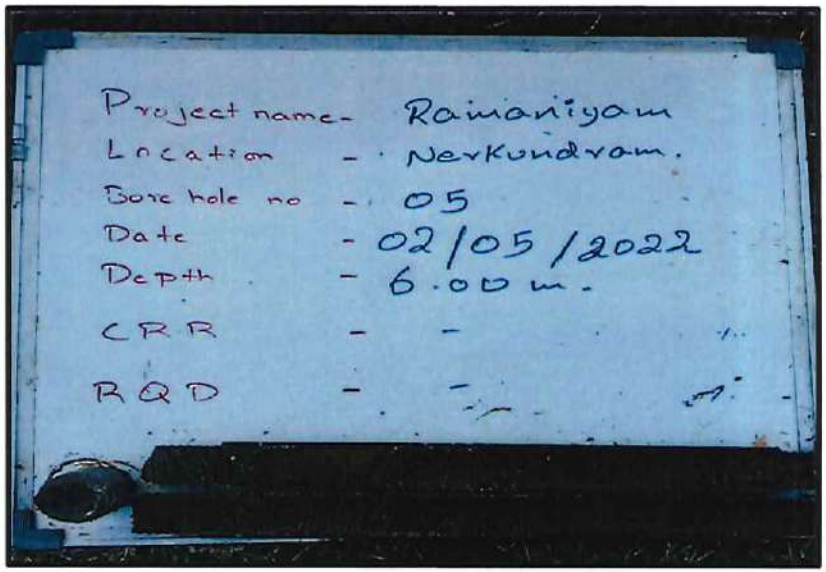


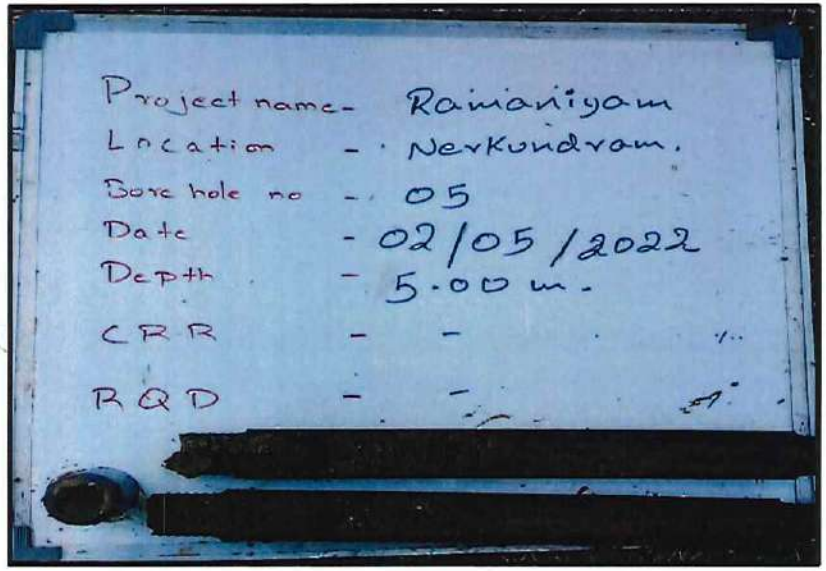


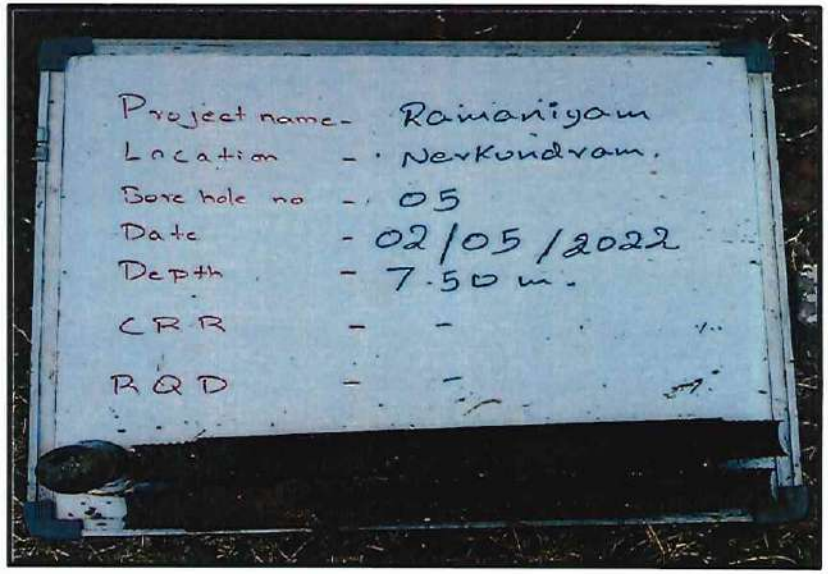


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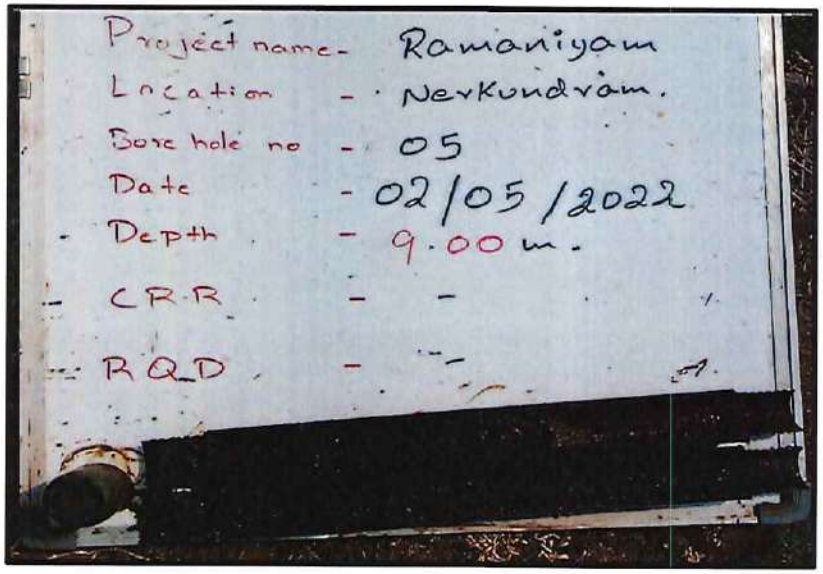


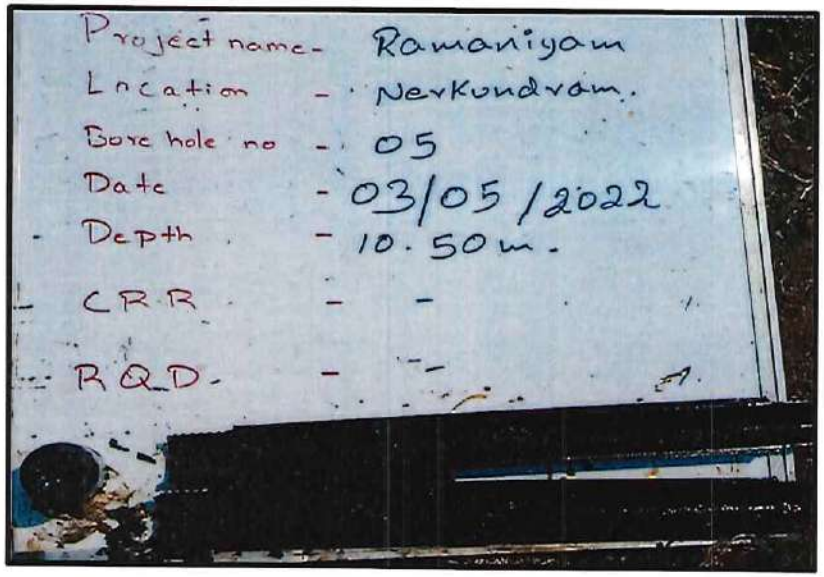


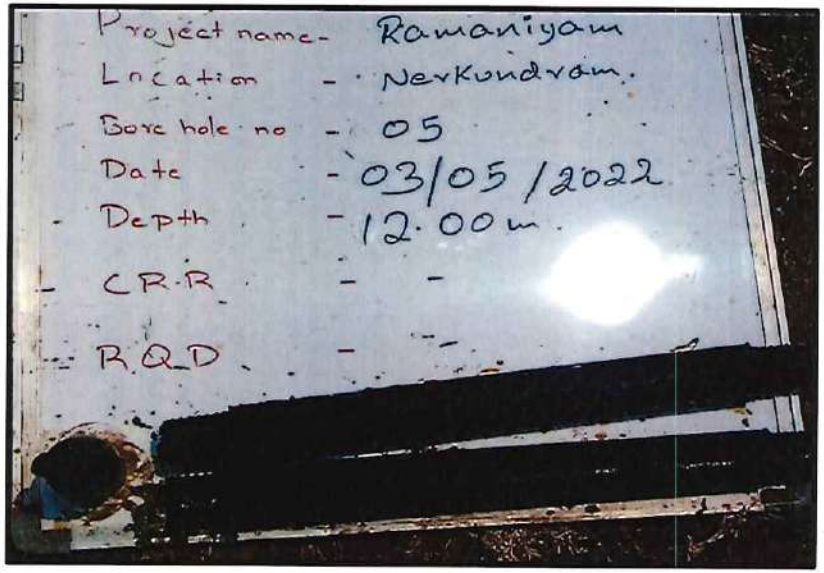


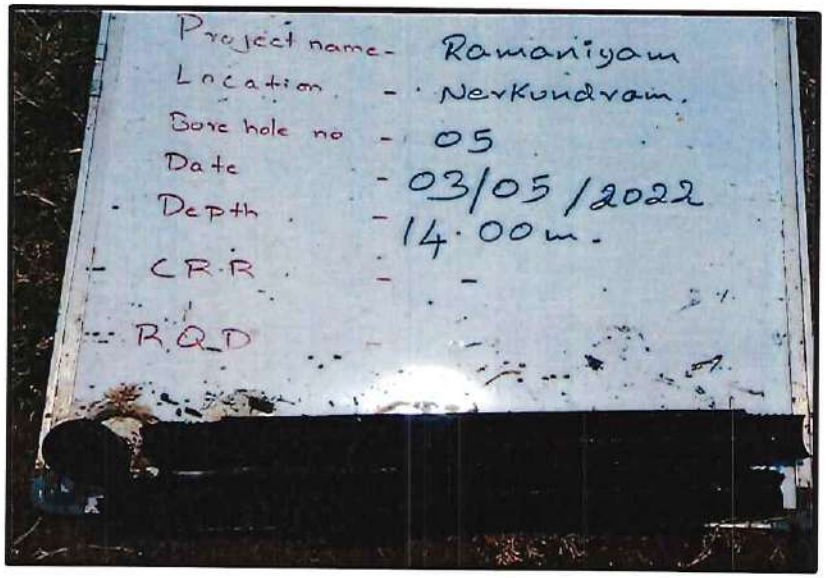


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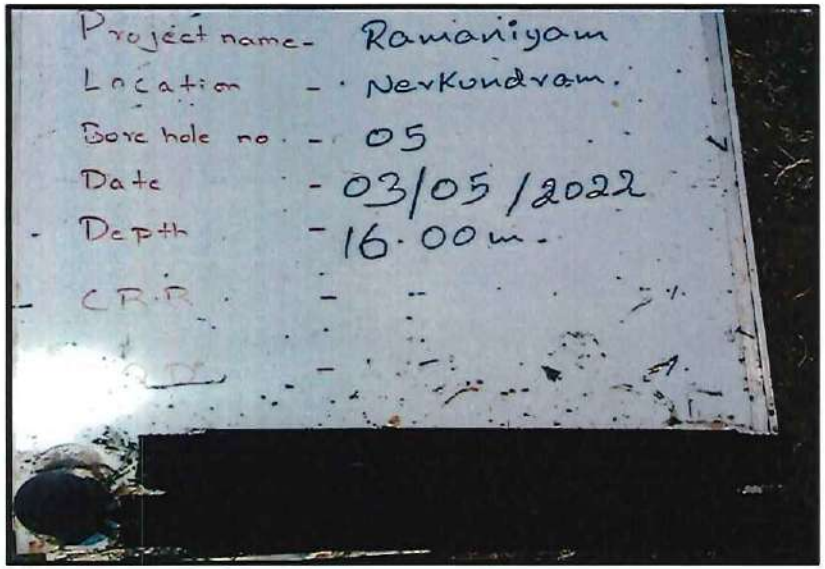




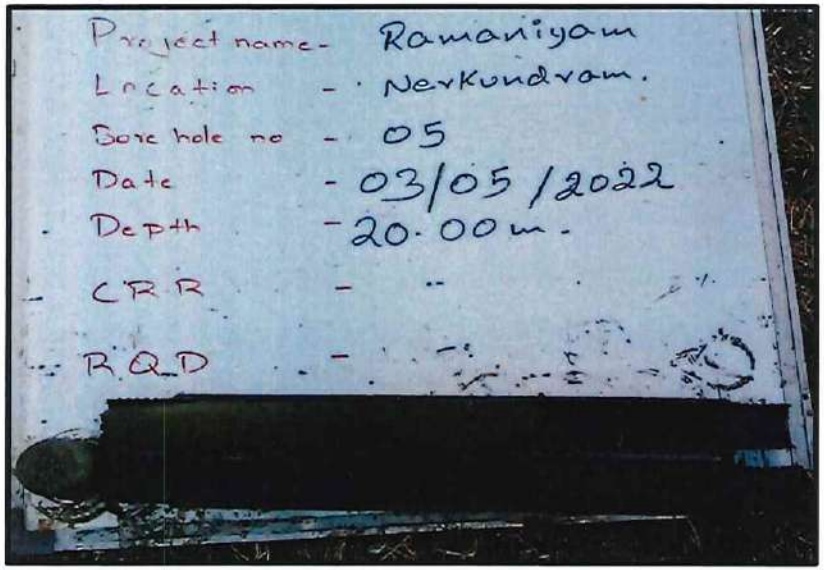


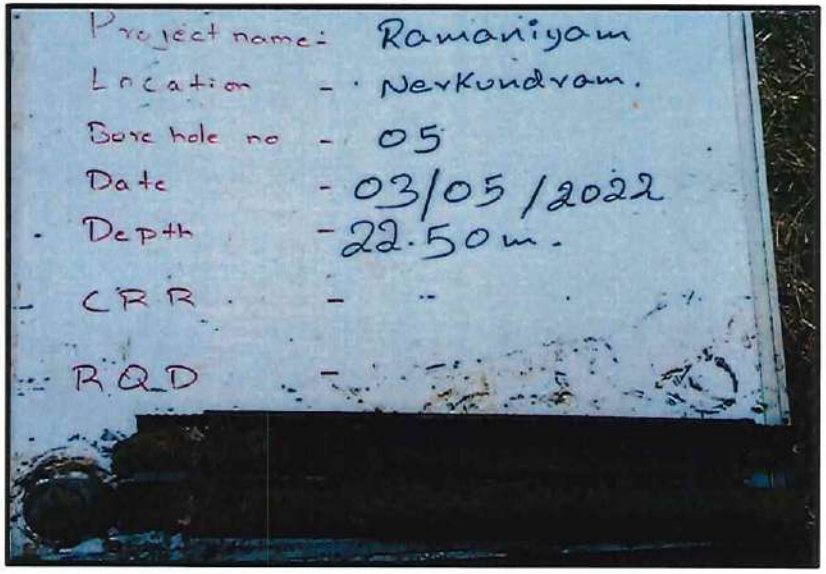


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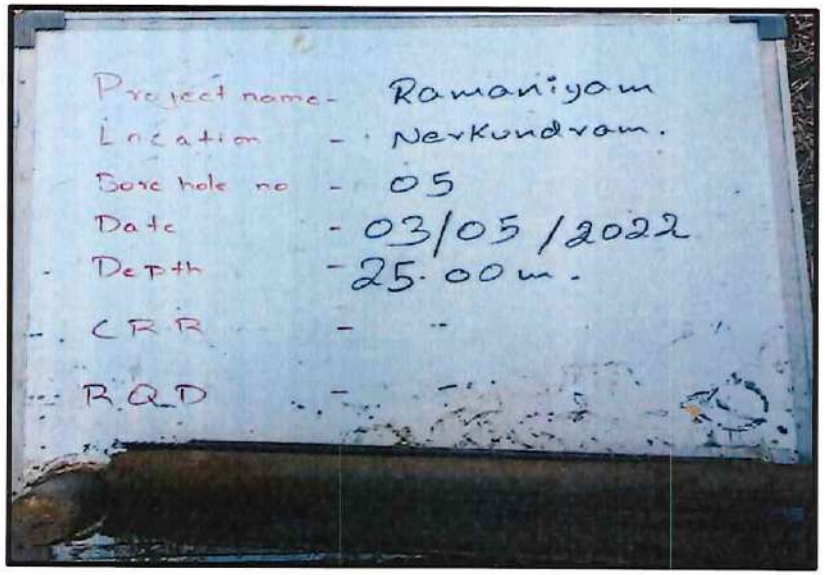


