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NAME OF PROJECT

PROPOSED CONSTRUCTION OF RESIDENTIAL BUILDING CONSISTING OF STILT+ 5 UPPER FLOORS AT NEW DOOR NO. 13, OLD DOOR NO. 5, NAGESWARA RAO ROAD, NUNGAMBAKKAM, CHENNAI – 600 034, COMPRISED IN R.S.NO. 141, 142 & 143, NEW T.S.NO. 142/4, BLOCK NO. 21 OF NUNGAMBAKKAM VILLAGE

CLIENT

M/s CHAITANYA FOUNDATIONS PVT LTD.,
BANYAN VIEW – 3rd FLOOR,
NO-39, KARPAGAM GARDENS,
Ist MAIN ROAD, ADYAR,
CHENNAI 600 020

TITLE

GEOTECHNICAL INVESTIGATION REPORT

REPORT NO.: GT- 2651

Dr.C.VENKATA PRASAD
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DATE	REVISON	DESCRIPTION		AUTHORISED SIGNATORY
20/09/2023	FIRST SUBMISSION	SUBMISSION OF GEOTECHNICAL REPORT	SIGN	
			DATE	20/09/2023
			DESIGNATION	MANAGING DIRECTOR
			NAME	**DR. C.V.PRASAD**

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GEO MARINE

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REPORT TEXT

CHAPTER-1

INTRODUCTION

1.0 PROJECT INFORMATION MATRIX:

NATURE OF PROJECT	: **RESIDENTIAL BUILDING**
STRUCTURE	: **STILT + 5 UPPER FLOORS**
PROJECT OWNER	: **M/s CHAITANYA FOUNDATIONS PVT LTD**
PROJECT LOCATION	: **NUNGAMBAKKAM, CHENNAI**
JOB CODE	: **GT-2651**

1.1 SCOPE OF WORK:

1.1.1 FIELD WORK:

- Conducting three 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
  - In rock formation, the core recovery is carried out at 1.5m depth interval
- The depth of borehole investigation is 24.0m 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

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CHAPTER-2

INVESTIGATION METHODOLOGY & TEST RESULTS

2.0 PREAMBLE:

Three 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.

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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 2.3. The graphical representation of grainsize distribution curve for the representative samples in each bore is presented in Fig. 2.5 to 2.7.

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 2.3. The graphical representation of hydrometer analyses curve for the representative samples in each bore is presented in Fig. 2.8 to 2.15.

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 - 2.4 to 2.6.

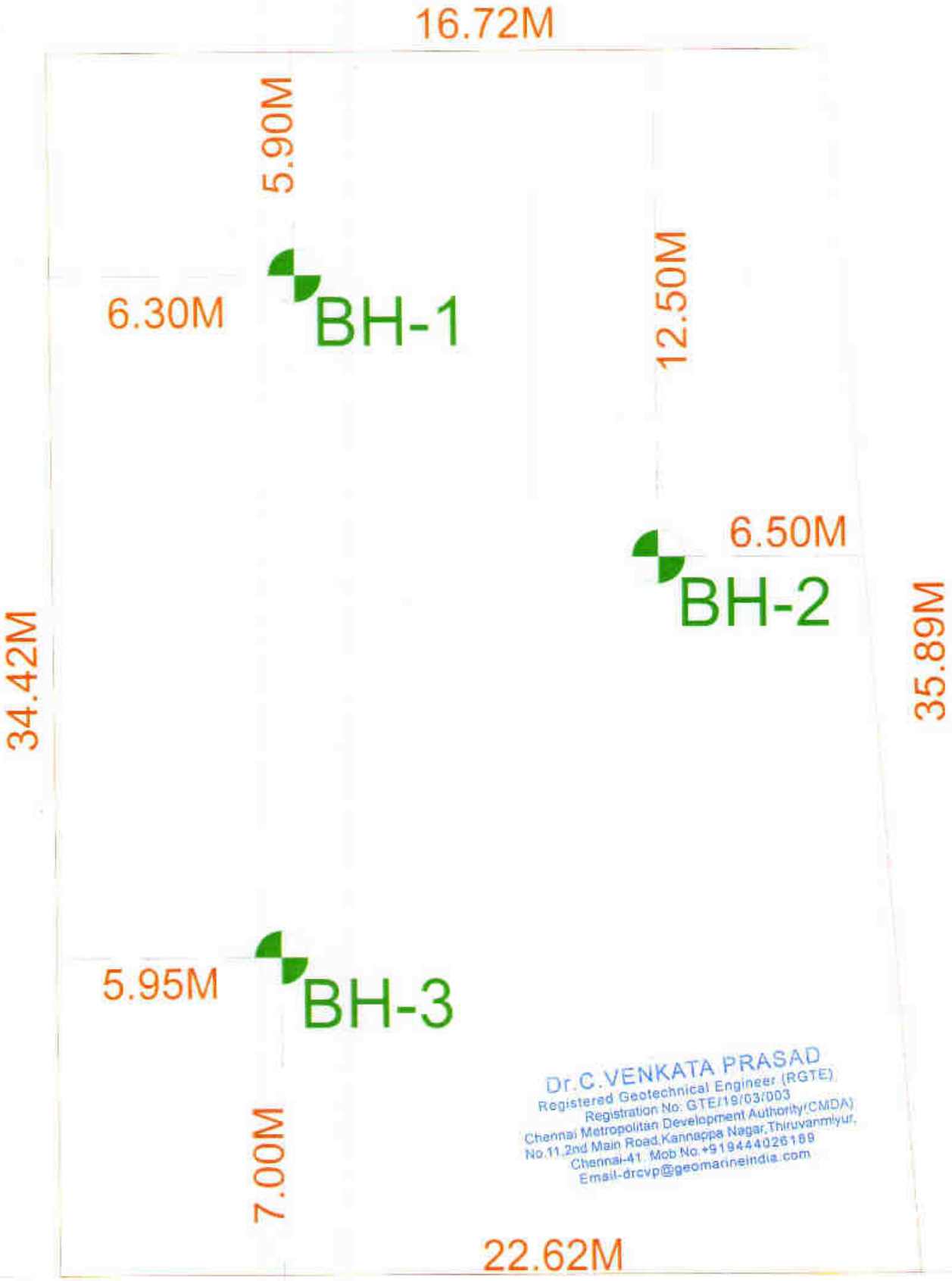
2.3 SUMMARY:

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 2.3.

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.2.4.

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SITE PLAN


16.72M
5.90M
6.30M
BH-1
12.50M
6.50M
BH-2
34.42M
35.89M
5.95M
BH-3
7.00M
22.62M
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SOIL PROFILES

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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-01		
SHEET	1	OF	3
DIA OF BORE HOLE	150mm ✓ / NX		
BORE START DATE	07/09/2023		
BORE END DATE	08/09/2023		
TOTAL DRILL DAYS	2		

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING						
LOCATION	Nungambakkam, Chennai	MACHINE No.	CR-04	Free Fall Energy (%)	60		
STRUCTURE	Stilt + 5 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N	-	
JOB CODE	GT-2651	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 Value: N80	SPT Value: N	Sample Details: No.	Type	RL (m)	Legend	Layer Data: No	Depth	Geotechnical Description
0	07/09/2023	12	19	SC	-	-										L1	0.50	Filled Up Soil
		To																
		12	20				3	7	7	-	14	0.50	1	SS	-0.5			
		12	29									0.95						Grey Brown,Moist,Poorly Graded,Fine & Medium Grains Sand,Medium Dense,**Clayey Silty SAND (SC)**
1		To		SC	-	-										L2	1.25	
		12	30				4	6	8	-	14	1.25	2	SS	-1.25			
		12	36									1.70						
		To		SC	-	-												
2		12	37				4	5	7	-	12	2.00	3	SS	-2.0			
		12	43									2.45						Brown,Grey Brown,Moist,Stiff,**Silty CLAY (CL) & Silty CLAY (CI)** With Sand Mix Clay of Low & Medium Plasticity
		To		SC	-	-												
		12	44															
3		12	50				2	3	5	-	8	3.00	4	SS	-3.0			
		To		SC	-	-						3.45						
		12	51													L3	4.00	
4		14	08				4	3	3	-	6	4.00	5	SS	-4.0			
		To		SC	-	-						4.45						Brown,Moist,Poorly Graded,Fine & Medium Grains Sands,Loose,**Silty SAND (SM)**
		14	09													L4	5.00	
5		14	17				5	8	12	-	20	5.00	6	SS	-5.0			
		To		SC	-	-						5.45						
		14	18															
6		14	29				12	11	9	-	20	6.00	7	SS	-6.0			
		To		SC	-	-						6.45						Brown,Moist,Poorly Graded,Fine & Medium Grains Sands,Medium Dense, **Silty SAND (SM)**
7		14	30													L5	7.50	
		14	39				2	3	3	-	6	7.50	8	SS	-7.5			
8		To		SC	-	-						7.96						Brown,Moist,Poorly Graded,Fine & Medium Grains Sands,Loose,**Silty SAND (SM)**
		14	40													L6	9.00	
9							7	9	10	-	19	9.00	9	SS	-9.0			
		14	54									9.45						Grey Brown,Moist,Poorly Graded,Fine & Medium Grains Sands,Medium Dense, **Silty SAND (SM)**
		To		SC	-	-												
10		14	55															

CS - Core Sample	DS - Disturbed Sample	LOGGED	K.Loganthan	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	07/09/2023	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	G.Sharmila	WATER TABLE (m) 3.70	
WS - Wash Sample	DB - Diamond Bit	DATE	11/09/2023	CASING DEPTH (m) 0.00	

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SITE INVESTIGATION RECORD

BORE HOLE No. **BH-01**
SHEET 2 OF 3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING					DIA OF BORE HOLE	150mm ✓ / NX
LOCATION	Nungambakkam, Chennai	MACHINE No.	CR-04	Free Fall Energy (%)	60	BORE START DATE	07/09/2023
STRUCTURE	Stilt + 5 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	08/09/2023
JOB CODE	GT-2651	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 Value: N80	SPT Value: N	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
10							21	29	31	-	60	10.50	10	SS	-10.5		L7	10.5	Grey Brown,Moist,Poorly Graded,Fine & Medium Grains Sands,Medium Dense, **Silty SAND (SM)**
11		15	14									10.95							
		To		SC	-	-													
		15	15																
12							32	41	35	-	76	12.00	11	SS	-12.0				
												12.45							
		15	36																
13		To		SC	-	-													Brown,Grey Brown,Moist,Poorly Graded,Fine & Medium Grains Sands, Very Dense & Dense @ Parts,**Silty SAND (SM)**
		15	37																
14	07/09/2023						21	22	24	-	46	14.00	12	SS	-14.0				
												14.45							
		15	58																
15		To		SC	-	-													
		16	00																
16							15Cm Penet for 53 Blows			-	>100	16.00	13	SS	-16.0		L8	16.0	
												16.15							
		16	55																
17		To		SC	-	-													Brown,Moist,Poorly Graded,Fine & Medium Grains,Very Dense,**Silty SAND (SM)**
		16	58																
18							29	45	52	-	97	18.00	14	SS	-18.0		L9	18.0	
												18.45							
		09	09																
19	08/09/2023	To		SC	-	-													Brown Grey,Moist,Sub Fissile,Hard, **Fissile Silty CLAY (CH)** Clays of High Plasticity
		09	20																
20							27	39	13Cm Penet for 62 Blows	-	>100	20.00	15	SS	-20.0				
												20.43							