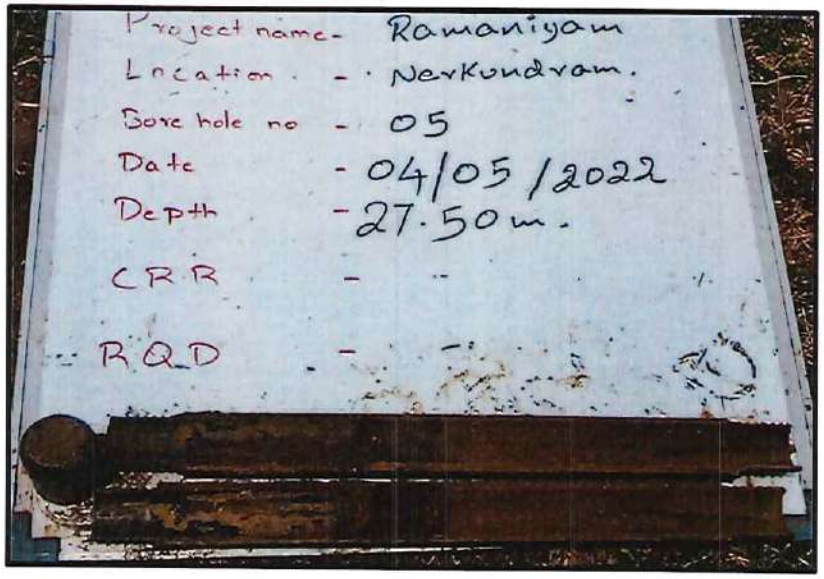


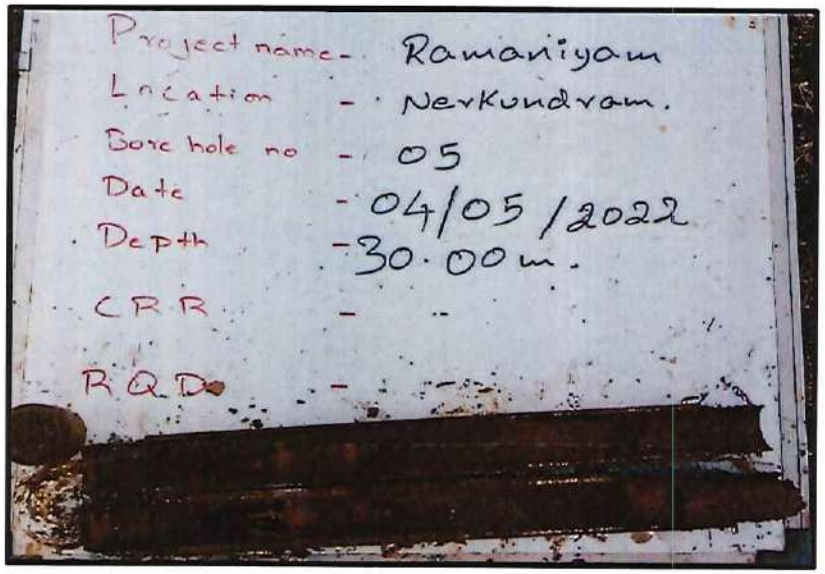


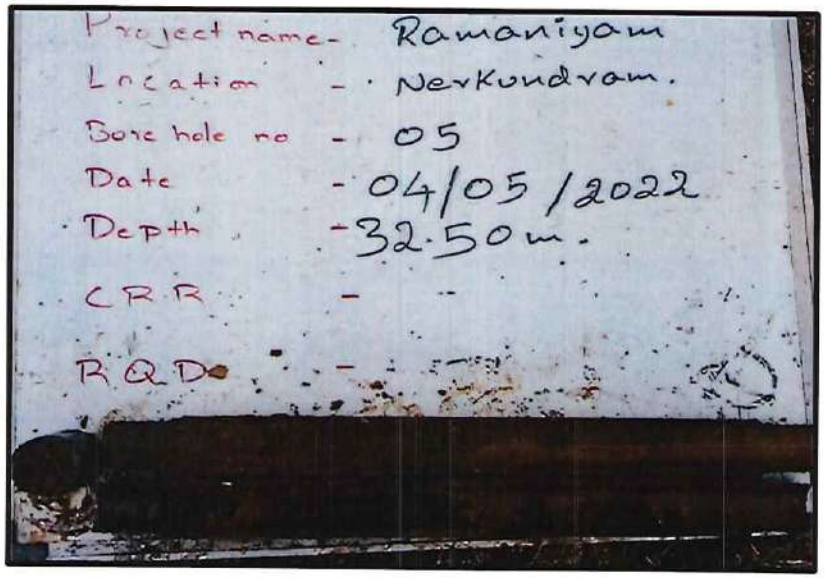


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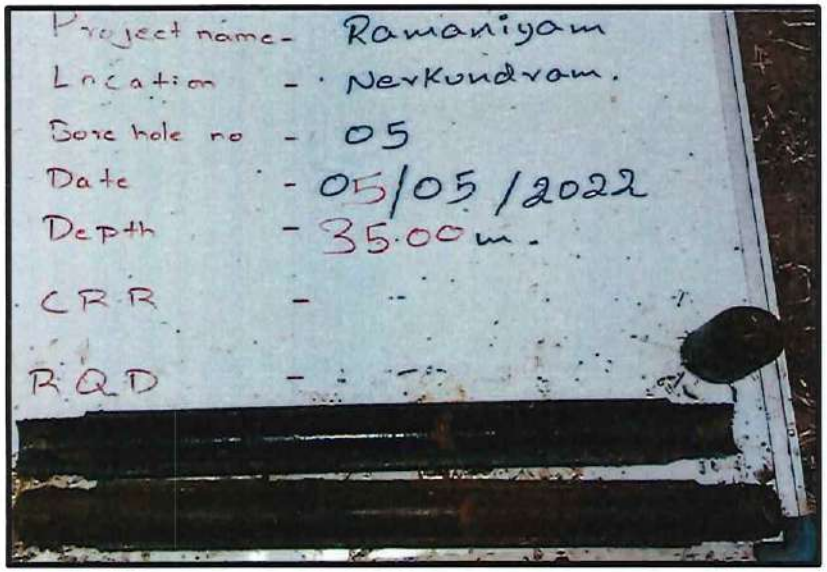


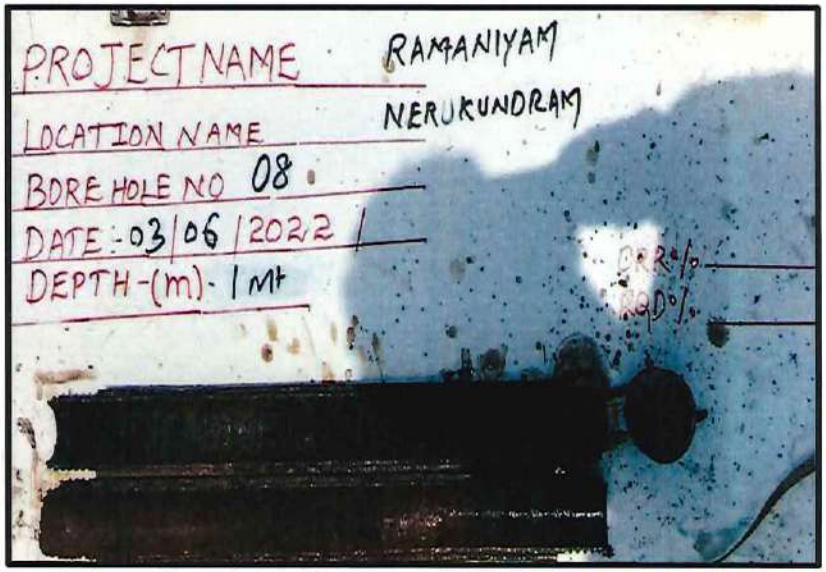


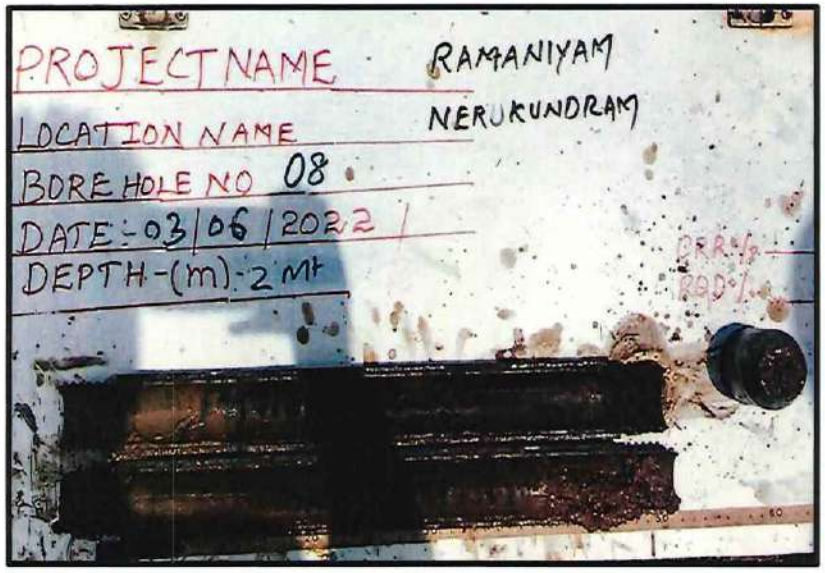




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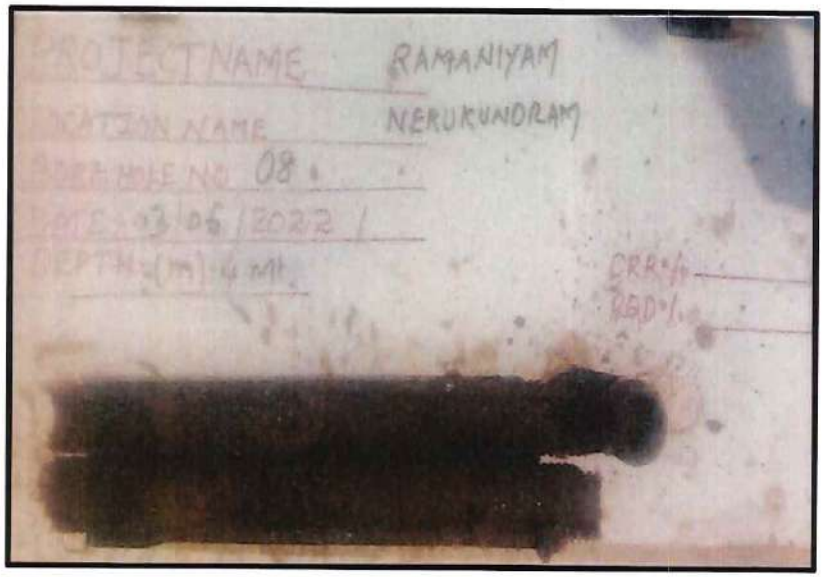




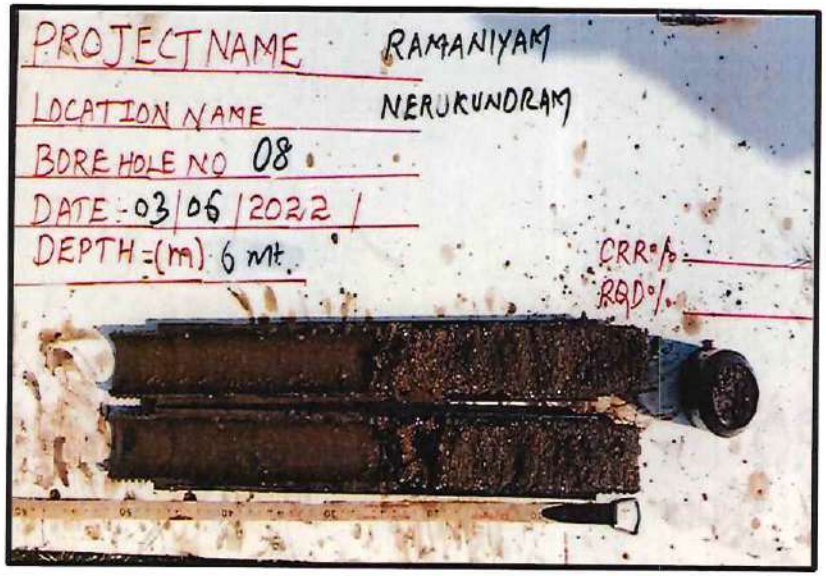


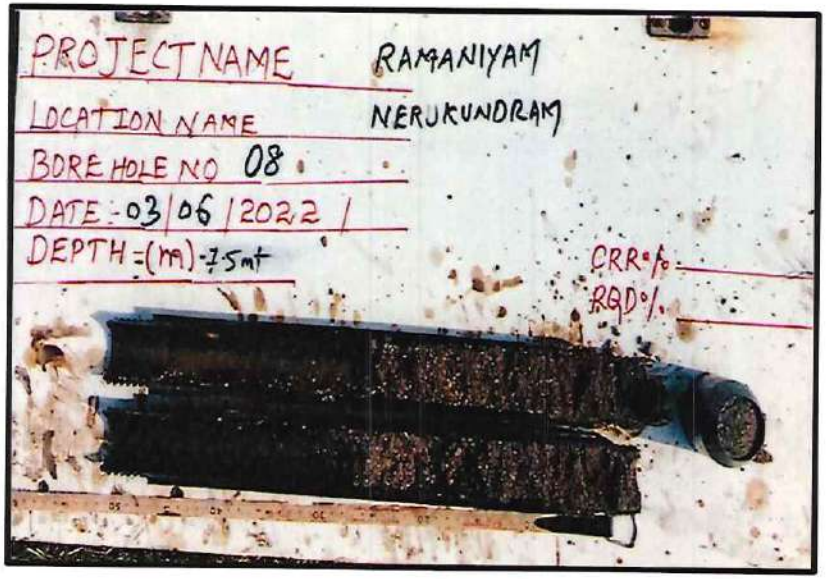


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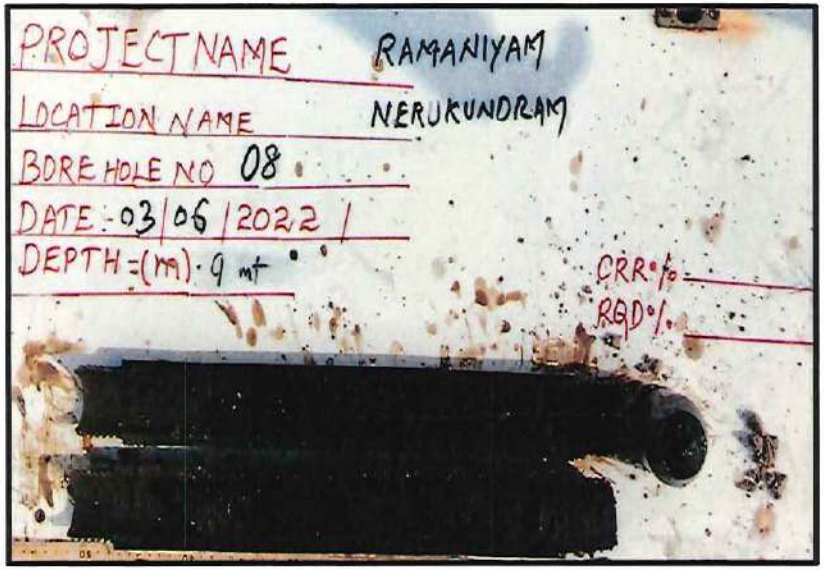


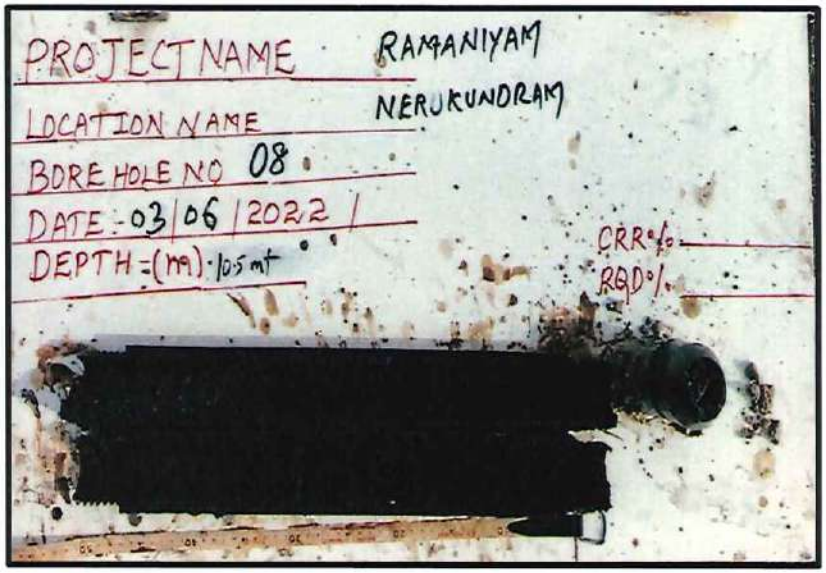


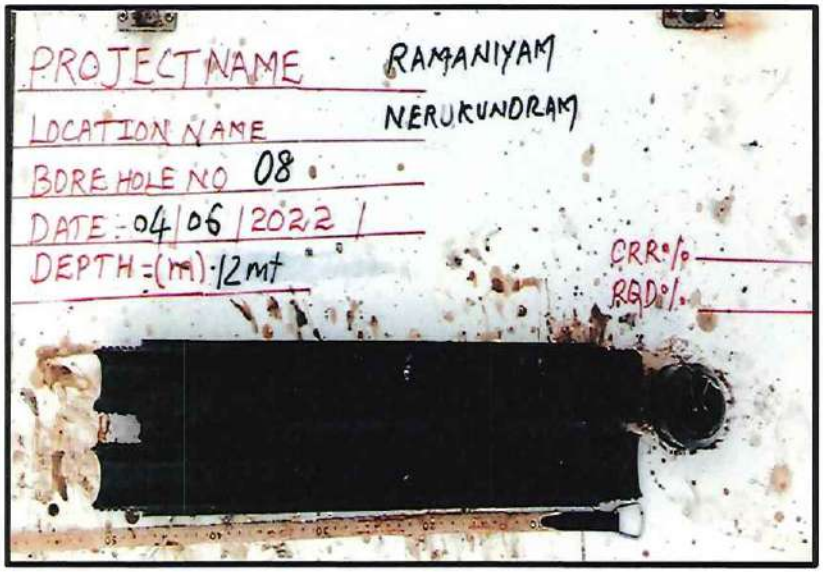


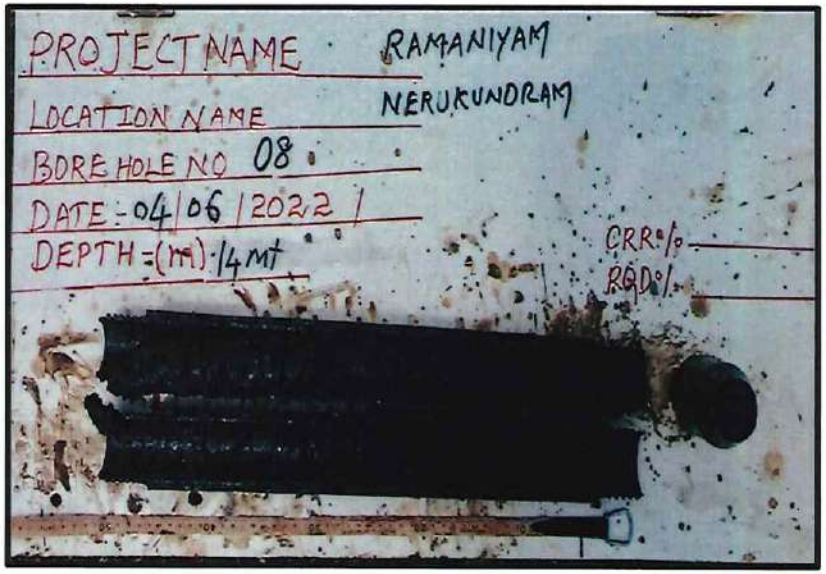


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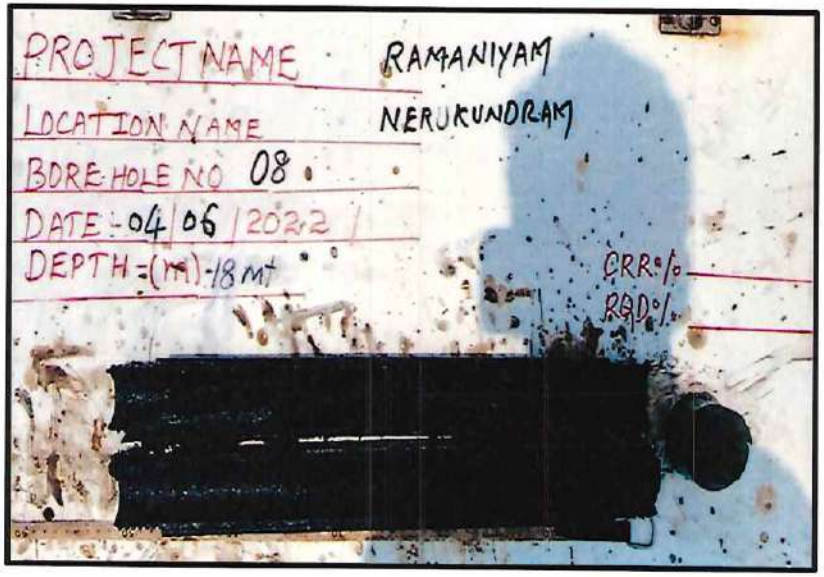


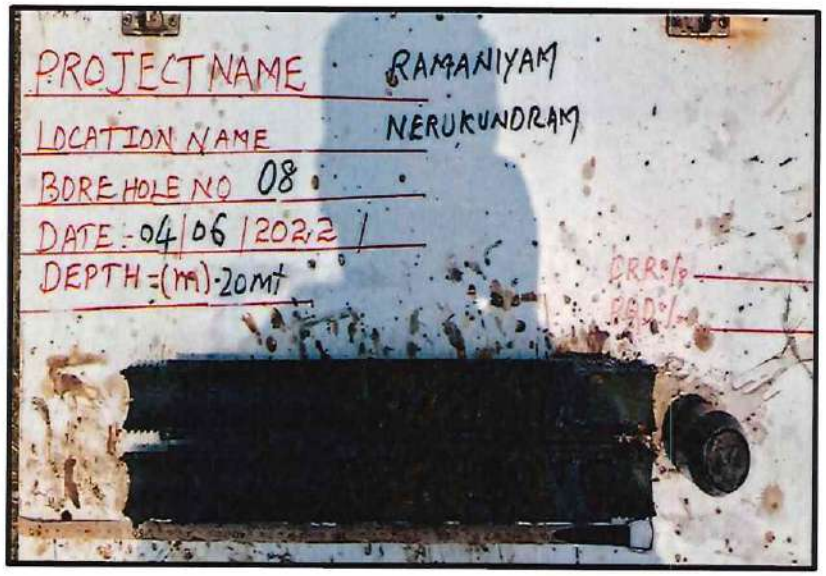




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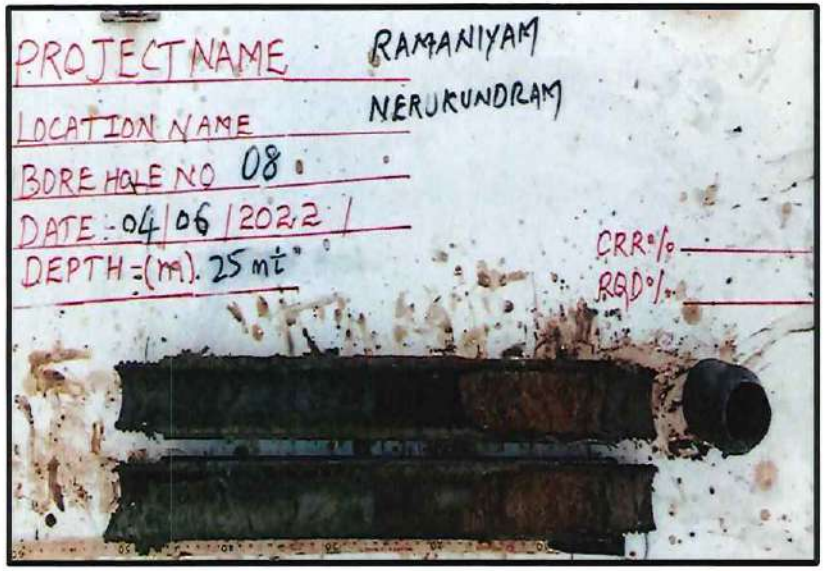


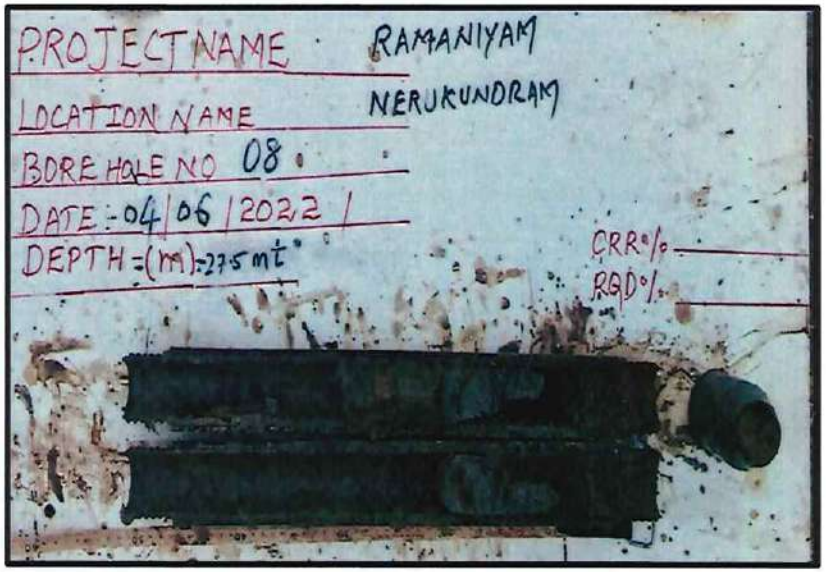


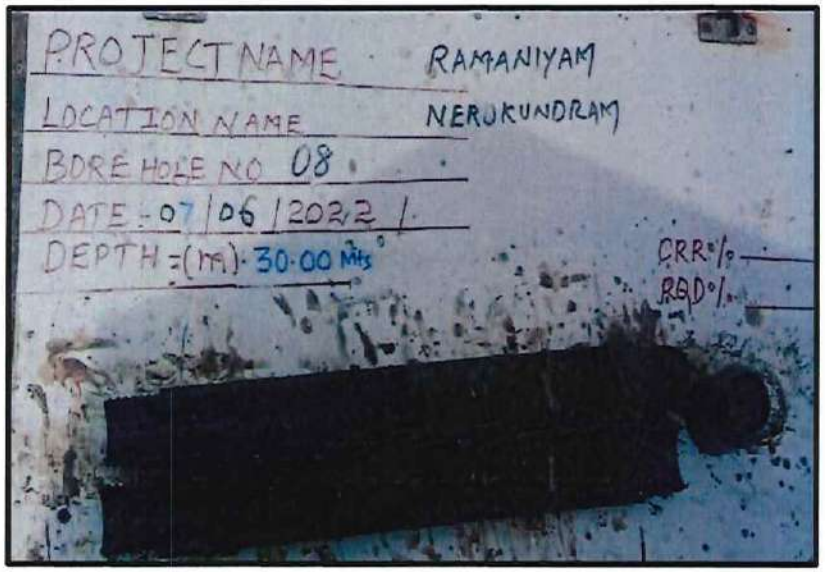


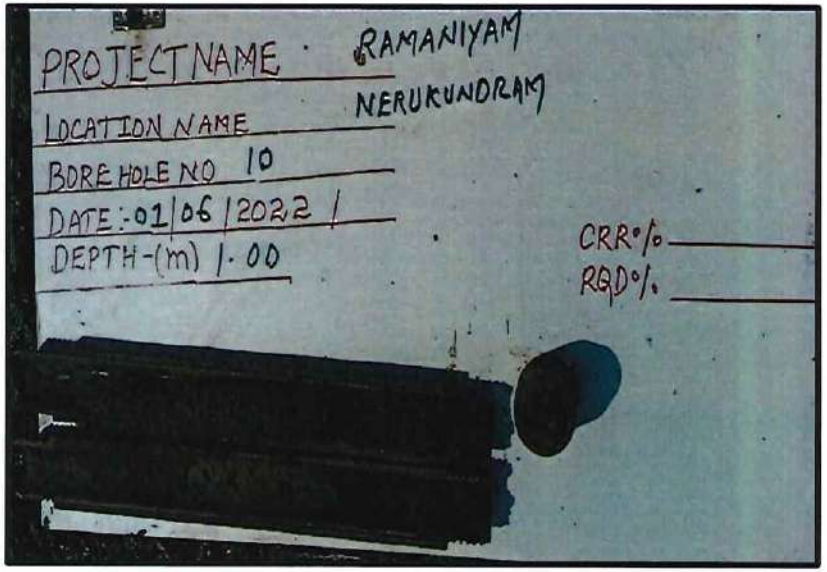


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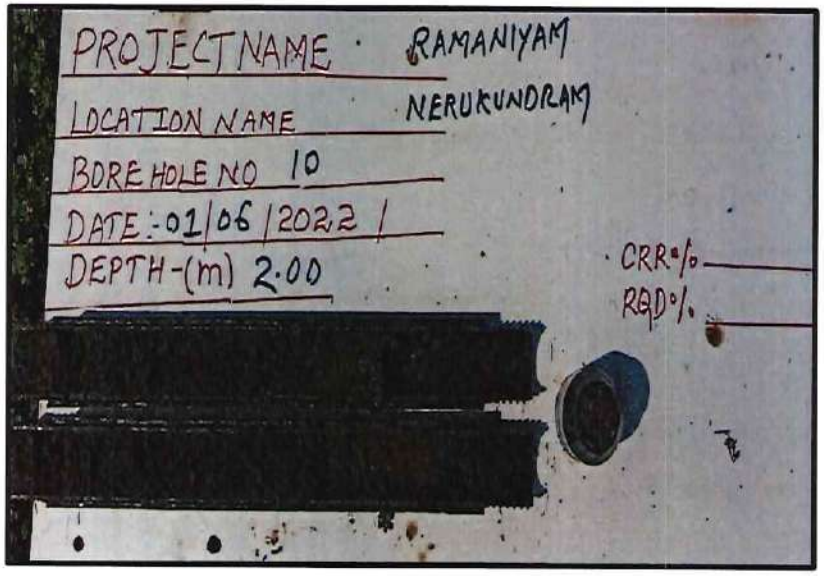