CS - Core Sample	DS - Disturbed Sample	LOGGED	K.Loganthan	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	08/09/2023	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	G.Sharmila	WATER TABLE (m) 3.70	
WS - Wash Sample	DB - Diamond Bit	DATE	11/09/2023	CASING DEPTH (m) 0.00	

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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-01						
SHEET	3	OF	3				
PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING					DIA OF BORE HOLE	150mm / NX ✓
LOCATION	Nungambakkam, Chennai	MACHINE No.	CR-04	Free Fall Energy (%)	60	BORE START DATE	07/09/2023
STRUCTURE	Stilt + 5 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	08/09/2023
JOB CODE	GT-2651	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 / TCR / 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 Value: N80	SPT Value: N	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	08/09/2023	Total drilling time 26 mins		DB	1	0											L10	21.0	Brown Grey,Moist,Sub Fissile,Hard, **Fissile Silty CLAY (CH)** Clays of High Plasticity
22							SPT Hammer Rebounded			-	>100	22.00	16	CS/ WS	-22.0	+ + + + + + + + + + + +	L11	22.0	Grey Brown,Medium & Coarse Grain Structure,Highly to Completely Fractured & Weathered,Very Dense, **Completely Weathered Rock - Grade W5 Rock Formation**
23		11 10 To 11 35		DB	16	0										+ + + + + + + + + + + +	L12	23.5	Grey Brown,Grey,Medium & Coarse Grains Structure,Highly Fractured,Partly Weathered Formation, **Highly Weathered Rock - Grade W4 Rock Formation** Fractured Hypersthene Granitic Rock
24							-	-	-	-	-	23.50	17	CS	-23.5				
25																			
26																			
27																			
28																			
29																			
30																			

CS - Core Sample	DS - Disturbed Sample	LOGGED	K.Loganthan	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	08/09/2023	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	G.Sharmila	WATER TABLE (m) 3.70	
WS - Wash Sample	DB - Diamond Bit	DATE	11/09/2023	CASING DEPTH (m) 0.00	

Borehole terminated at 23.5 m depth below E.G.L

FIG.2.1 Sub Soil Profile at BH-01 Location

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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-02		
SHEET	1	OF	3
DIA OF BORE HOLE	150mm ✓		
	NX		

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING					BORE START DATE	08/09/2023
LOCATION	Nungambakkam, Chennai	MACHINE No.	CR-04	Free Fall Energy (%)	60		
STRUCTURE	Stilt + 5 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	09/09/2023
JOB CODE	GT-2651	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	Blows/cm 15-30	Blows/cm 30-45	SPT Value: N80	SPT Value: N	Sample Details: No.	Type	RL (m)	Layer Data: Legend	No.	Depth	Geotechnical Description
0	08/09/2023	14	20	SC	-	-										L1	0.50	Filled Up Soil
		To																
		14	21				1	2	5	-	7	0.50	1	SS	-0.5			Brown,Moist,Medium Stiff,**Silty CLAY (CI)** With Sand Mix Lean Clay of Medium Plasticity
		14	30									0.95						
1		To		SC	-	-										L2	1.25	
		14	31				4	6	13	-	19	1.25	2	SS	-1.25			Brown,Moist,Very Stiff,**Silty CLAY (CH)** Clays of High Plasticity
		14	39									1.70						
		To		SC	-	-										L3	2.00	
2		14	40				-	-	-	-	-	2.00	3	UDS	-2.0			
		14	54															Brown,Moist,Stiff,**Silty CLAY (CI)** With Sand Mixture Lean Clay of Medium Plasticity
		To		SC	-	-										L4	3.00	
		14	55															
3		15	04				9	15	18	-	33	3.00	4	SS	-3.0			
		To		SC	-	-						3.45						
		15	05															
4		15	15				19	22	23	-	45	4.00	5	SS	-4.0			Brown,Moist,Poorly Graded,Fine & Medium Grains Sands,Medium Dense & Dense,**Silty SAND (SM)**
		To		SC	-	-						4.45						
		15	16															
5		15	28				9	14	13	-	27	5.00	6	SS	-5.0			
		To		SC	-	-						5.45						
		15	29															
6		15	39				3	3	4	-	7	6.00	7	SS	-6.0	L5	6.00	
		To		SC	-	-						6.45						
		15	40															Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Loose,**Silty SAND (SM)**
7																L6	7.50	
							3	5	6	-	11	7.50	8	SS	-7.5			
												7.95						
8		15	50															
		To		SC	-	-												
		15	51															
9							4	7	8	-	15	9.00	9	SS	-9.0			Brown Grey,Brown,Moist,Poorly Graded,Fine & Medium Grains Sands, Medium Dense,**Silty SAND (SM)**
												9.45						
		16	01															
		To		SC	-	-												
10		16	02															

CS - Core Sample	DS - Disturbed Sample	LOGGED	K.Loganathan	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	08/09/2023	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	G.Sharmila	WATER TABLE (m)	3.50	
WS - Wash Sample	DB - Diamond Bit	DATE	11/09/2023	CASING DEPTH (m)	0.00	

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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-02
SHEET	2 OF 3
DIA OF BORE HOLE	150mm ✓ / NX
BORE START DATE	08/09/2023
BORE END DATE	09/09/2023
TOTAL DRILL DAYS	2

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING						
LOCATION	Nungambakkam, Chennai	MACHINE No.	CR-04	Free Fall Energy (%)	60		
STRUCTURE	Stilt + 5 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N	-	
JOB CODE	GT-2651	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 / OB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT Value: N80	SPT Value: N	Sample Details: Depth	No.	Type	RL (m)	Legend	Layer Data: No	Depth	Geotechnical Description
10																			Brown Grey,Brown,Moist,Poorly Graded,Fine & Medium Grains Sands, Medium Dense,**Silty SAND (SM)**
							12	15	18	-	33	10.50	10	SS	-10.5		L7	10.5	
11		16	15	SC	-	-						10.95							
		To																	
		16	16																
12							27	29	37	-	66	12.00	11	SS	-12.0				
												12.45							
		16	32																
13	08/09/2023	To		SC	-	-													Grey Brown,Moist,Poorly Graded,Fine & Medium Grains Sands,Dense & Very Dense,**Silty SAND (SM)**
		16	33																
14							16	17	18	-	35	14.00	12	SS	-14.0				
												14.45							
		16	52																
15		To		SC	-	-													
		16	53																
16							51	10Cm Penet for 52 Blows		-	>100	16.00	13	SS	-16.0		L8	16.0	
												16.25							
		09	11																
17		To		SC	-	-													Grey Brown,Yellow Brown,Moist,Poorly Graded,Fine & Medium Grains Sands With Coarse Sand & Gravels Mixture,Very Dense,**Silty SAND (SM) & Clayey Silty SAND (SM)**
		09	15																
18	09/09/2023						41	15Cm Penet for 56 Blows		-	>100	18.00	14	SS	-18.0				
												18.30							
		09	50																
19		To		SC	-	-													
		10	05																
20							29	31	67	-	98	20.00	15	SS	-20.0		L9	20.0	Brown Grey,Moist,Sub Fissile,Hard, **Fissile Silty CLAY (CH)** Clays of High Plasticity
												20.45							

CS - Core Sample	DS - Disturbed Sample	LOGGED	K.Loganathan	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	09/09/2023	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	G.Sharmila	WATER TABLE (m) 3.50	
WS - Wash Sample	DB - Diamond Bit	DATE	11/09/2023	CASING DEPTH (m) 0.00	

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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-02						
SHEET	3	OF	3				
PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING					DIA OF BORE HOLE	150mm ✓ / NX
LOCATION	Nungambakkam, Chennai	MACHINE No.	CR-04	Free Fall Energy (%)	60	BORE START DATE	08/09/2023
STRUCTURE	Stilt + 5 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	09/09/2023
JOB CODE	GT-2651	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 Value: N80	SPT Value: N	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
21	09/09/2023	10	32	DB	0	0													Brown Grey,Moist,Sub Fissile,Hard, **Fissile Silty CLAY (CH)** Clays of High Plasticity
		To 10	35				SPT Hammer Rebounded			-	>100	21.00	-	WS	-21.0		L10	21.0	
22		11	05	DB	0	0										+ + +			No Penetration From Wash Sample Observation, Disintegrated Hypersthene Granitic Rock Formation/ Grade W5 Completely Weathered Rock
		To 11	22				SPT Hammer Rebounded			-	>100	22.50	-	WS	-22.5	+ + +	L11	22.5	
23		11	50	DB	16	0										+ + +			Grey Brown,Grey,Medium & Coarse Grains Structure,Highly Fractured,Partly Weathered Formation, **Highly Weathered Rock - Grade W4 Rock Formation** Fractured Hypersthene Granitic Rock
24		To 12	13				-	-	-	-	-	24.00	16	CS	-24.0	+ + +	L12	24.0	
25																			
26																			
27																			
28																			
29																			
30																			

CS - Core Sample	DS - Disturbed Sample	LOGGED	K.Loganathan	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	09/09/2023	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	G.Sharmila	WATER TABLE (m) 3.50	
WS - Wash Sample	DB - Diamond Bit	DATE	11/09/2023	CASING DEPTH (m) 0.00	

Borehole terminated at 24 m depth below E.G.L

FIG.2.2 Sub Soil Profile at BH-02 Location

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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-03						
SHEET	1	OF	3				
PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING					DIA OF BORE HOLE	150mm ✓ / NX
LOCATION	Nungambakkam, Chennai	MACHINE No.	CR-04	Free Fall Energy (%)	60	BORE START DATE	09/09/2023
STRUCTURE	Stilt + 5 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	11/09/2023
JOB CODE	GT-2651	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 Value: N80	SPT Value: N	Sample Details: No.	Type	RL (m)	Legend	Layer Data: No	Depth	Geotechnical Description
0		14	51															
		To		SC	-	-												
1		14	52				8	10	14	-	24	1.25	-	SS	-1.25			
		15	00									1.70						
		To		SC	-	-												
2		15	02				15	26	27	-	53	2.00	2	SS	-2.0			
		15	12									2.45						
		To		SC	-	-												
		15	13															
3		15	25				17	21	26	-	47	3.00	3	SS	-3.0			
		To		SC	-	-						3.45						
		15	26															
4		15	38				11	19	20	-	39	4.00	4	SS	-4.0			
		To		SC	-	-						4.45						
		15	39															
5	09/09/2023	15	48				7	4	3	-	7	5.00	5	SS	-5.0			
		To		SC	-	-						5.45						
		15	49															
6		15	59				1	2	4	-	6	6.00	6	SS	-6.0			
		To		SC	-	-						6.45						
		16	00															
7		16	10				2	2	4	-	6	7.50	7	SS	-7.5			
		To		SC	-	-						7.95						
8		16	11															
9		16	28				14	23	24	-	47	9.00	8	SS	-9.0			
		To		SC	-	-						9.45						
10		16	29															

Legend:
- L1 1.25 — Filled Up Soil Debris With Sand
- L2 2.00 — Grey Brown, Moist, Very Stiff, **Silty CLAY (CI)** Lean Clay of Medium Plasticity
- L3 5.00 — Brown, Moist, Poorly Graded, Fine & Medium Grains Sands, Dense & Very Dense, **Clayey Silty SAND (SC) & Silty SAND (SM)**
- L4 9.00 — Grey, Moist, Poorly Graded, Fine & Medium Grains Sands, Loose, **Clayey Silty SAND (SC)**
- Brown Grey, Moist, Poorly Graded, Fine & Medium Grains Sands, Medium Dense to Very Dense, **Silty SAND (SM)**