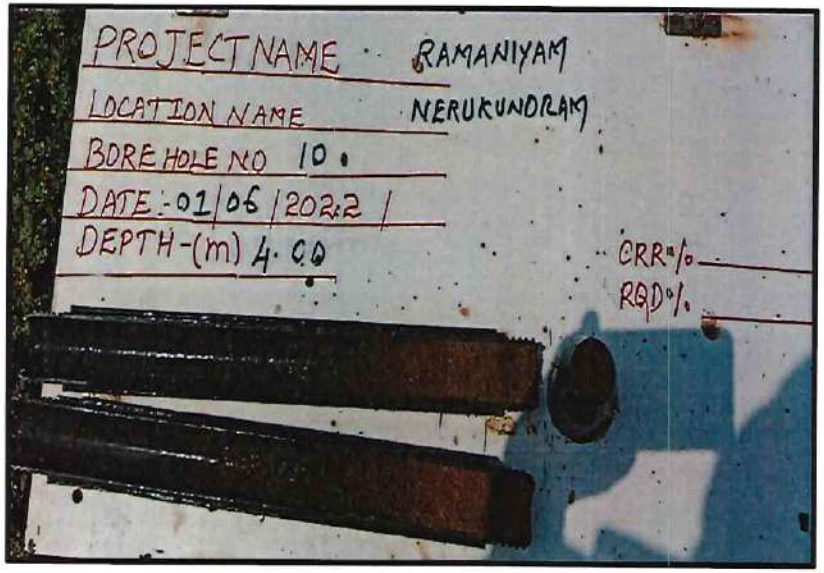


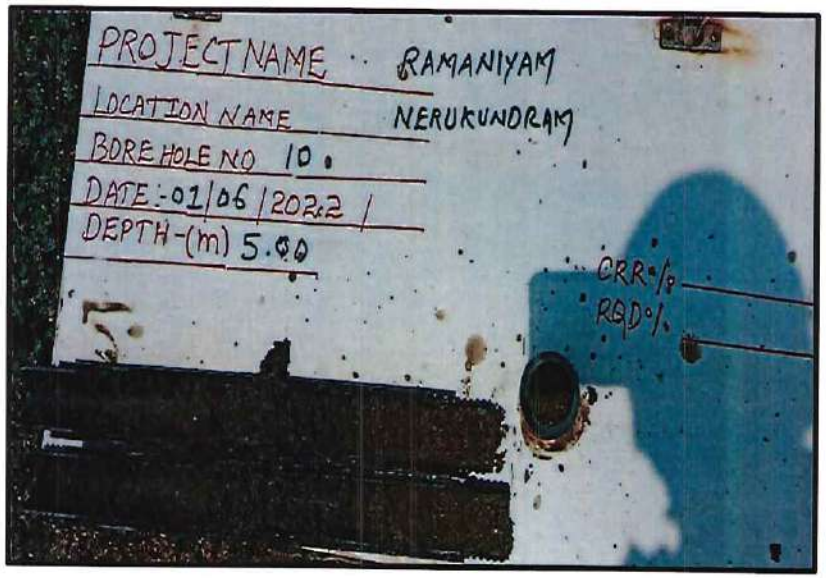


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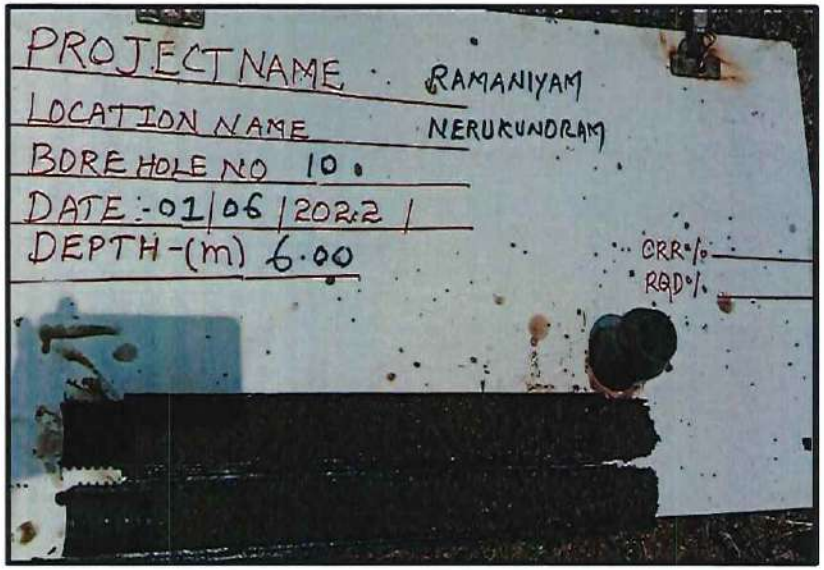


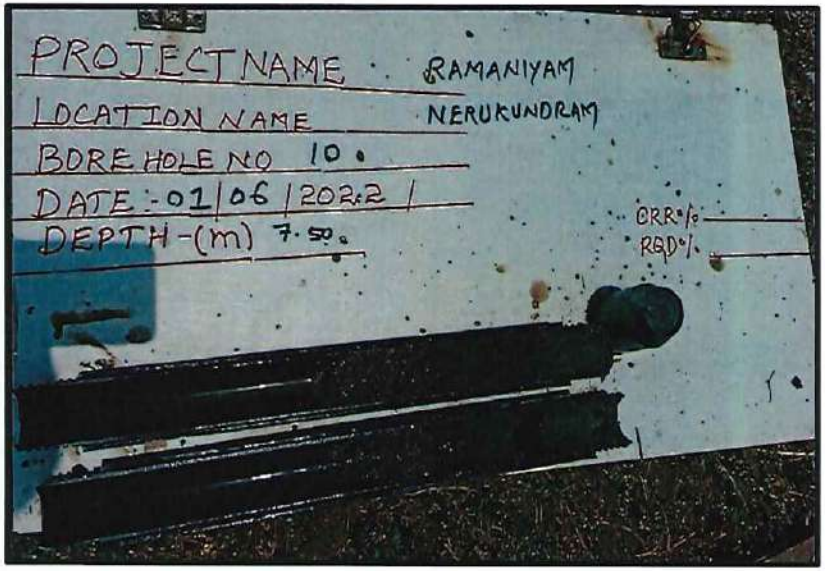


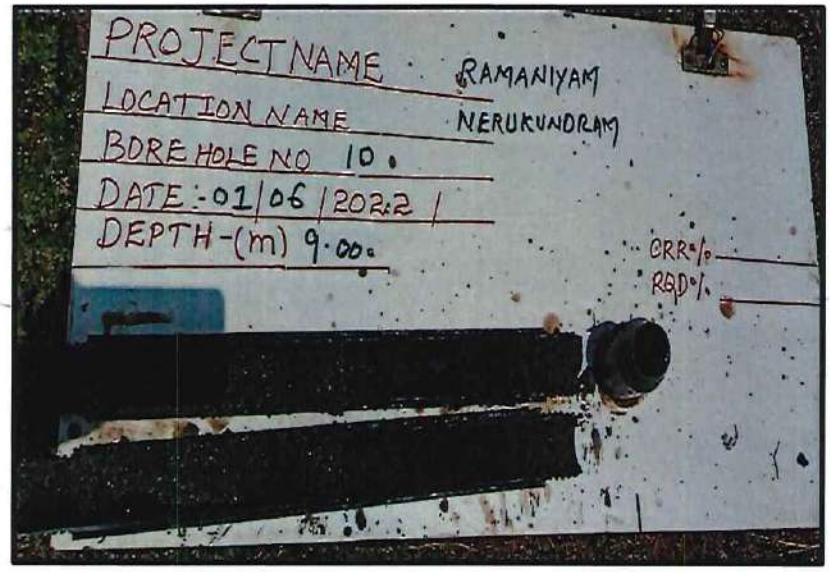


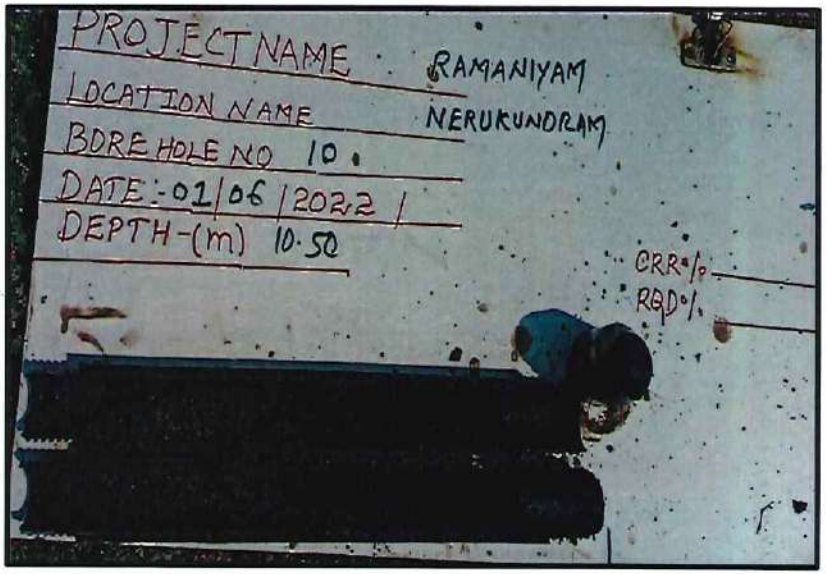


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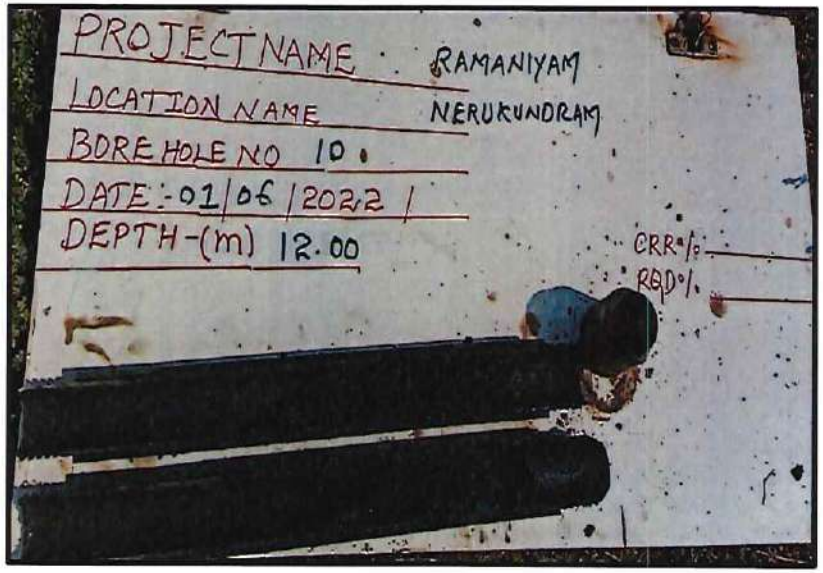




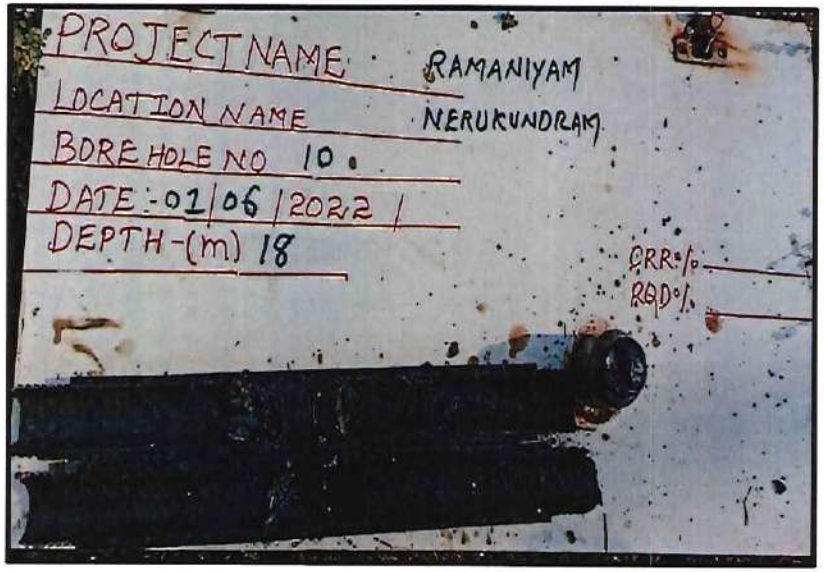


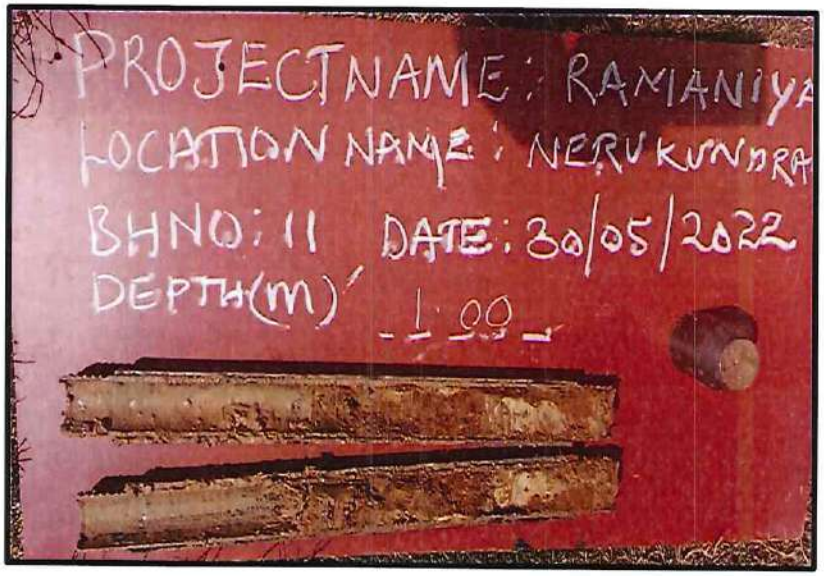


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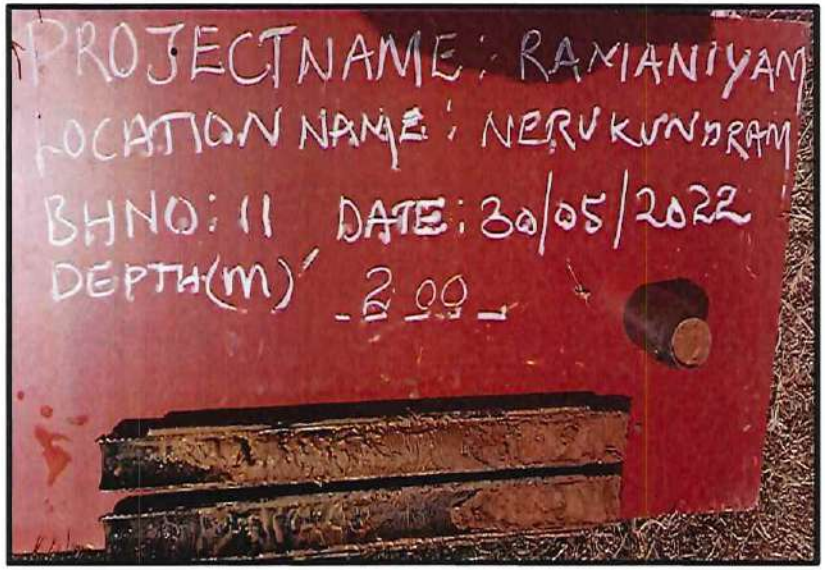


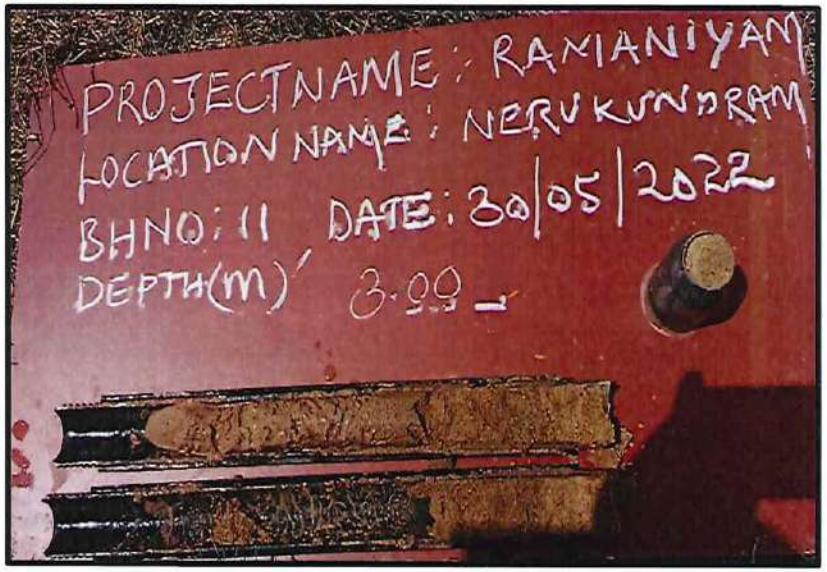


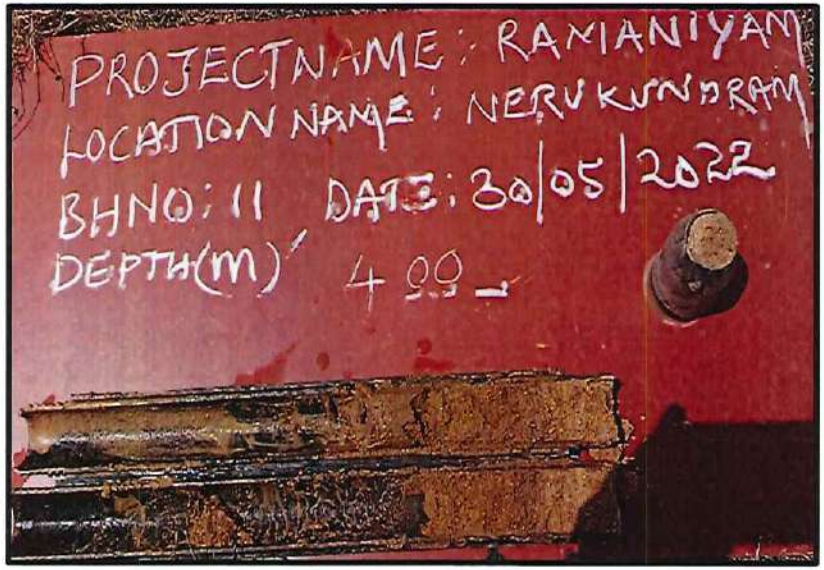


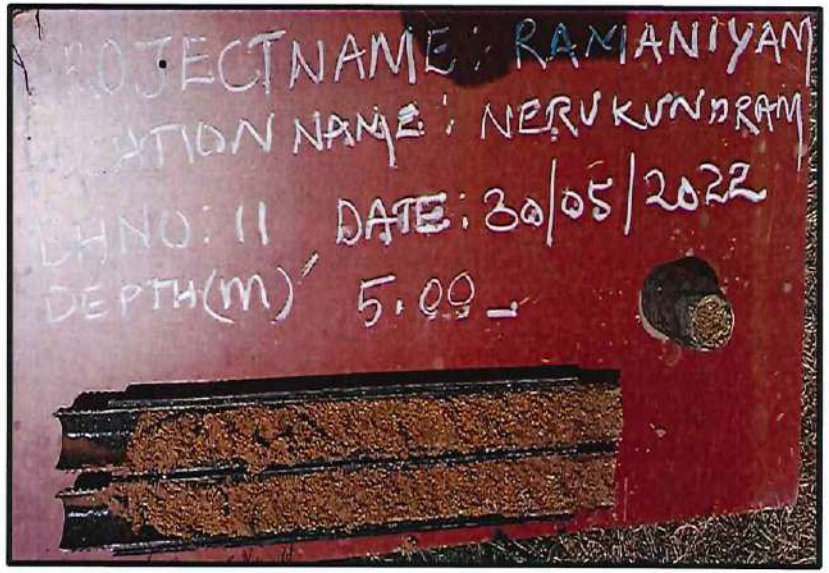


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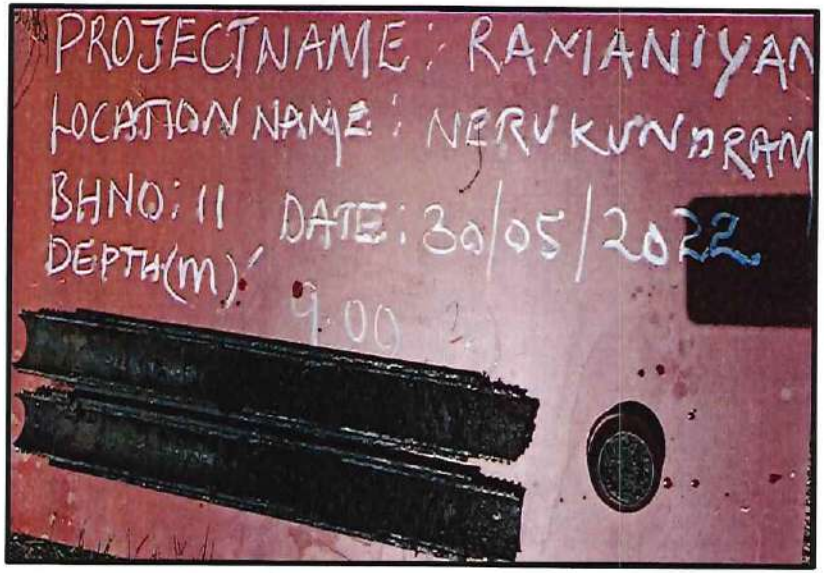


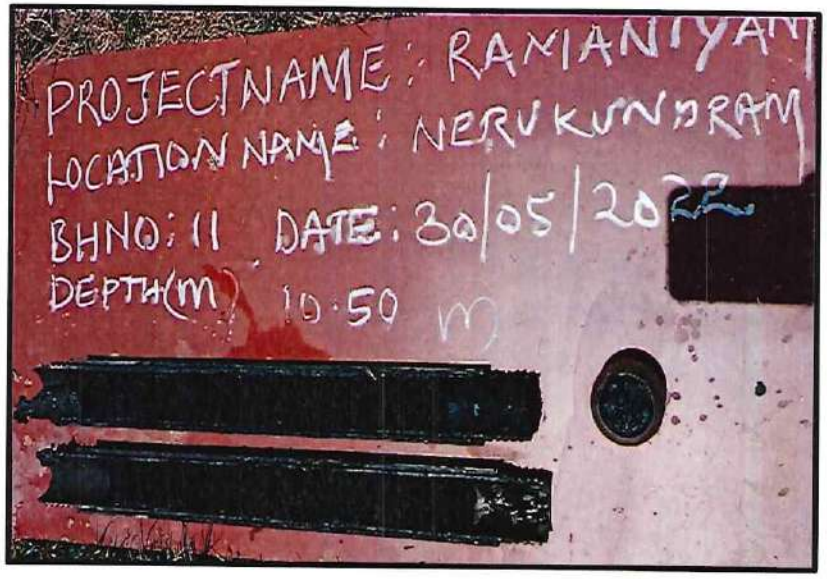


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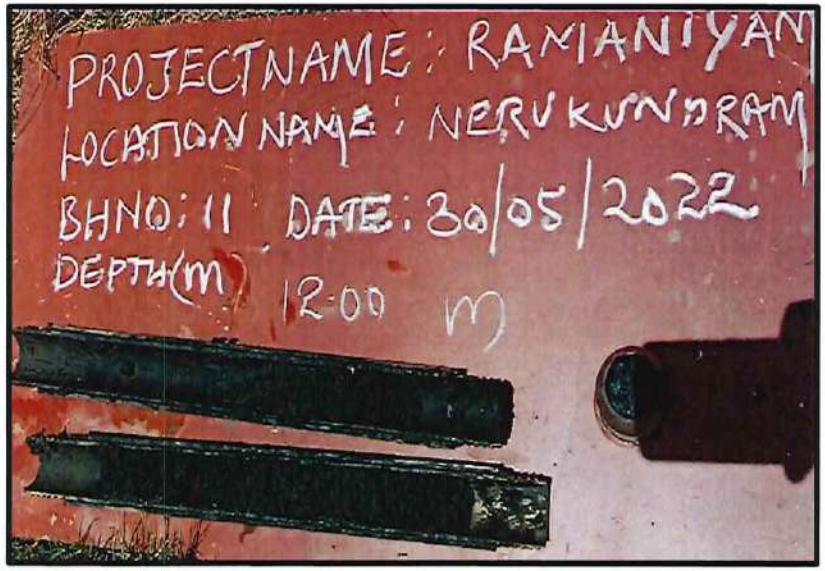


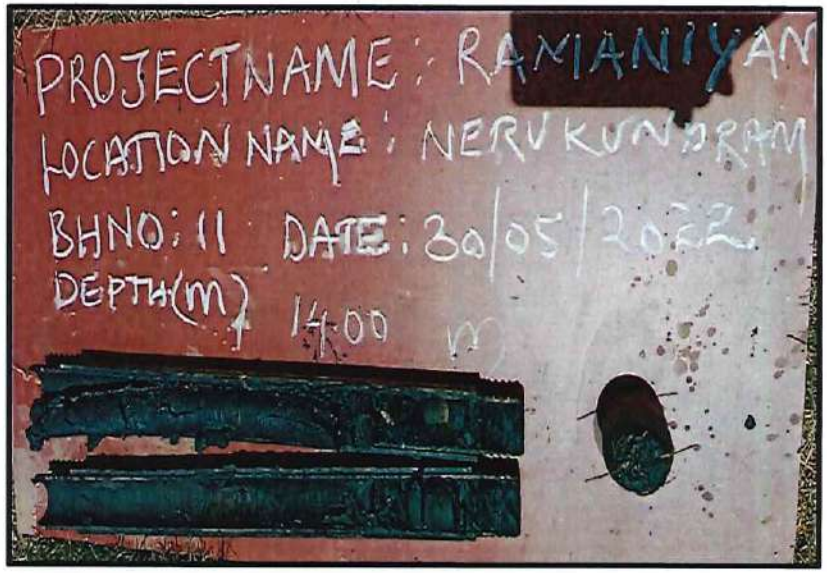


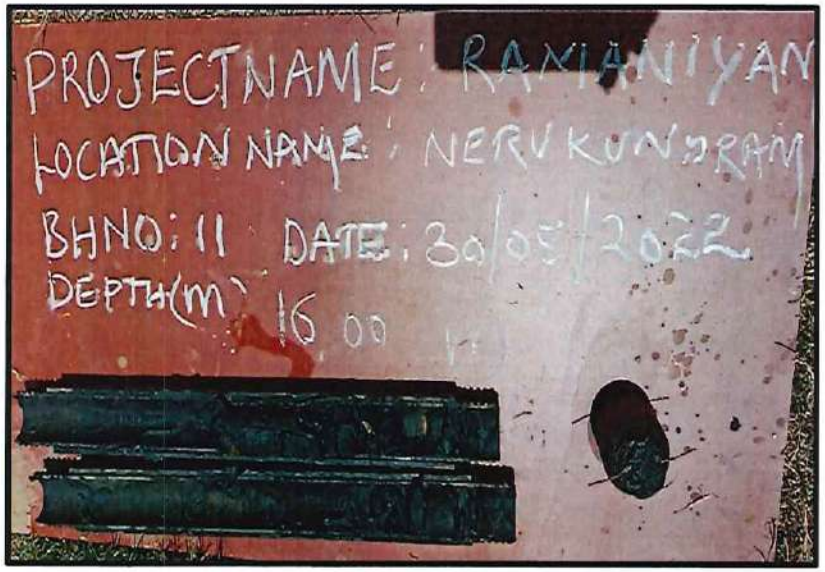


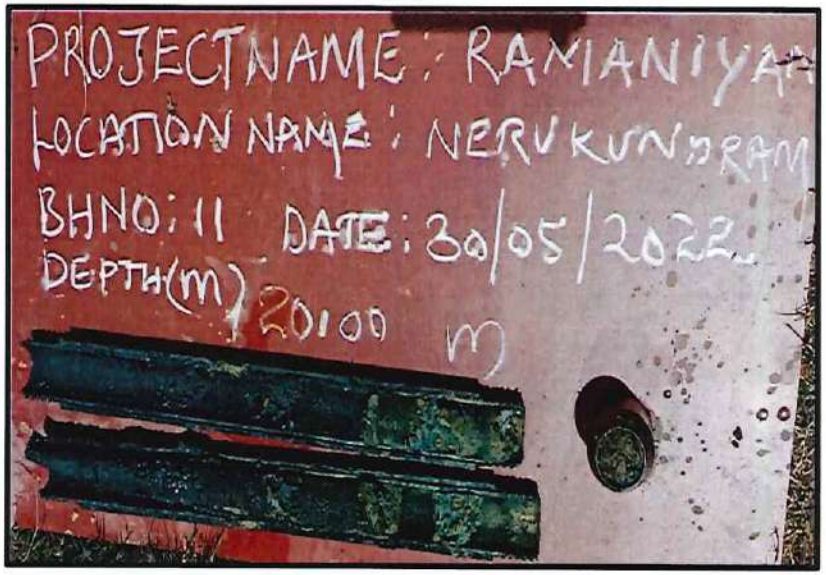


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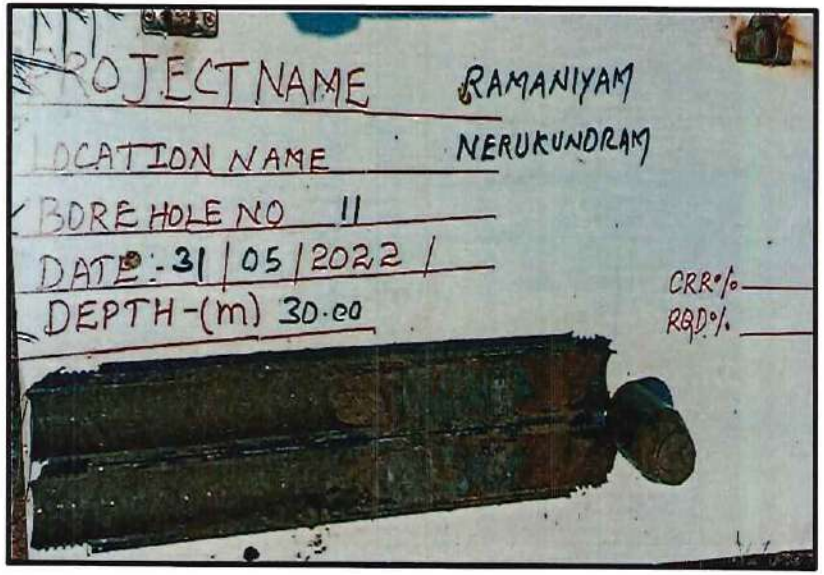




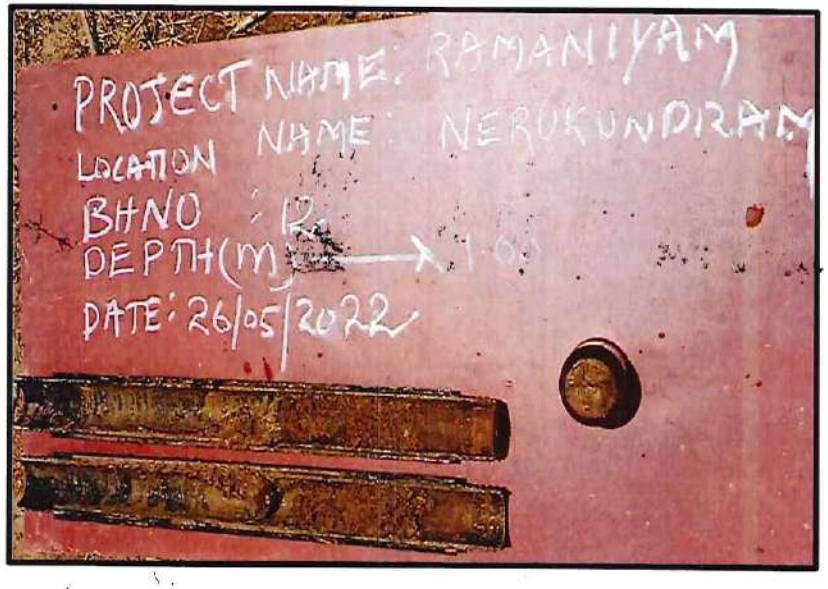


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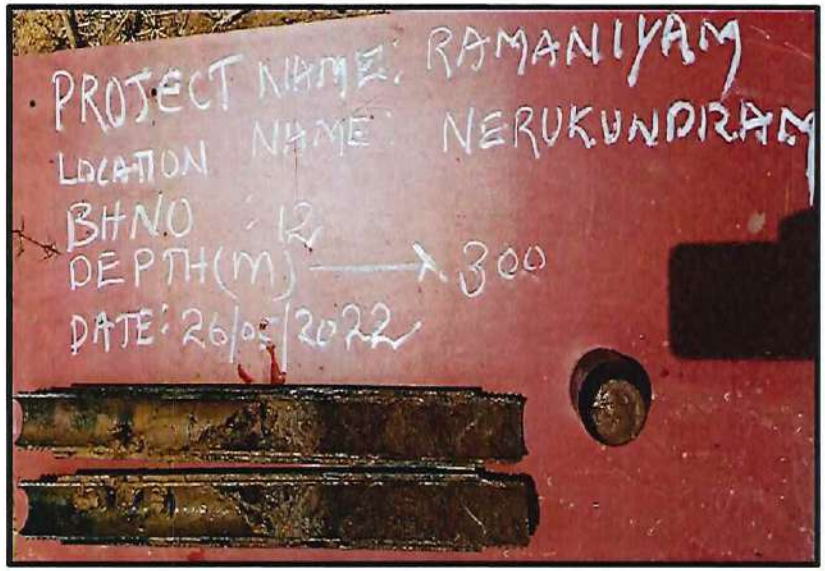