CS - Core Sample	DS - Disturbed Sample	LOGGED	K.Loganathan	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	09/09/2023	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	G.Sharmila	WATER TABLE (m) 3.60	
WS - Wash Sample	DB - Diamond Bit	DATE	12/09/2023	CASING DEPTH (m) 0.00	

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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-03						
SHEET	2	OF	3				
PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING					DIA OF BORE HOLE	150mm ✓ / NX
LOCATION	Nungambakkam, Chennai	MACHINE No.	CR-04	Free Fall Energy (%)	60	BORE START DATE	09/09/2023
STRUCTURE	Stilt + 5 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	11/09/2023
JOB CODE	GT-2651	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 / TCR / 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 Value: N80	SPT Value: N	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
11	12/05/2023	16	47	SC	-	-	10	12	15	-	27	10.50 / 10.95	10	SS	-10.5				
		To																	
		16	48																
12							11	20	35	-	55	12.00 / 12.45	11	SS	-12.0				
		17	13																Brown Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Medium Dense to Very Dense,**Silty SAND (SM)**
13		To		SC	-	-													
		17	14																
14							8	10	20	-	30	14.00 / 14.45	12	SS	-14.0				
		09	18																
15		To		SC	-	-													
		09	19																
16							46	10Cm Penet for 57 Blows		-	>100	16.00 / 16.25	13	SS	-16.0		L5	16.0	
		09	00																
17	11/09/2023	To		SC	-	-													
		09	08																Brown,Grey Brown,Moist,Fine & Medium Grains Sands,Very Dense, **Silty SAND (SM) & Clayey Silty SAND (SC)**
18							42	10Cm Penet for 62 Blows		-	>100	18.00 / 18.25	14	SS	-18.0				
		09	39																
19		To		SC	-	-													
		09	45																
20							14	27	44	-	71	20.00 / 20.45	15	SS	-20.0		L6	20.0	Grey,Moist,Sub Fissile,Hard, **Fissile Silty CLAY (CH)** Clays of High Plasticity

CS - Core Sample	DS - Disturbed Sample	LOGGED	K.Loganathan	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	11/09/2023	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	G.Sharmila	WATER TABLE (m) 3.60	
WS - Wash Sample	DB - Diamond Bit	DATE	12/09/2023	CASING DEPTH (m) 0.00	

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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-03						
SHEET	3	OF	3				
PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL BUILDING					DIA OF BORE HOLE	150mm ✓ / NX
LOCATION	Nungambakkam, Chennai	MACHINE No.	CR-04	Free Fall Energy (%)	60	BORE START DATE	09/09/2023
STRUCTURE	Stilt + 5 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	11/09/2023
JOB CODE	GT-2651	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 Value: N80	SPT Value: N	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	11/09/2023	11	06 To 11 17	SC	-	-				-	>100	21.00	-	WS	-21.0		L7	21.0	Grey,Moist,Sub Fissile,Hard, **Fissile Silty CLAY (CH)** Clays of High Plasticity
							SPT Hammer Rebounded												
22		11	41 To 12 03	DB	0	0										+ +			No Penetration From Wash Sample Observation, **Disintegrated Hypersthene Granitic Rock Formation/ Grade W5 Completely Weathered Rock**
							SPT Hammer Rebounded										L8	22.5	
23												22.50	-	WS	-22.5	+ +			Grey Brown,Grey,Medium & Coarse Grains Structure,Highly Fractured,Partly Weathered Formation, **Highly Weathered Rock - Grade W4 Rock Formation** Fractured Hypersthene Granitic Rock
		12	35 To 13 00	DB	20	0													
24							-	-	-	-	-	24.00	16	CS	-24.0		L9	24.0	
25																			
26																			
27																			
28																			
29																			
30																			

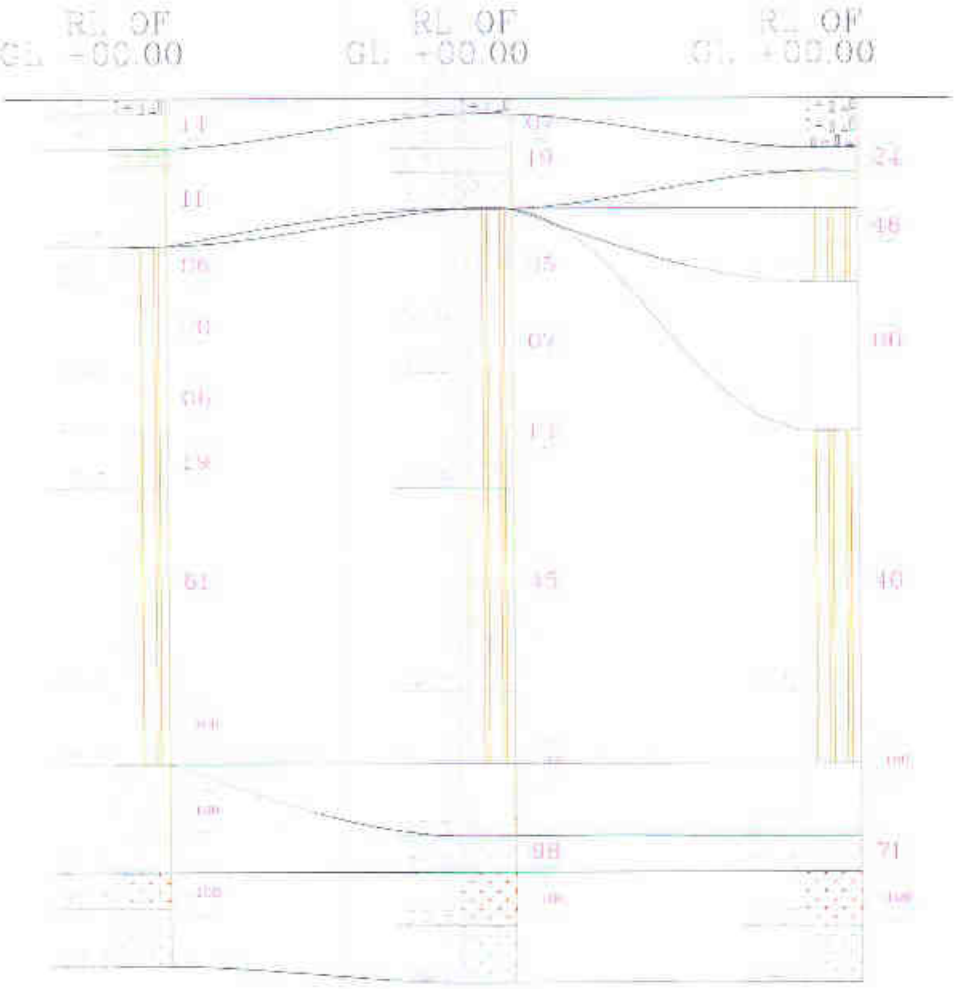
CS - Core Sample	DS - Disturbed Sample	LOGGED	K.Loganathan	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	11/09/2023	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	G.Sharmila	WATER TABLE (m) 3.60	
WS - Wash Sample	DB - Diamond Bit	DATE	12/09/2023	CASING DEPTH (m) 0.00	

Borehole terminated at 24 m depth below E.G.L

FIG.2.3 Sub Soil Profile at BH-03 Location

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CROSS SECTION PROFILE



LEGEND

SILTY CLAY (CI)

SILTY CLAY (CE)

Silty Clay (CL)

SILTY SAND (SM)

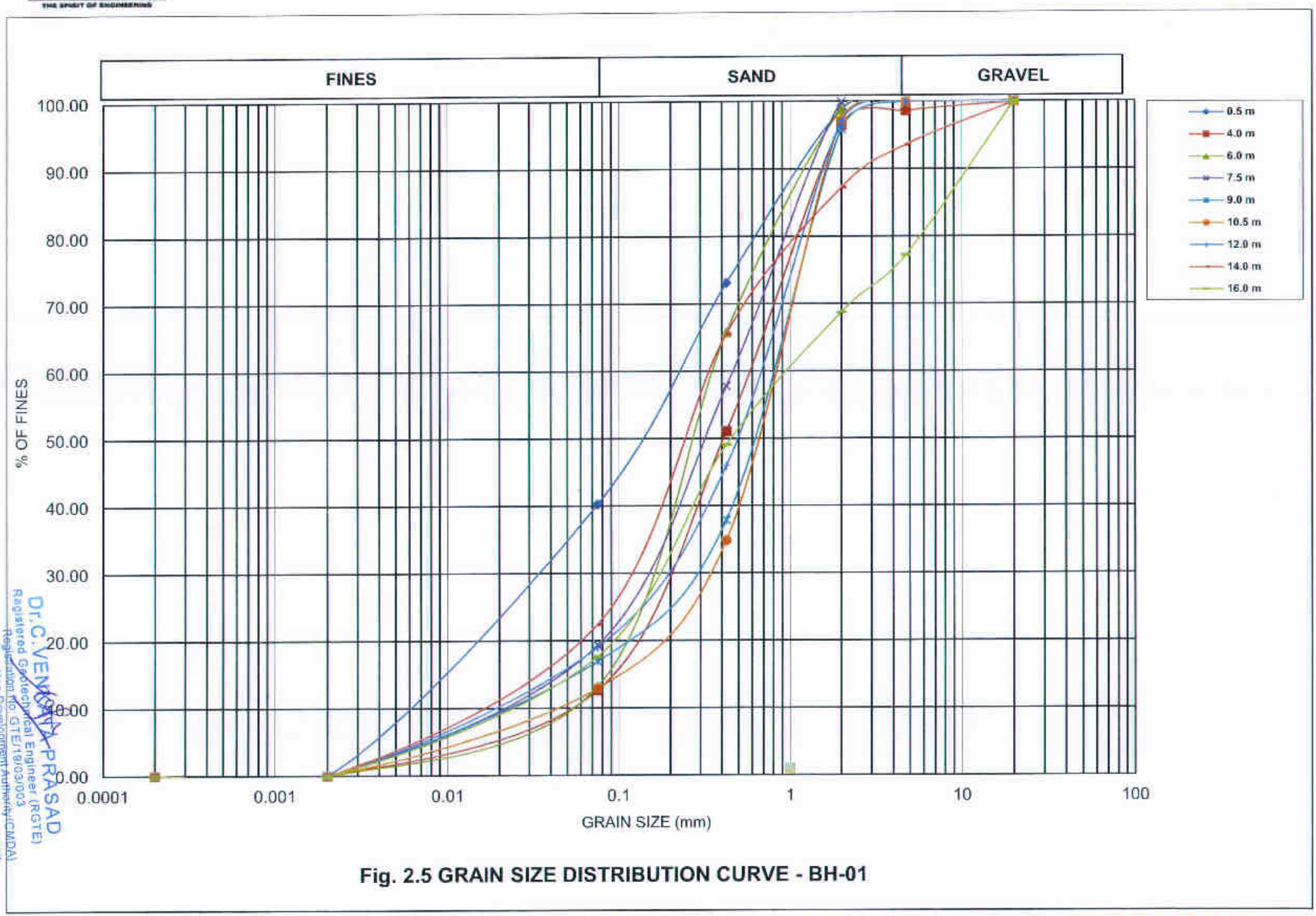
Residual Soil,Residual Soil to Completely Wea & Completely Weathered Rock

Completely to Highly Weathered Rock & Highly Weathered Rock

CLAYEY SILTY SAND (SC)

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GRAIN SIZE DISTRIBUTION CURVE



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Fig. 2.5 GRAIN SIZE DISTRIBUTION CURVE - BH-01

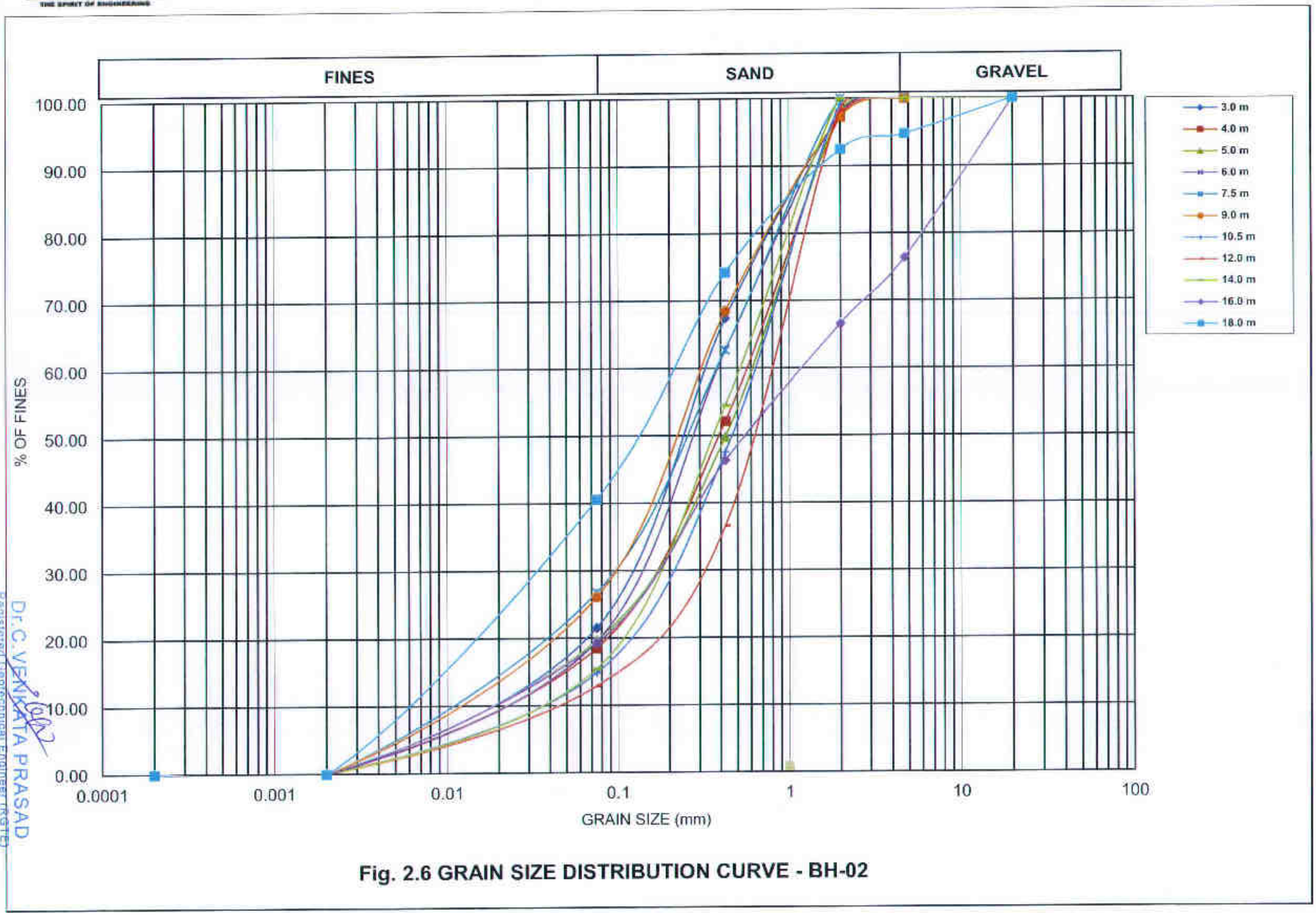


Fig. 2.6 GRAIN SIZE DISTRIBUTION CURVE - BH-02

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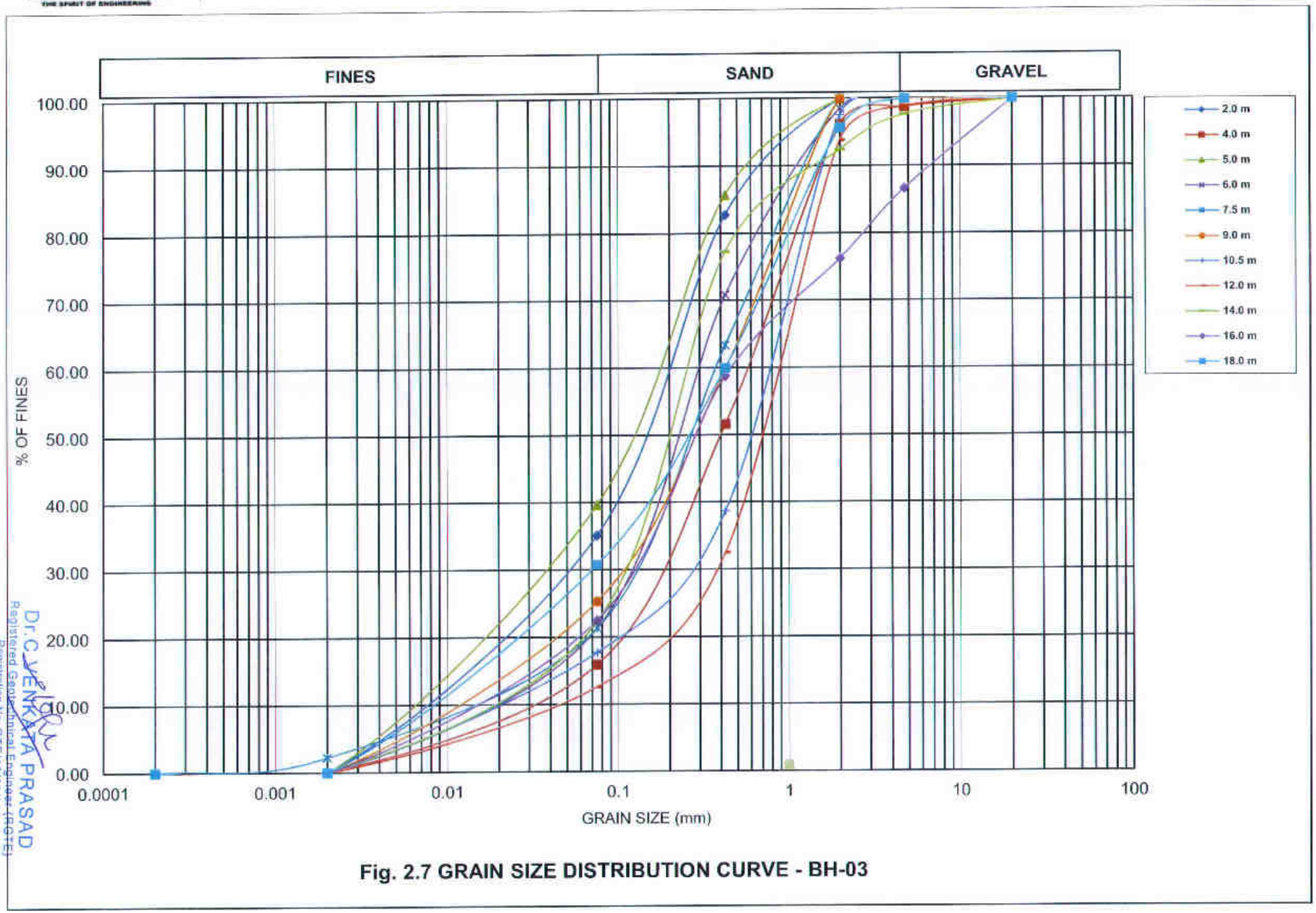