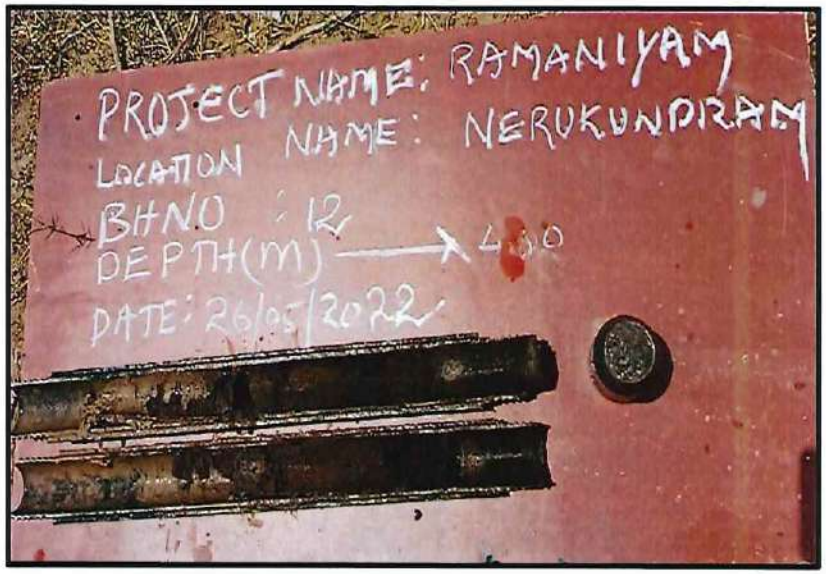


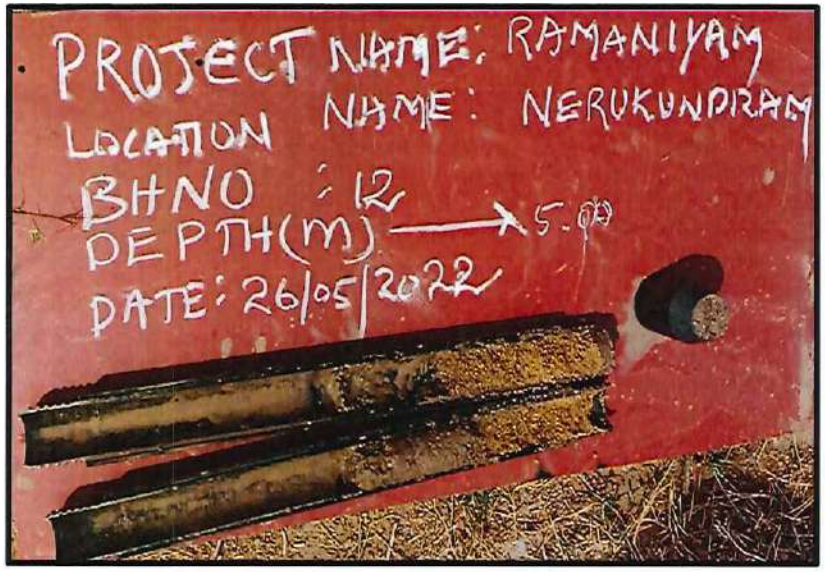


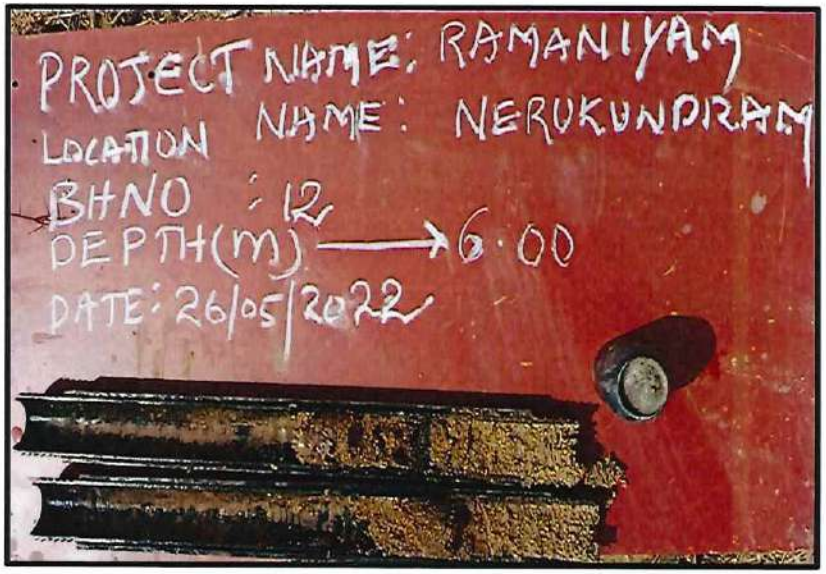


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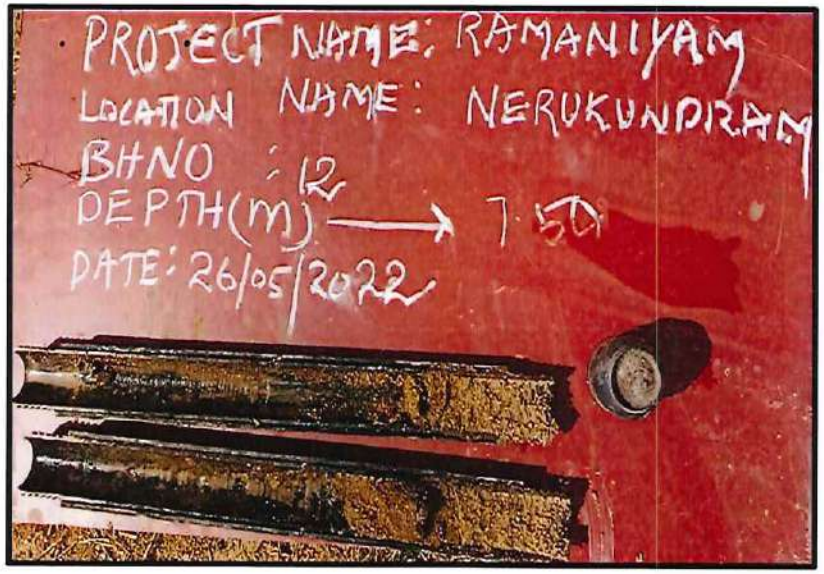


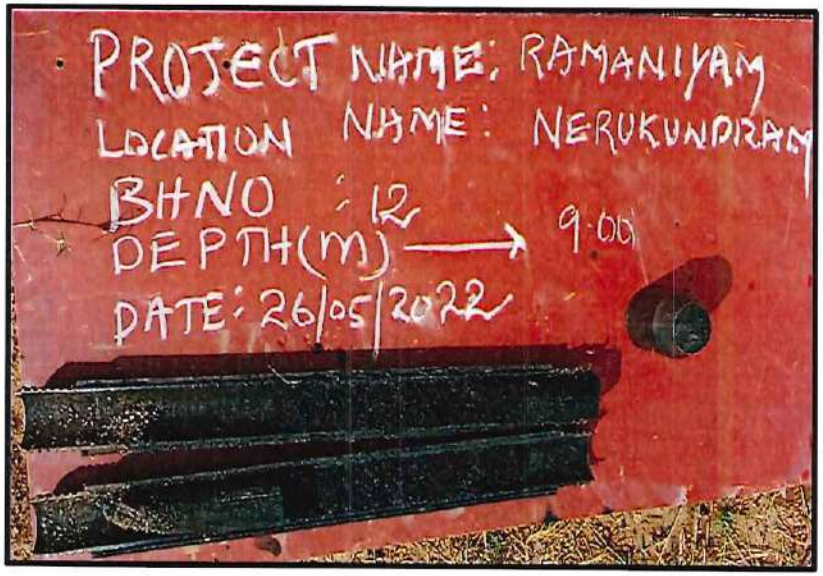


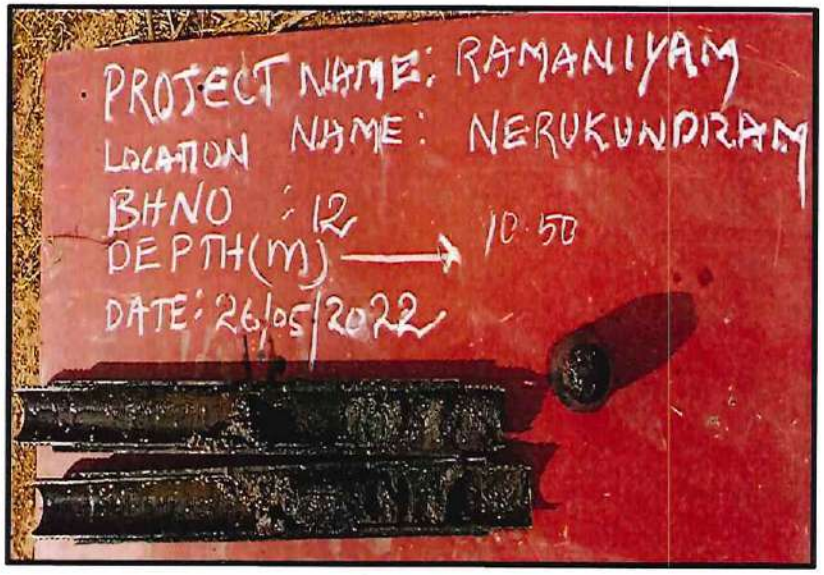


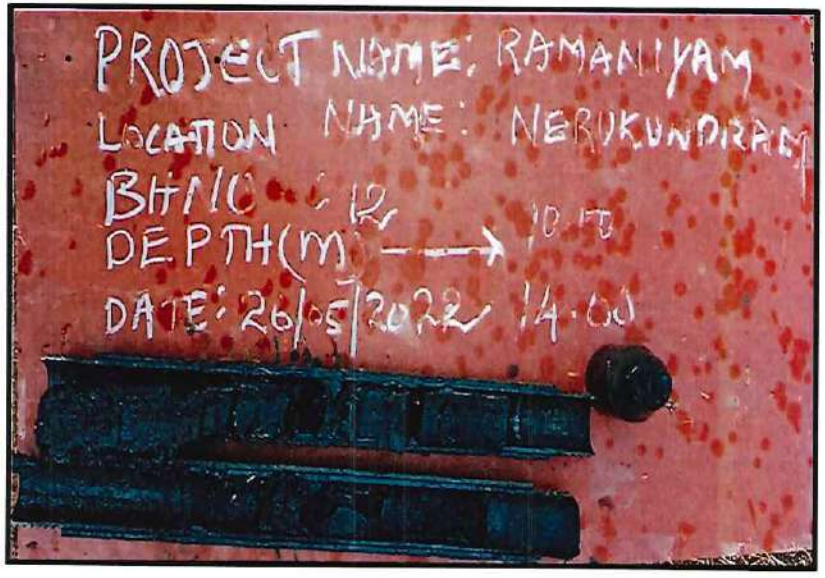


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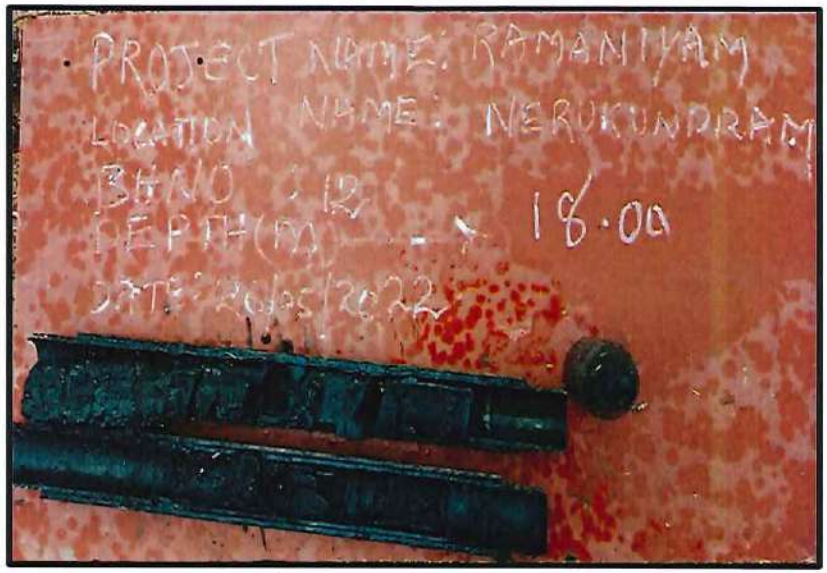