Fig. 2.7 GRAIN SIZE DISTRIBUTION CURVE - BH-03

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HYDROMETER ANALYSIS CURVE

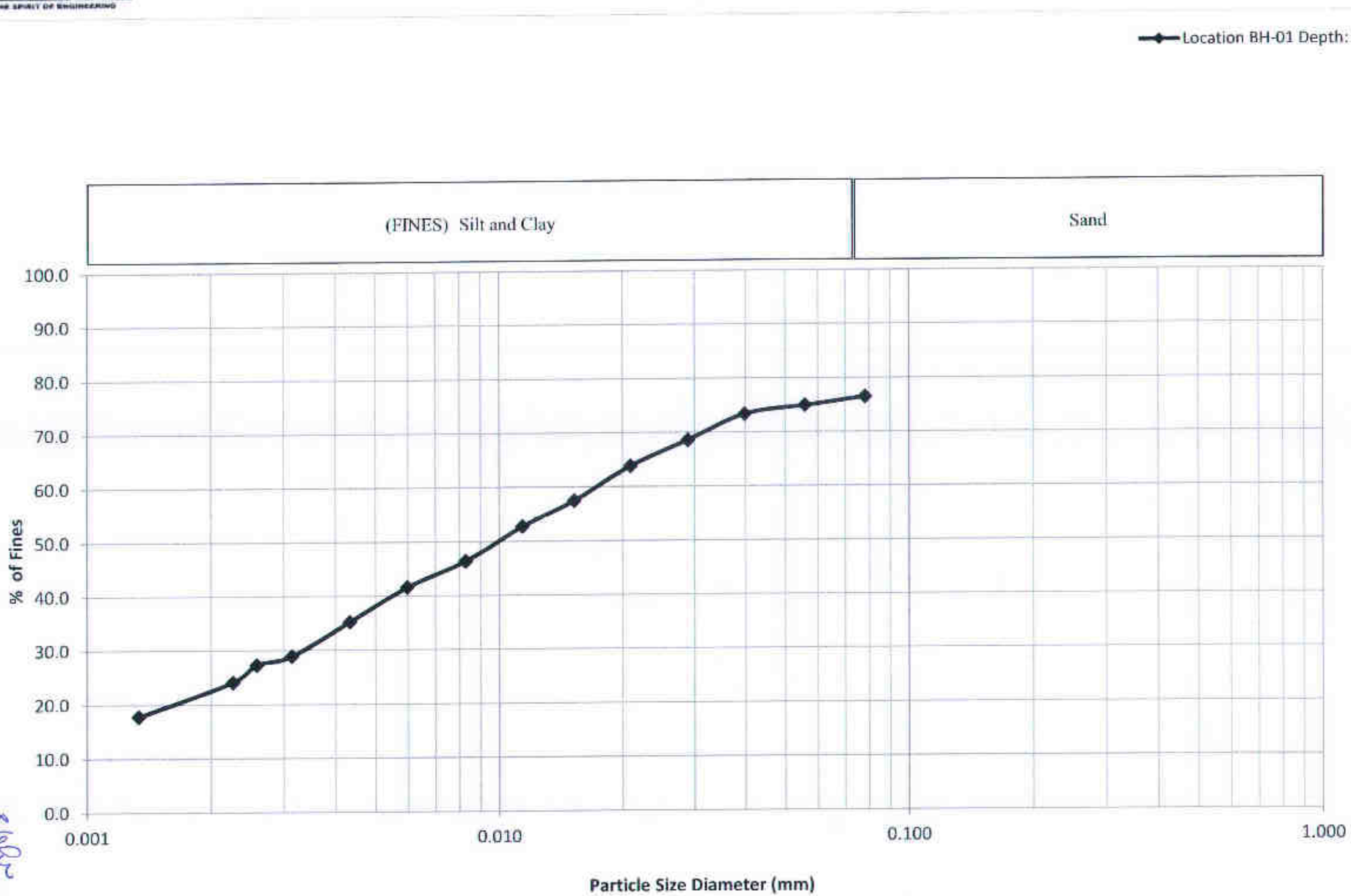


Fig 2.8 Hydrometer Analysis Master Curve

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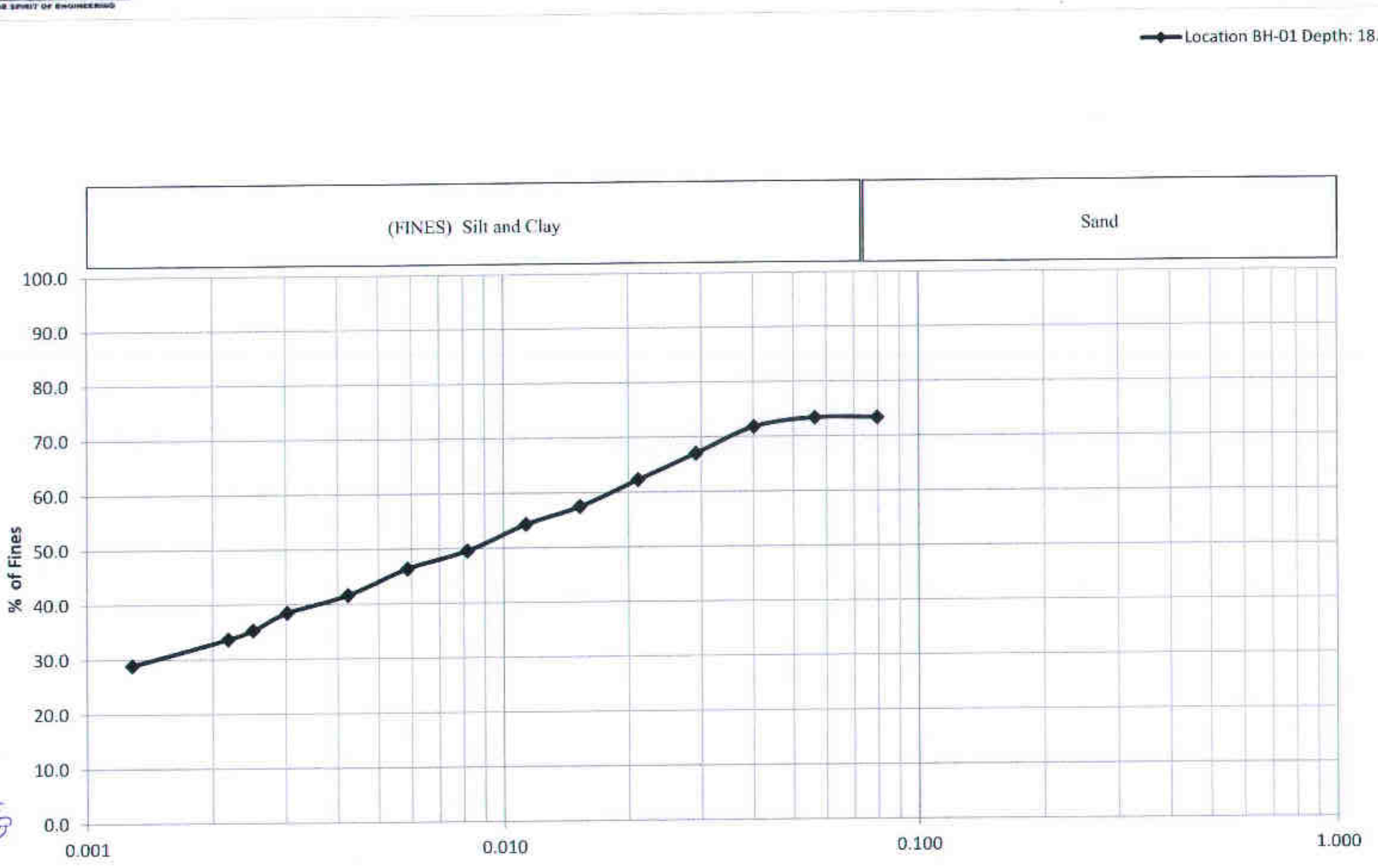


Fig 2.9 Hydrometer Analysis Master Curve

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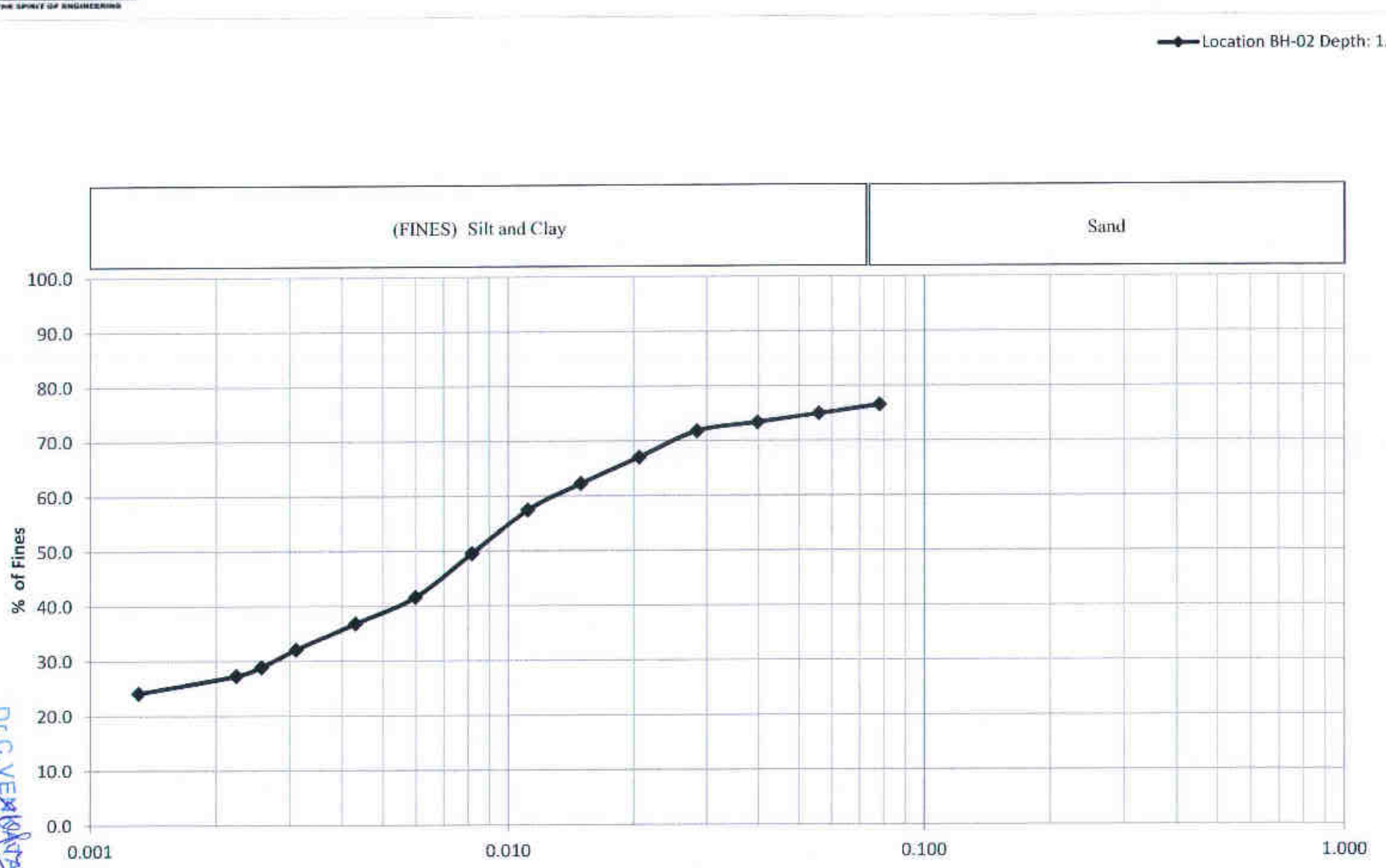


Fig 2.10 Hydrometer Analysis Master Curve

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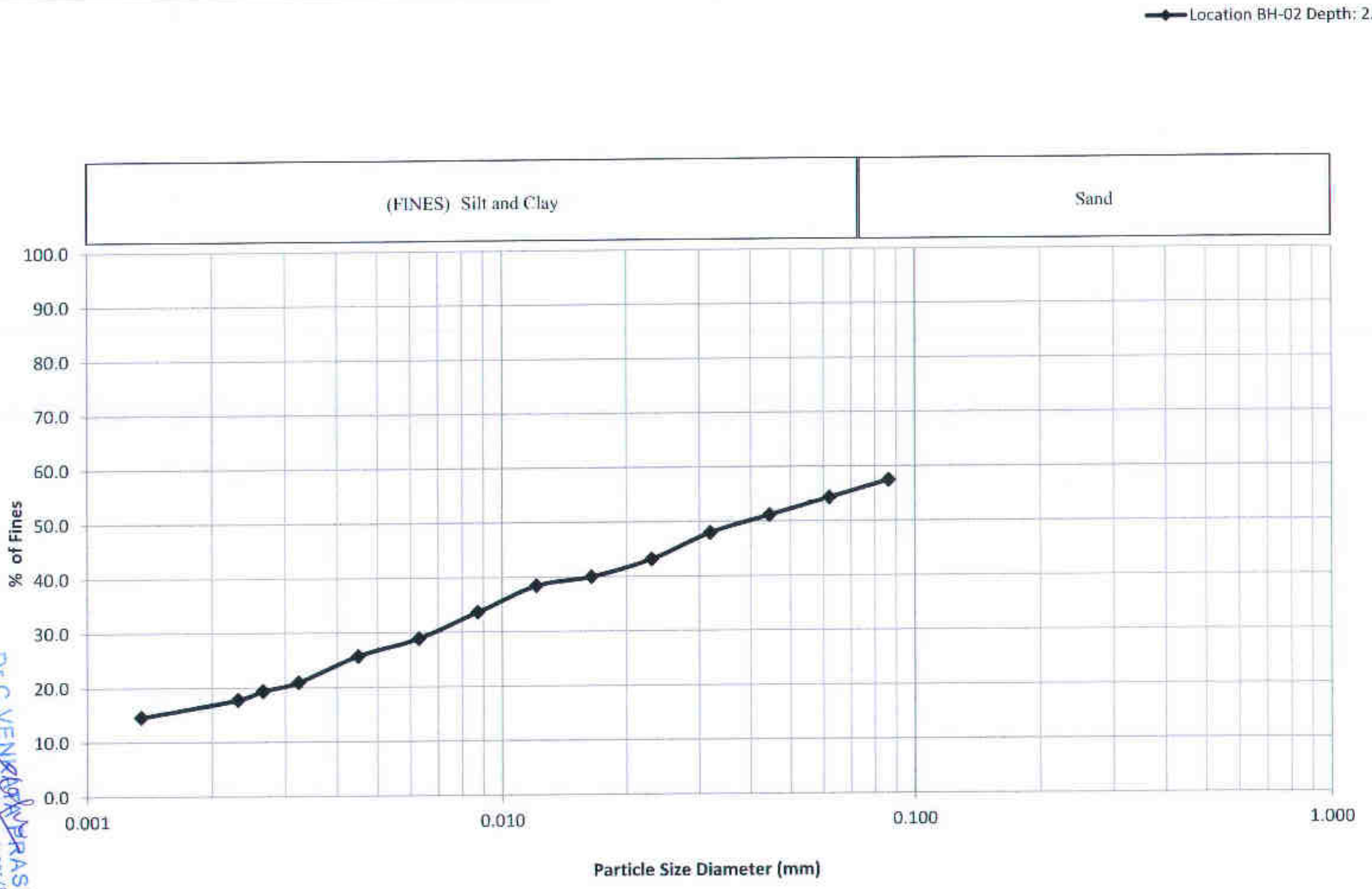


Fig 2.11 Hydrometer Analysis Master Curve

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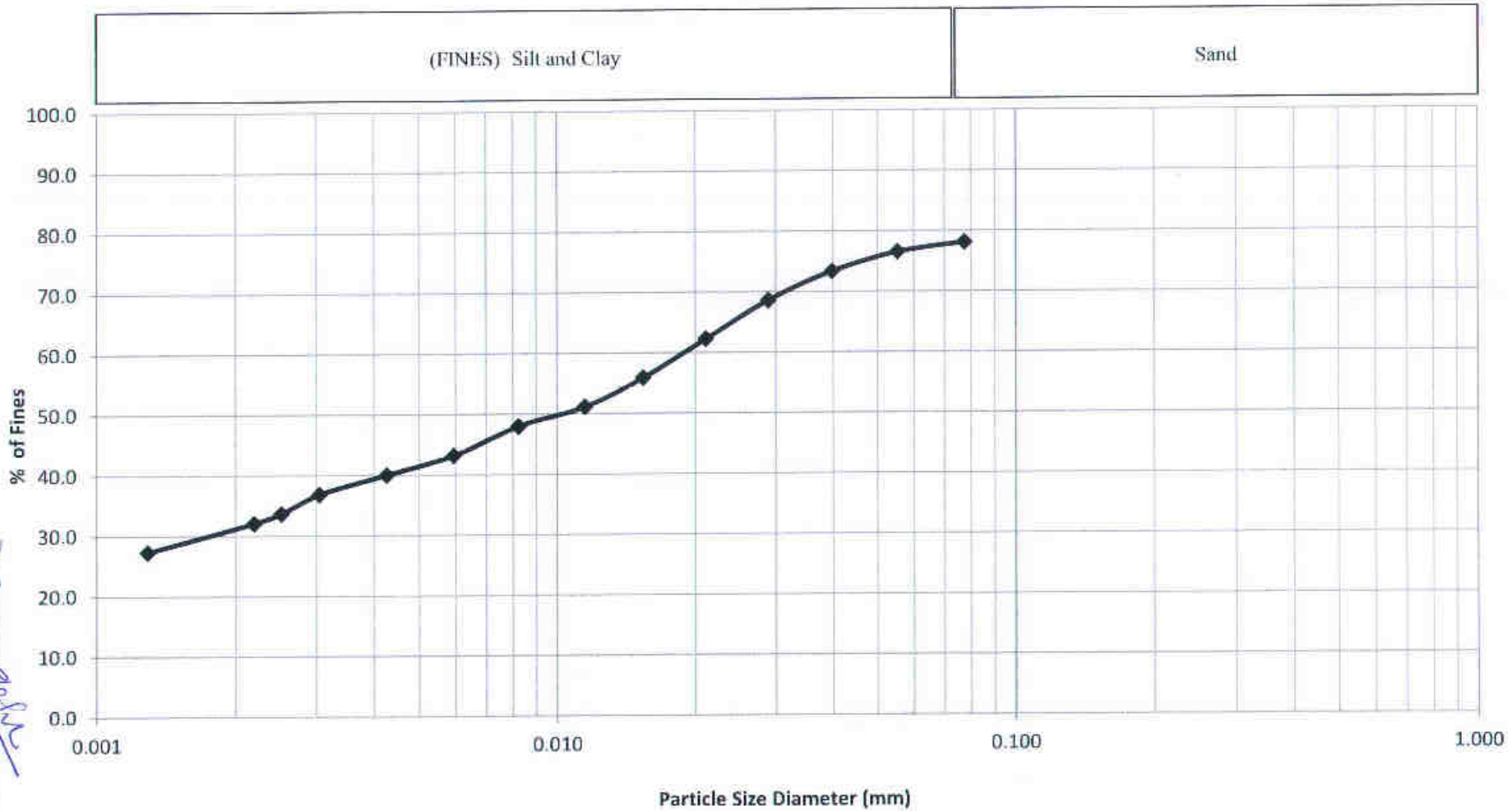


Fig 2.12 Hydrometer Analysis Master Curve

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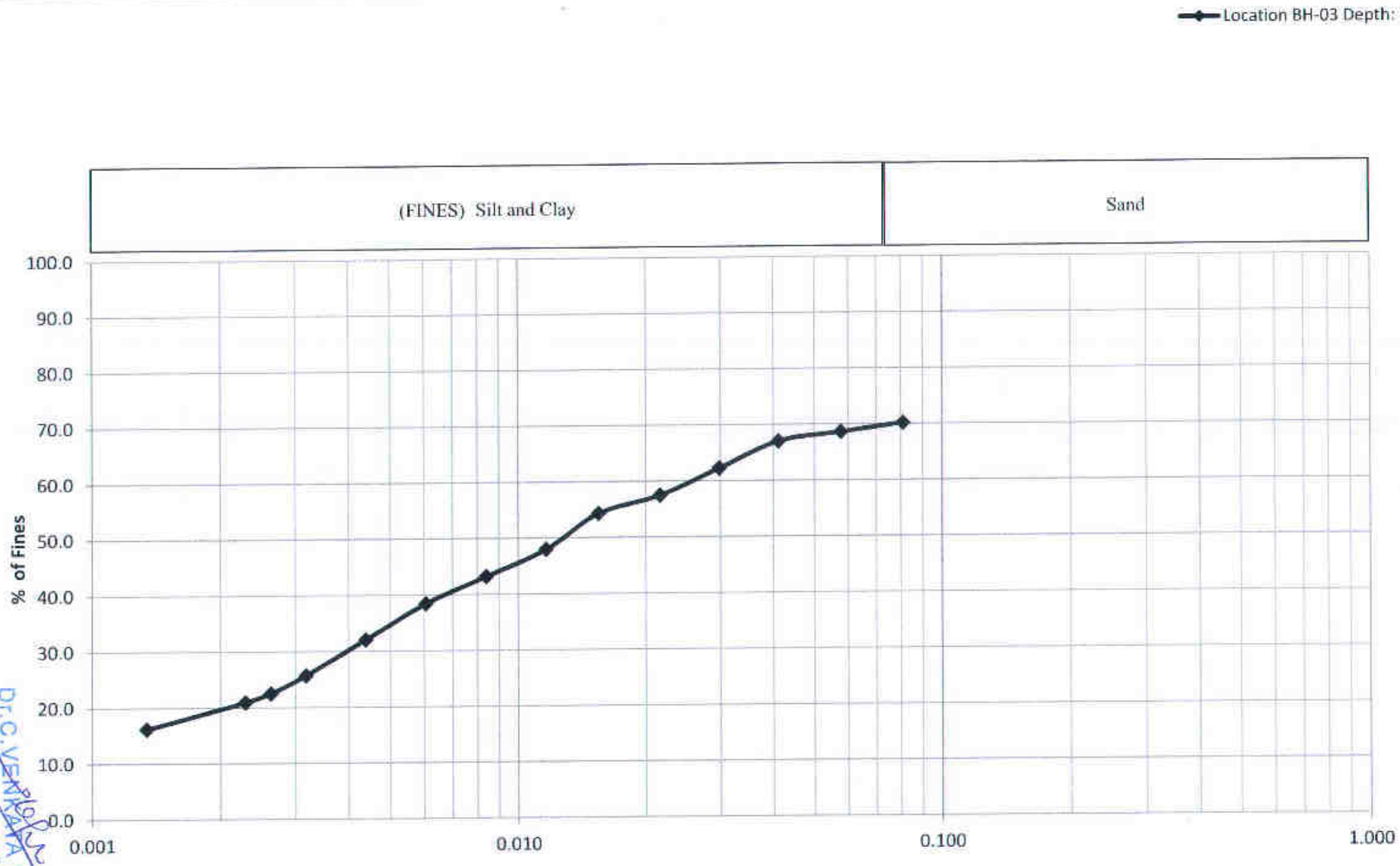


Fig 2.13 Hydrometer Analysis Master Curve

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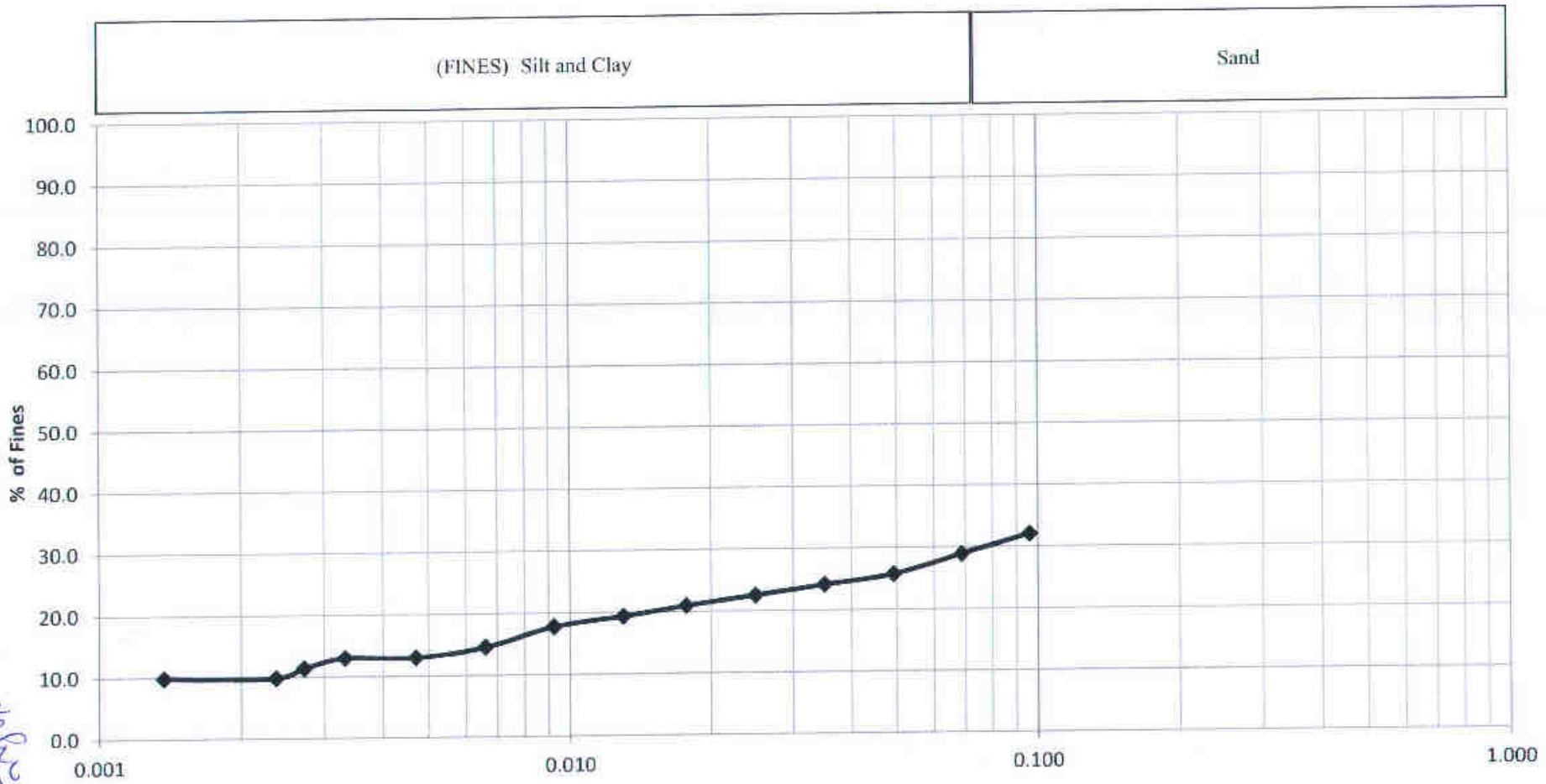