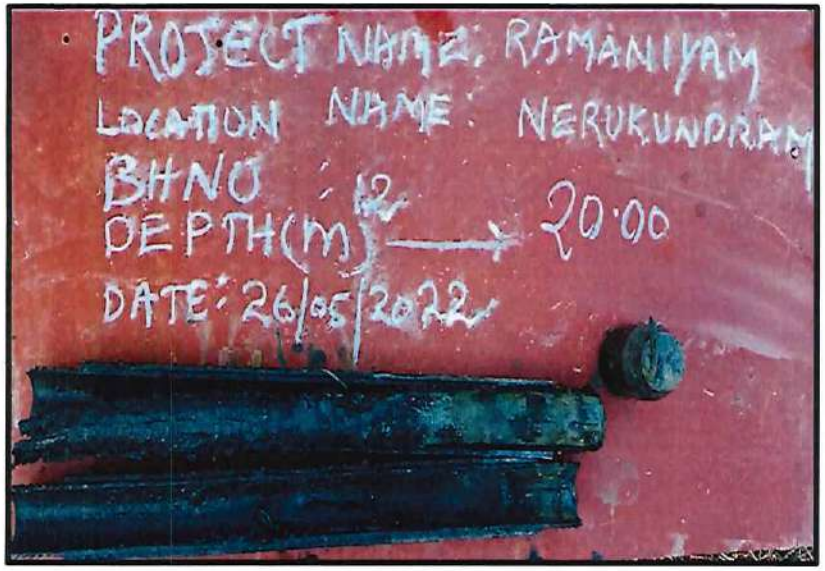


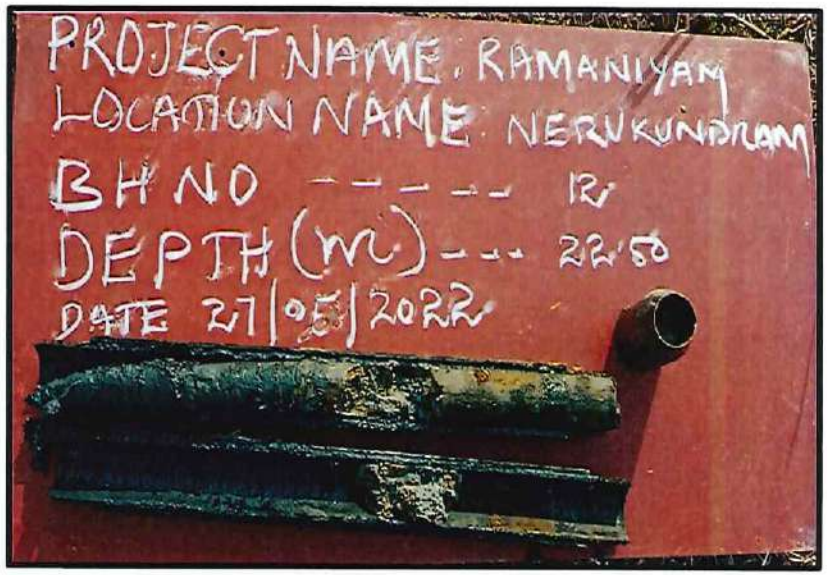


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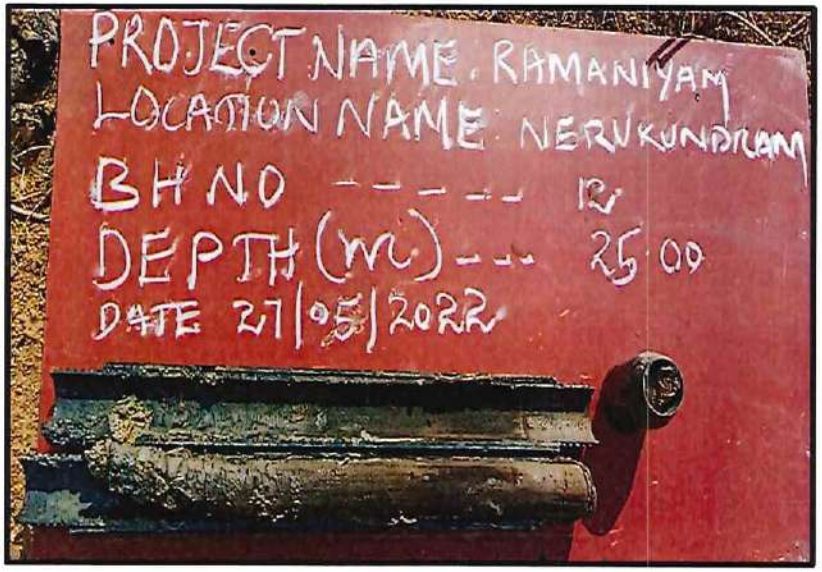


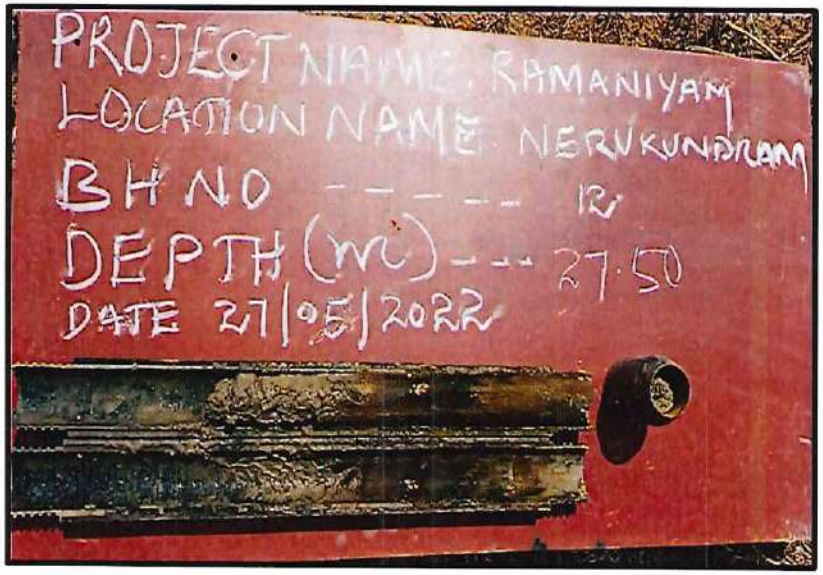


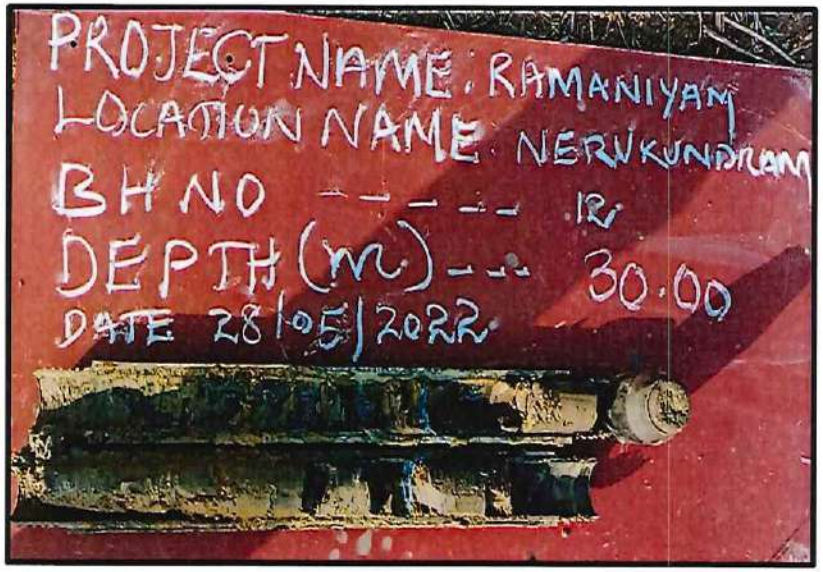


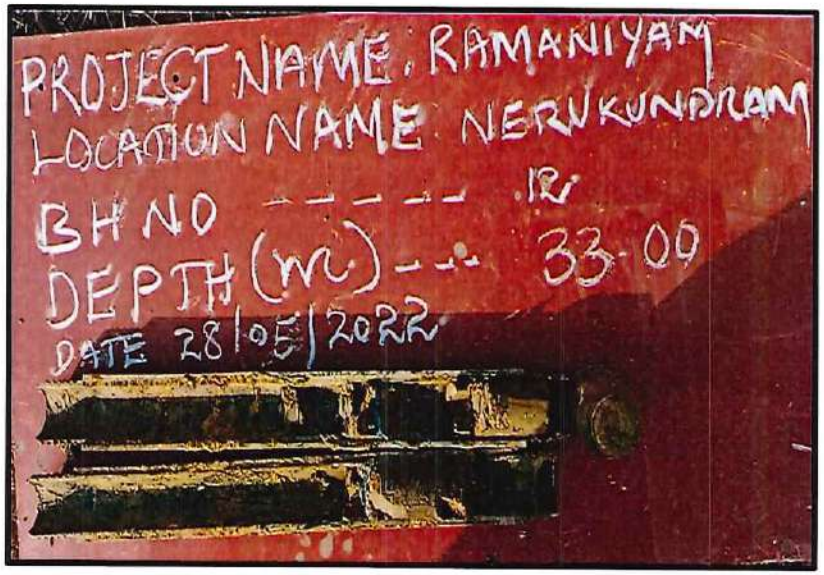


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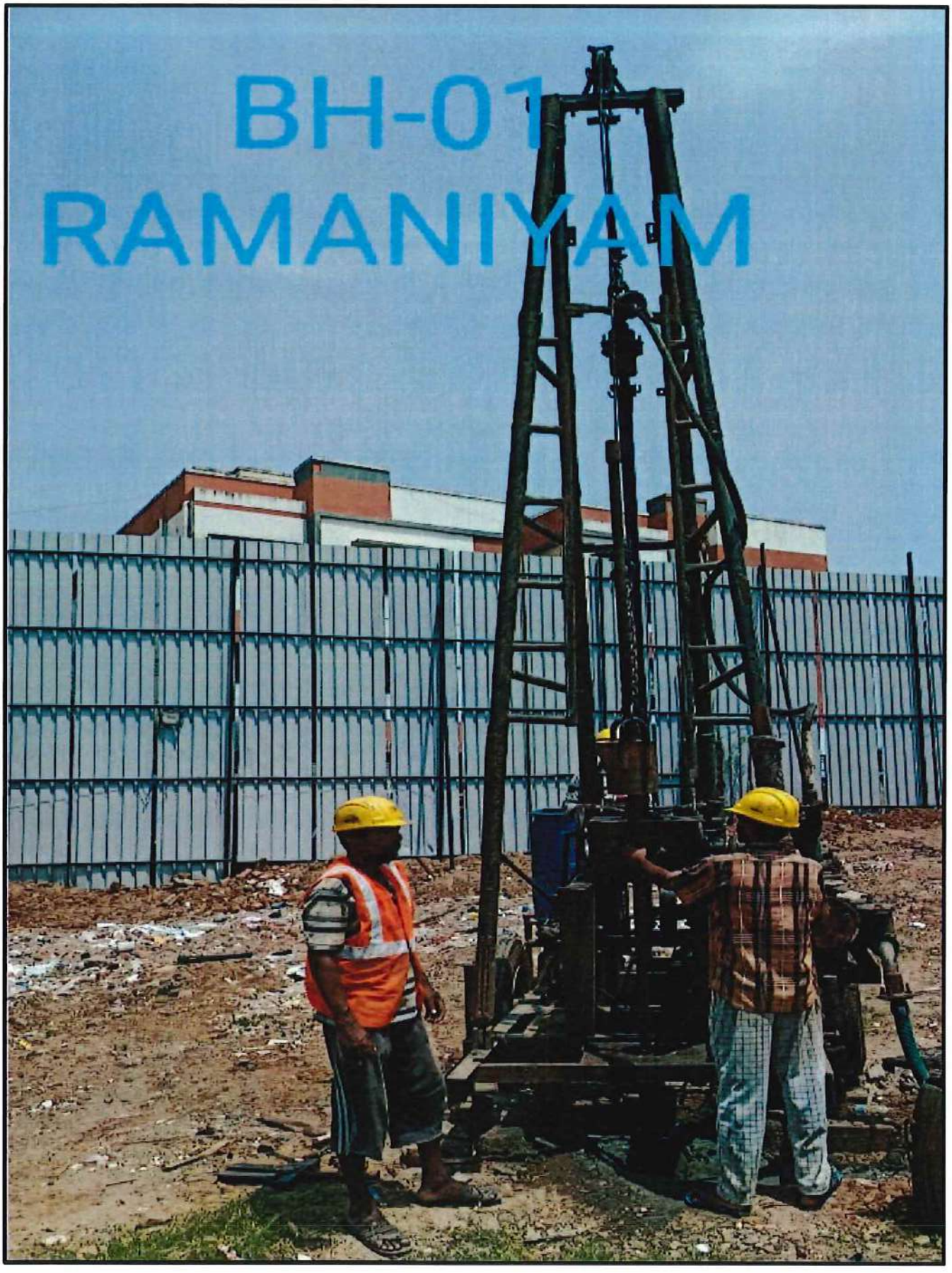