Fig 2.14 Hydrometer Analysis Master Curve

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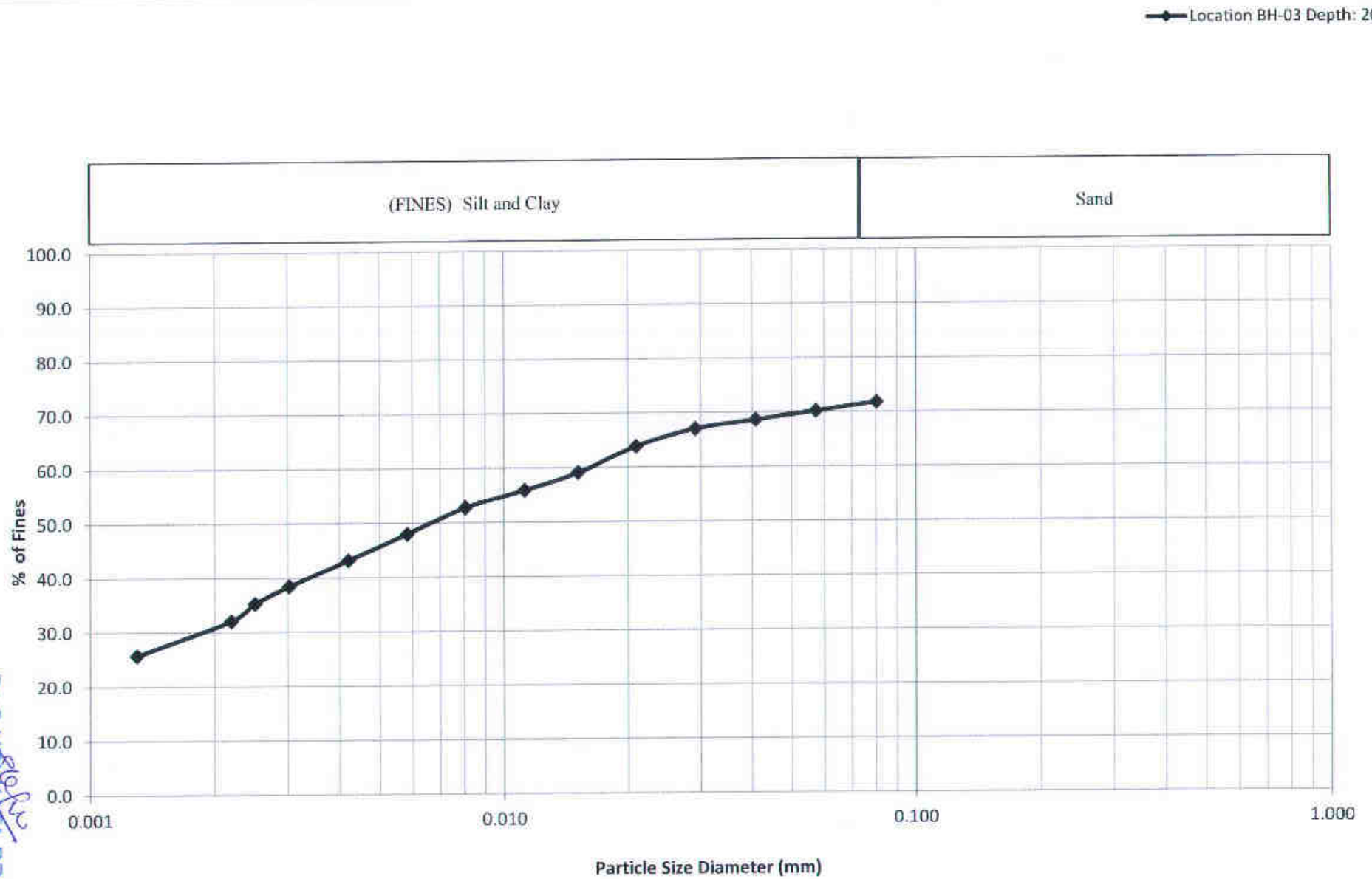


Fig 2.15 Hydrometer Analysis Master Curve

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LABORATORY TEST RESULTS

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LABORATORY TEST REPORT

GEOMARINE CONSULTANTS PVT LTD- TESTING LABORATORY

NO.11 2nd MAIN ROAD, KANNAPA NAGAR, CHENNAI-600041

TC-11410

ULR NO.	:	TC114102300000166F	SAMPLE IDENTIFICATION NUM	:	GMC/0923/741
REPORT ISSUED TO	:	M/s CHAITANYA FOUNDATIONS PVT LTD	TEST REPORT NUMBER	:	GT-2651
DISCIPLINE/GROUP	:	MECHANICAL (SOIL AND ROCK)	SAMPLE RECEIPT DATE	:	09/09/2023
SAMPLE DESCRIPTION	:	CLAY AND SOIL	PERIOD OF TESTING	:	11/09/2023 to 18/09/2023
SAMPLE CONDITION	:	SATISFACTORY	REPORT ISSUE DATE	:	20/09/2023
TEST METHOD	:	BUREAU OF INDIAN STANDARDS	NO. OF PAGES	:	One

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

Sampling Depth (m)	"N" Value	Type of Sample	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)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	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						DIRECT SHEAR TEST IS 2720 PART 13:1986 (RA 2016)		Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}\times D_{60})$	Consistancy	Relative Density	IS-Notation		
										Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)	Cohesion (kg/cm²)	ϕ (Degrees)					Fine Grain Soils	Gravely Soils	Sandy Soils
0.5	14	SPT	12.4	32.6	13.9	18.7	13.6	7.7	-	0.0	1.2	25.7	32.8	40.3		-	-	-	-	-	M.Dense	-	-	SC
1.25	14	SPT	15.0	34.8	13.7	21.1	13.1	0.0	-	0.0	0.0	10.4	19.7	69.9		-	-	-	-	Stiff	-	CL	-	-
2.0	12	SPT	16.9	36.1	16.4	19.7	-	0.0	-	0.0	0.0	9.4	33.2	57.3		-	-	-	-	Stiff	-	CI	-	-
3.0	8	SPT	18.0	36.0	17.4	18.6	13.4	0.0	-	0.0	0.0	4.2	14.8	61.5	19.5	-	-	-	-	Stiff	-	CI	-	-
4.0	6	SPT	16.6	-	-	-	-	-	-	1.3	2.1	45.4	38.5	12.7		-	-	-	-	-	Loose	-	-	SM
6.0	20	SPT	18.9	-	-	-	-	-	2.63	0.0	1.2	33.0	52.6	13.2		-	-	-	-	-	M.Dense	-	-	SM
7.5	6	SPT	15.0	Non-Plastic Binder				0.0	-	0.0	0.0	42.2	38.4	19.4		-	-	-	-	-	Loose	-	-	SM
9.0	19	SPT	12.1	-	-	-	-	-	-	0.0	4.1	58.0	21.0	17.0		-	-	-	-	-	M.Dense	-	-	SM
10.5	60	SPT	11.5	-	-	-	-	-	-	0.0	2.7	62.3	21.9	13.0		-	-	-	-	-	V.Dense	-	-	SM
12.0	76	SPT	11.7	-	-	-	-	-	2.61	0.0	2.9	51.1	26.9	19.1		-	-	-	-	-	V.Dense	-	-	SM
14.0	46	SPT	12.0	-	-	-	-	-	-	6.3	6.3	21.7	43.2	22.5		-	-	-	-	-	Dense	-	-	SM
16.0	>100	SPT	13.2	-	-	-	-	-	-	22.7	8.5	19.7	31.4	17.7		-	-	-	-	-	V.Dense	-	-	SM
18.0	97	SPT	21.5	88.0	33.4	54.5	8.3	90.0	-	-	-	-	-	66.4	33.6	-	-	-	-	Hard	-	CH	-	-
20.0	>100	SPT	11.1	82.8	33.9	48.9	8.5	100.0	-	-	-	-	-	100.0		-	-	-	-	Hard	-	CH	-	-

** END OF REPORT**

Terms and Conditions

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Authorised Signatory
A. VINOTH
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GEOMARINE
Phone No.: 044 24481485, 044-24480305

LABORATORY TEST REPORT

GEOMARINE CONSULTANTS PVT LTD- TESTING LABORATORY

NO.11 2nd MAIN ROAD, KANNAPA NAGAR, CHENNAI-600041

TC-11410

ULR NO.	:	TC114102300000166F	SAMPLE IDENTIFICATION NUM	: GMC/0923/741
REPORT ISSUED TO	:	M/s CHAITANYA FOUNDATIONS PVT LTD	TEST REPORT NUMBER	: GT-2651
DISCIPLINE/GROUP	:	MECHANICAL (SOIL AND ROCK)	SAMPLE RECEIPT DATE	: 09/09/2023
SAMPLE DESCRIPTION	:	CLAY AND SOIL	PERIOD OF TESTING	: 11/09/2023 to 18/09/2023
SAMPLE CONDITION	:	SATISFACTORY	REPORT ISSUE DATE	: 20/09/2023
TEST METHOD	:	BUREAU OF INDIAN STANDARDS	NO. OF PAGES	: One

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

Sampling Depth (m)	"N" Value	Type of Sample	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)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	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						DIRECT SHEAR TEST IS 2720 PART 13:1986 (RA 2016)		Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$	Consistancy	Relative Density	IS-Notation		
										Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)	Cohesion (kg/cm²)	ϕ (Degrees)					Fine Grain Soils	Gravely Soils	Sandy Soils
0.5	7	SPT	31.2	48.6	23.0	25.6	10.3	0.0	-	0.0	2.1	6.3	10.8	80.8		-	-	-	-	M.Stiff	-	CI	-	-
1.25	19	SPT	25.7	62.6	25.8	36.8	9.8	20.0	-	-	-	-	-	72.7	27.3	-	-	-	-	V.Stiff	-	CH	-	-
2.0	-	UDS	16.5	43.5	20.6	22.9	12.4	14.3	2.58	0.0	0.0	13.5	22.0	53.0	11.5	-	-	-	-	-	-	CI	-	-
3.0	33	SPT	22.1	-	-	-	-	-	-	0.0	2.7	29.8	45.9	21.6		-	-	-	-	-	Dense	-	-	SM
4.0	45	SPT	14.7	-	-	-	-	-	-	0.0	2.7	45.1	33.6	18.6		-	-	-	-	-	Dense	-	-	SM
5.0	27	SPT	16.9	-	-	-	-	-	-	0.0	2.1	48.1	30.2	19.7		-	-	-	-	-	M.Dense	-	-	SM
6.0	7	SPT	20.7	-	-	-	-	-	-	0.0	2.2	35.1	43.1	19.6		-	-	-	-	-	Loose	-	-	SM
7.5	11	SPT	15.8	Non-Plastic Binder				0.0	2.58	0.0	0.0	37.2	36.0	26.8		-	-	-	-	-	M.Dense	-	-	SM
9.0	15	SPT	12.4	-	-	-	-	-	-	0.0	2.7	28.7	42.4	26.2		-	-	-	-	-	M.Dense	-	-	SM
10.5	33	SPT	13.3	-	-	-	-	-	-	0.0	1.0	51.4	32.7	14.9		-	-	-	-	-	Dense	-	-	SM
12.0	66	SPT	11.9	-	-	-	-	-	2.60	0.0	1.7	61.7	23.7	13.0		-	-	-	-	-	V.Dense	-	-	SM
14.0	35	SPT	13.4	Little Plastic to Non-Plastic Binder				20.0	-	0.0	0.0	45.5	39.1	15.5		-	-	-	-	-	Dense	-	-	SM
16.0	>100	SPT	13.4	-	-	-	-	-	-	23.5	9.8	20.3	27.1	19.3		-	-	-	-	-	V.Dense	-	-	SM
18.0	>100	SPT	19.4	50.8	26.0	24.8	19.3	23.1	-	5.2	2.3	18.2	33.7	40.6		-	-	-	-	-	V.Dense	-	-	SC
20.0	98	SPT	24.5	69.0	27.6	41.4	17.7	63.6	-	-	-	-	-	67.9	32.1	-	-	-	-	Hard	-	CH	-	-