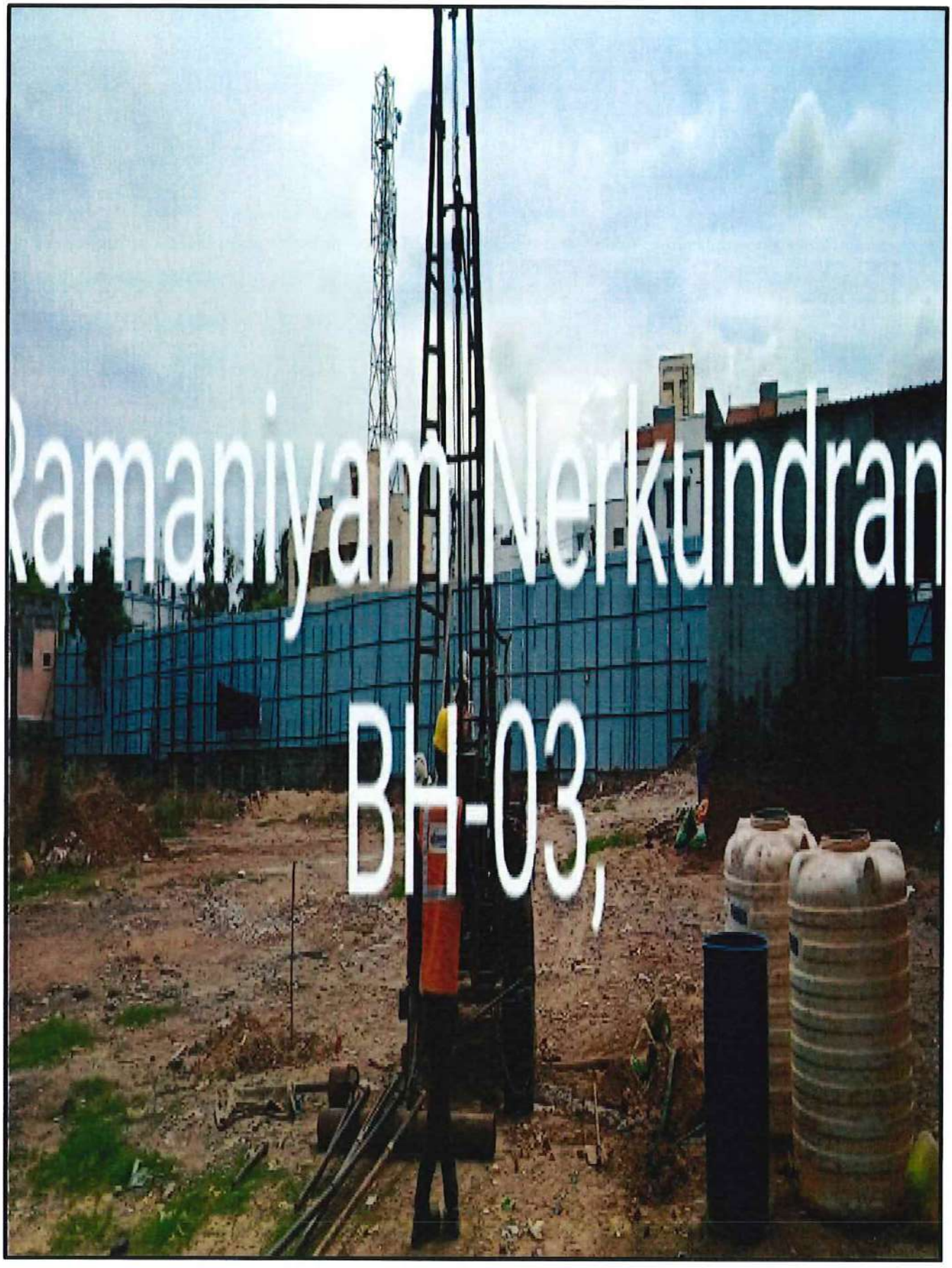
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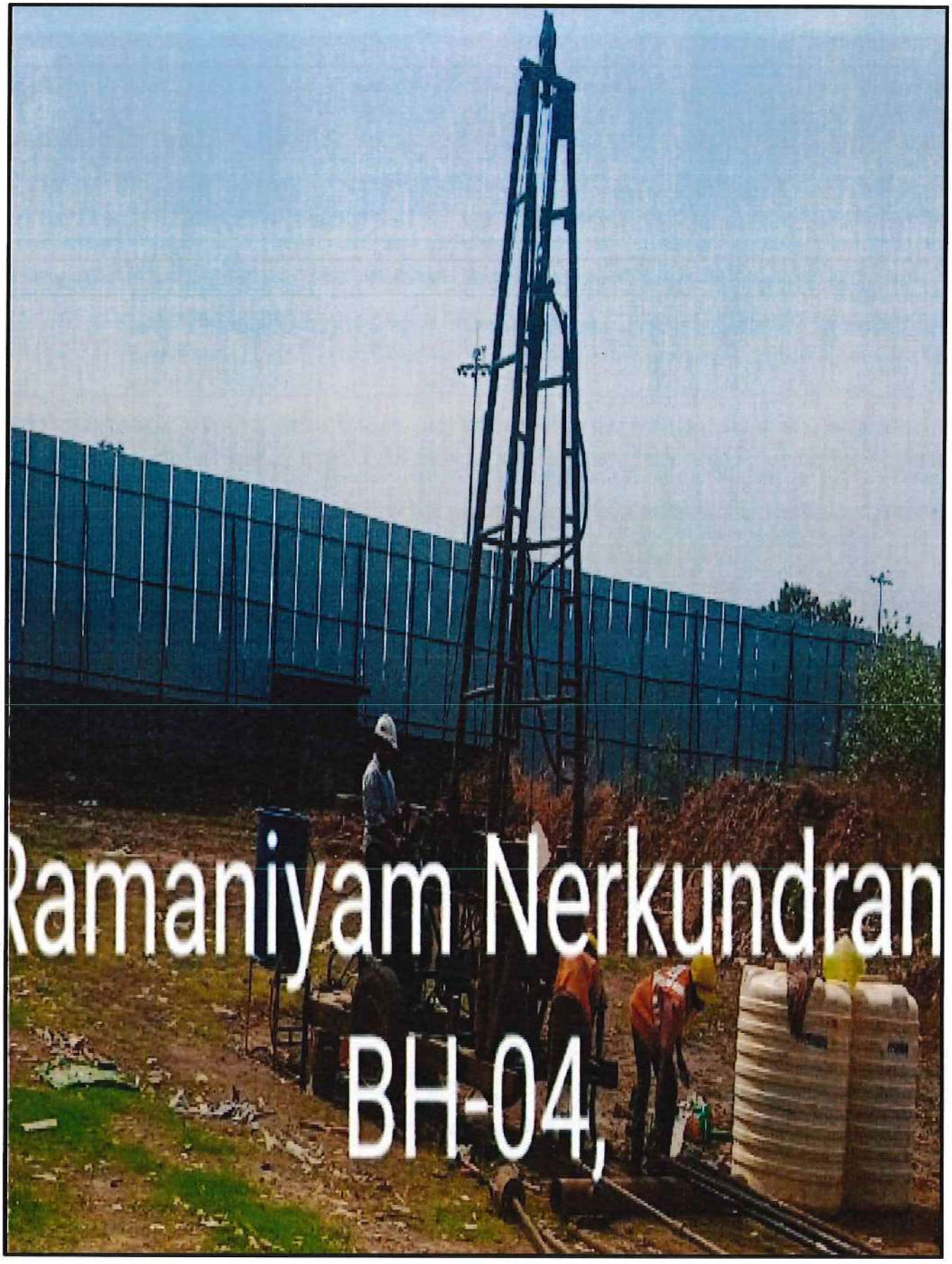
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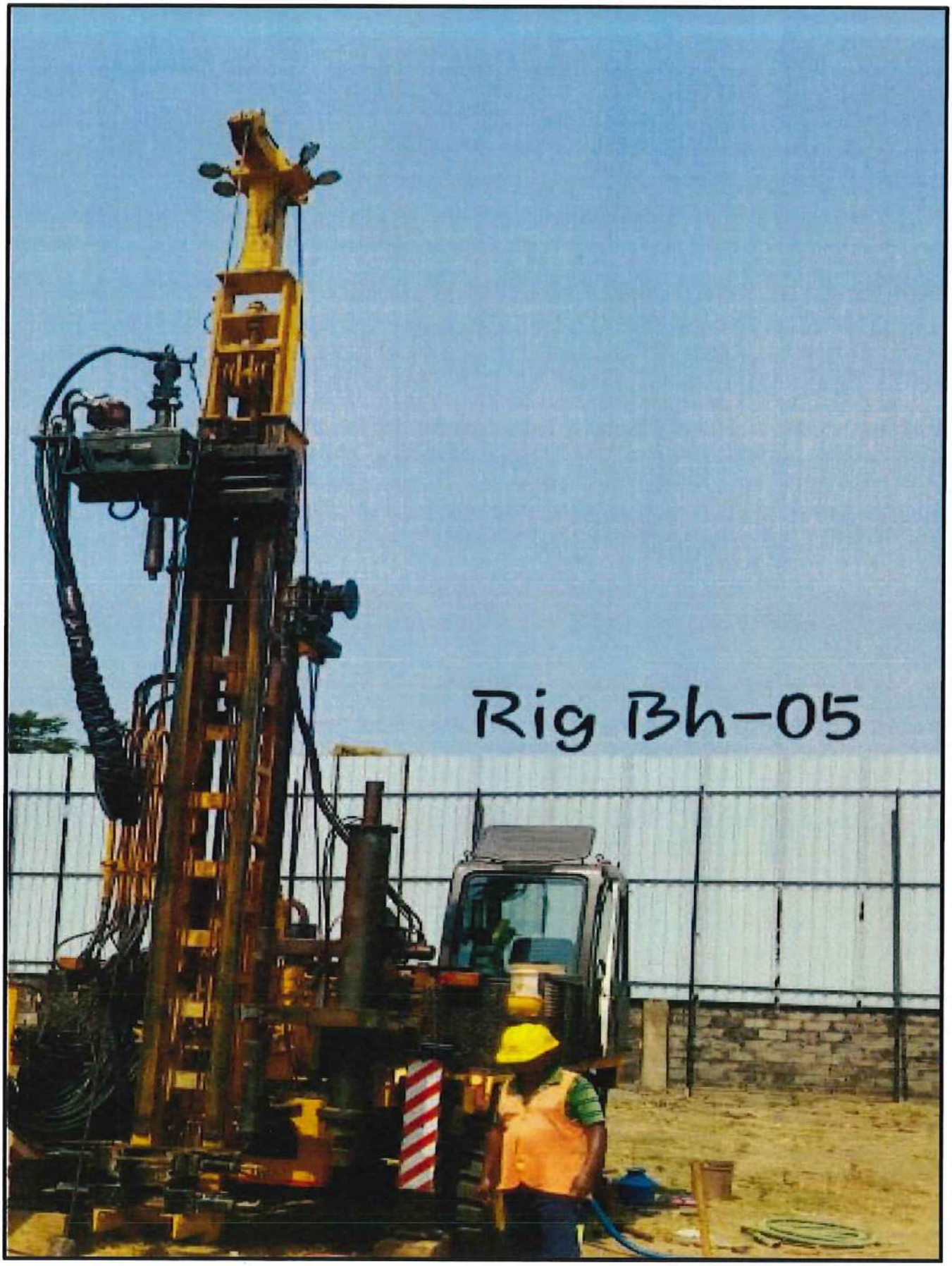
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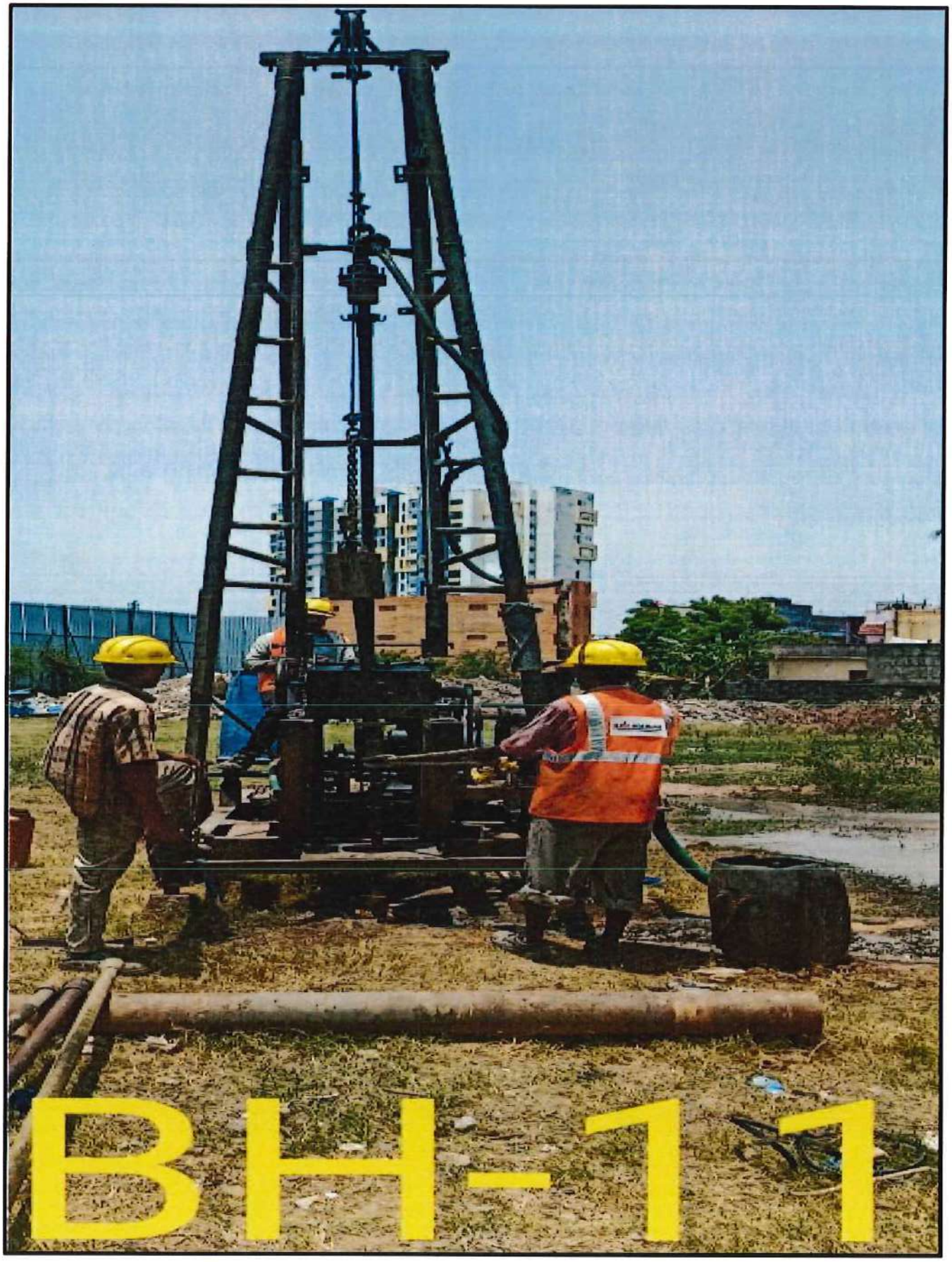
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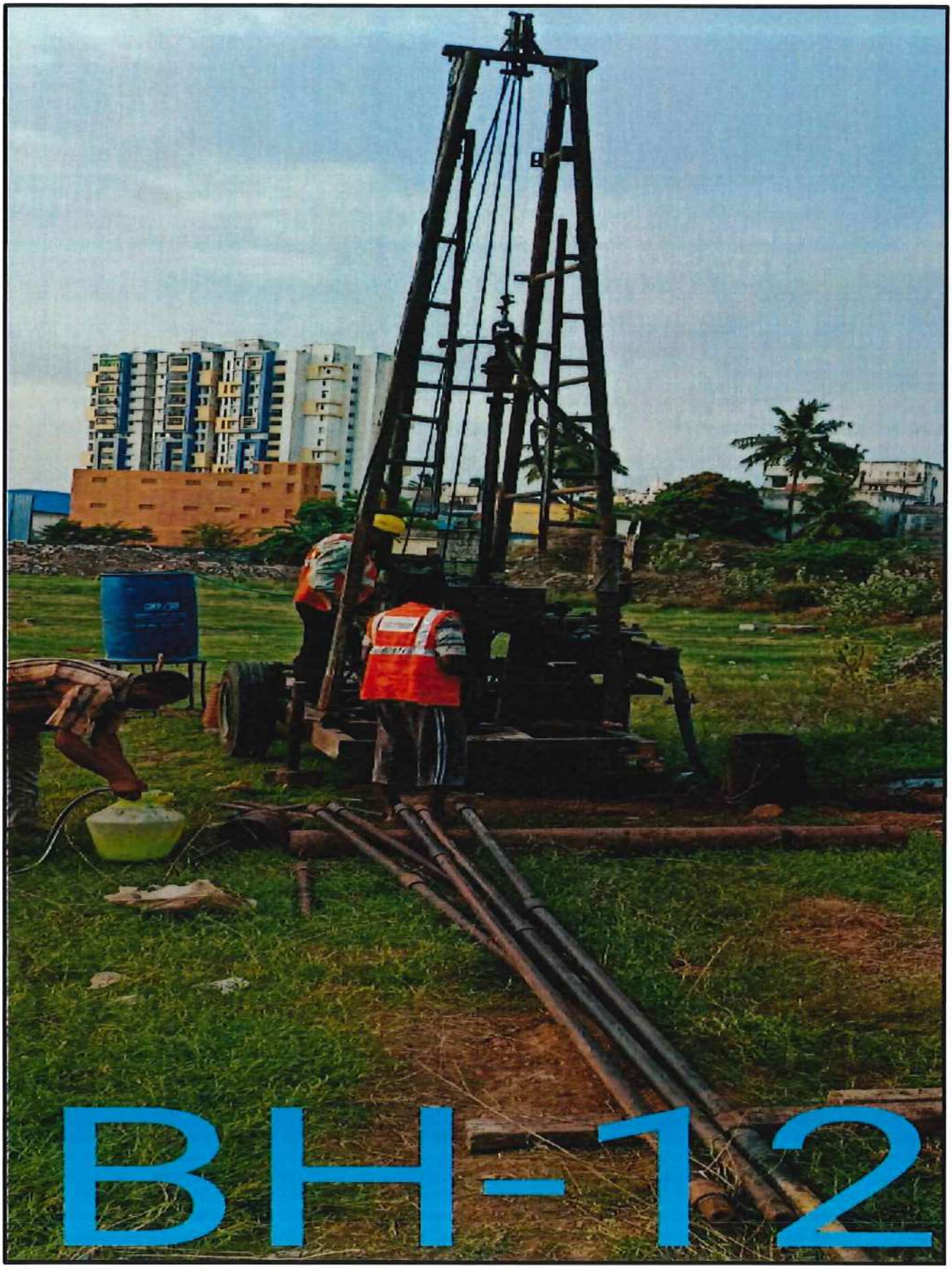
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THE LANDLENS SUITE

Eight ways to know a piece of land before you pay for it.

This report covers one part of the picture. These cover the rest, drawn from the same government records, for any property in Tamil Nadu.

LandLens One
Ask anything about a property and get an answer grounded in live government records, with the sources shown.
/landlens/one

Verify My Land
Every record check run on one property and returned as a single report.
/landlens/verify-my-land

Legal Opinion
An advocate's written opinion on the title, built on the records we pull for it.
/landlens

One Map
Every layer on one map: the parcel, its boundary, zoning, water bodies and what sits around it.
/landlens/one/map

PriceMap
What land actually changed hands for around this plot, taken from the registered deeds.
/landlens/pricemap

Build Scope
What you are allowed to build here: floor space, height, coverage and setbacks.
/landlens/build-scope

Property Tracker
Watch a property and hear about it when something new is registered against it.
/landlens/property-tracker

Deal Room
Run the transaction in one place: documents, stamping, signatures and the parties.
/landlens/deal-room

FREE TOOLS · NO ACCOUNT NEEDED

Twenty-four checks you can run yourself, at no cost.

Records and verification

The registers themselves, read for you.

- Encumbrance Certificate
- Patta and Chitta
- Field Measurement Sketch
- EC Analyzer
- Bank charge check
- Court case search
- Seller background check
- Approval check by survey

Value and duty

What it is worth and what it costs to register.

- Guideline value by street
- Guideline value by survey
- Stamp duty and registration fees
- Capital gains
- Floor space index
- Area unit converter

Zoning and land use

What the plan says can happen on this land.

- Land use zone finder
- CMDA land use check
- Coastal regulation zone
- Master plan check
- Water bodies finder
- Airport height clearance

Registers and directories

Who holds it, and which office keeps the record.

- Find your registering office
- Temple property check
- Waqf property check
- RERA register

Every free tool
/tools

Services we run for you
/services

The LandLens suite
/landlens/one

Verified RealEstate™

Every claim in this document traces back to a government record.

- Legal opinions, due diligence and title verification
- Building plan, layout and sub-division approvals
- Completion and occupancy certificates, regularisation
- Escrow, negotiation and NRI property management
- Land survey, soil testing, architecture and construction

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Prepared from the registers named on the page each finding sits on. Where a register could not be read, this document says so in its place rather than leaving the gap to be read as a clean result.