** END OF REPORT**

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LABORATORY TEST REPORT

GEOMARINE CONSULTANTS PVT LTD- TESTING LABORATORY

NO.11 2nd MAIN ROAD, KANNAPA NAGAR, CHENNAI-600041

TC-11410

ULR NO.	:	TC114102300000166F	SAMPLE IDENTIFICATION NUM	: GMC/0923/741
REPORT ISSUED TO	:	M/s CHAITANYA FOUNDATIONS PVT LTD	TEST REPORT NUMBER	: GT-2651
DISCIPLINE/GROUP	:	MECHANICAL (SOIL AND ROCK)	SAMPLE RECEIPT DATE	: 12/09/2023
SAMPLE DESCRIPTION	:	CLAY AND SOIL	PERIOD OF TESTING	: 12/09/2023 to 19/09/2023
SAMPLE CONDITION	:	SATISFACTORY	REPORT ISSUE DATE	: 20/09/2023
TEST METHOD	:	BUREAU OF INDIAN STANDARDS	NO. OF PAGES	: One

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

Sampling Depth (m)	"N" Value	Type of Sample	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)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	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						DIRECT SHEAR TEST IS 2720 PART 13:1986 (RA 2016)		Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$	Consistancy	Relative Density	IS-Notation		
										Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)	Cohesion (kg/cm^2)	ϕ (Degrees)					Fine Grain Soils	Gravely Soils	Sandy Soils
1.25	24	SPT	19.1	49.6	20.1	29.4	13.6	0.0	-	0.0	3.7	11.8	15.8	54.2	14.4	-	-	-	-	V.Stiff	-	CI	-	-
2.0	53	SPT	10.0	28.8	14.3	14.5	-	0.0	-	0.0	0.0	17.2	47.6	35.2		-	-	-	-	-	V.Dense	-	-	SC
3.0	47	SPT	Low Sample for Atterberg's Limit Test & Grain Size Classificaition. Based on Physical Identification, the Sample is Identified as Silty Sand																					
4.0	39	SPT	16.3	-	-	-	-	-	-	1.2	2.6	44.5	35.7	16.0		-	-	-	-	-	Dense	-	-	SM
5.0	7	SPT	25.8	31.6	18.2	13.3	15.9	7.7	-	0.0	0.0	14.3	46.1	39.7		-	-	-	-	-	Loose	-	-	SC
6.0	6	SPT	30.7	22.9	14.5	8.4	13.1	0.0	2.59	0.0	1.5	27.7	49.5	21.4		-	-	-	-	-	Loose	-	-	SC
7.5	6	SPT	19.7	23.6	Little/Non Plasticity			0.0	-	0.0	0.0	36.6	40.2	20.9	2.3	-	-	-	-	-	Loose	-	-	SM
9.0	47	SPT	14.1	Non-Plastic Binder				0.0	-	0.0	0.0	40.1	34.5	25.4		-	-	-	-	-	Dense	-	-	SM
10.5	27	SPT	13.0	-	-	-	-	-	2.58	0.0	2.4	58.8	21.0	17.8		-	-	-	-	-	M.Dense	-	-	SM
12.0	55	SPT	11.5	-	-	-	-	-	-	1.1	5.0	61.3	19.9	12.7		-	-	-	-	-	V.Dense	-	-	SM
14.0	30	SPT	15.0	Non-Plastic Binder				0.0	-	2.3	5.2	15.1	54.9	22.4		-	-	-	-	-	M.Dense	-	-	SM
16.0	>100	SPT	16.3	-	-	-	-	-	-	13.3	10.4	17.5	36.2	22.6		-	-	-	-	-	V.Dense	-	-	SM
18.0	>100	SPT	14.8	37.1	18.3	18.8	-	36.4	-	0.0	4.3	35.7	29.2	30.8		-	-	-	-	-	V.Dense	-	-	SC
20.0	71	SPT	31.9	108.6	34.6	74.0	8.8	57.1	-	0.0	0.0	3.4	5.2	62.0	29.3	-	-	-	-	Hard	-	CH	-	-

** END OF REPORT**

Terms and Conditions

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Table 2.5 Result of Chemical Test

ULR NO	:	TC114102300000168F	SAMPLE IDENTIFICATION NUMBER	:	GMC/0923/741
REPORT ISSUED TO	:	M/s CHAITANYA FOUNDATIONS PVT LTD	TEST REPORT NUMBER	:	GT-2651
DISCIPLINE/GROUP	:	CHEMICAL - WATER	SAMPLE RECEIPT DATE	:	09/09/2023
SAMPLE DESCRIPTION	:	GROUND WATER	PERIOD OF TESTING	:	13/09/2023
SAMPLE CONDITION	:	SATISFACTORY	REPORT ISSUE DATE	:	20/09/2023
TEST METHOD	:	BUREAU OF INDIAN STANDARDS	NO. OF PAGES	:	ONE

S No.	Bore Hole Number	Water			
		DEPTH OF SAMPLE (m)	pH AS PER IS 3025 (P-XI) - 2022	SULPHATES (mg/l) AS PER APHA 23rd Edn.2017-4500	CHLORIDES (mg/l) AS PER IS 3025(P-XXXII) - 1988, RA-2019
1.0	BH-01	3.70	6.90	41.3	43.7
2.0	BH-02	3.50	7.30	264.7	102.0
3.0	BH-03	3.60	7.55	224.4	140.8

** END OF REPORT**

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Phone No.: 044-24480305

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

TC-11410

Table 2.6 Result of Chemical Test

ULR NO	: TC114102300000169F	SAMPLE IDENTIFICATION NUMBER	: GMC/0923/741
REPORT ISSUED TO	: M/s CHAITANYA FOUNDATIONS PVT LTD	TEST REPORT NUMBER	: GT-2651
DISCIPLINE/GROUP	: CHEMICAL - SOIL AND ROCK	SAMPLE RECEIPT DATE	: 09/09/2023
SAMPLE DESCRIPTIOI	: SOIL	PERIOD OF TESTING	: 13/09/2023
SAMPLE CONDITION	: SATISFACTORY	REPORT ISSUE DATE	: 20/09/2023
TEST METHOD	: BUREAU OF INDIAN STANDARDS	NO. OF PAGES	: ONE

S No.	SOIL (2:1)		
	Bore Hole Number	DEPTH OF SAMPLE (m)	pH AS PER IS 2720 (P-XXVI) - 1987, RA-2021
1.0	BH-01	1.25	6.93
2.0	BH-02	3.00	7.27
3.0	BH-03	1.25	7.22

** END OF REPORT**

Authorised Signatory
A. VINOTH
(Technical Manager)

Terms and Conditions

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

Table 2.7 Result of Chemical Test

REPORT ISSUED TO	: M/s CHAITANYA FOUNDATIONS PVT LTD	SAMPLE IDENTIFICATION NUMBER	: GMC/0923/741
DISCIPLINE/GROUP	: CHEMICAL - SOIL	TEST REPORT NUMBER	: GT-2651
SAMPLE DESCRIPTIC	: SOIL	SAMPLE RECEIPT DATE	: 09/09/2023
SAMPLE CONDITION	: SATISFACTORY	PERIOD OF TESTING	: 13/09/2023
TEST METHOD	: BUREAU OF INDIAN STANDARDS	REPORT ISSUE DATE	: 20/09/2023
		NO. OF PAGES	: ONE

S No.	SOIL (2:1)			
	Bore Hole Number	DEPTH OF SAMPLE (m)	SULPHATES (mg/kg)	CHLORIDES (mg/kg)
1.0	BH-01	1.25	41.38	9.71
2.0	BH-02	3.00	38.05	9.71
3.0	BH-03	1.25	37.89	14.57

** 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 30 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
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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.

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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/m^3	Shear Parameters	
	Top BGL	Bottom BGL	Thickness							(C_u) kPa	(ϕ) Deg.
1.0	0.00	0.50	0.50	Filled up	-	-	-	-	-	-	-
2.0	0.50	1.25	0.75	Clayey Silty Sand	Grey Brown	14	Medium Dense	-	17	-	31.2
3.0	1.25	4.00	2.75	Silty Clay	Brown	11	-	Stiff	18	73	-
4.0	4.00	5.00	1.00	Silty Sand	Brown	6	Loose	-	14.5	-	29.2
5.0	5.00	7.50	2.50	Silty Sand	Brown	20	Medium Dense	-	18	-	33
6.0	7.50	9.00	1.50	Silty Sand	Brown	6	Loose	-	14.5	-	29.2
7.0	9.00	10.50	1.50	Silty Sand	Grey Brown	19	Medium Dense	-	18	-	32.7
8.0	10.50	16.00	5.50	Silty Sand	Brown	61	Very Dense	-	21	-	42.5
9.0	16.00	18.00	2.00	Silty Sand	Brown	>100	Very Dense	-	21	-	42.5
10.0	18.00	21.00	3.00	Silty Clay	Brown Grey	99	-	Hard	22	400	-
11.0	21.00	22.00	1.00	Completely Weathered Rock	Grey Brown	CRR 1% & RQD 0%					
12.0	22.00	23.50	1.50	Highly Weathered Rock	Grey Brown	CRR 18% & RQD 0%					

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GEO MARINE

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/m^3	Shear Parameters	
	Top BGL	Bottom BGL	Thickness							(C_u) kPa	(ϕ) Deg.
1.0	0.00	0.50	0.50	Filled up	-	-	-	-	-	-	-
2.0	0.50	1.25	0.75	Silty Clay	Brown	7	-	Medium Stiff	16	47	-
3.0	1.25	2.00	0.75	Silty Clay	Brown	19	-	Very Stiff	20	127	-
4.0	2.00	3.00	1.00	Silty Clay	Brown	-	-	-	-	-	-
5.0	3.00	6.00	3.00	Silty Sand	Brown	35	Dense	-	19.5	-	37.375
6.0	6.00	7.50	1.50	Silty Sand	Grey	7	Loose	-	14.5	-	29.4
7.0	7.50	10.50	3.00	Silty Sand	Brown Grey	13	Medium Dense	-	16.5	-	30.9
8.0	10.50	16.00	5.50	Silty Sand	Grey Brown	45	Dense	-	20	-	39.875
9.0	16.00	20.00	4.00	Clayey Silty Sand	Grey Brown	>100	Very Dense	-	21	-	42.5
10.0	20.00	21.00	1.00	Silty Clay	Brown Grey	98	-	Hard	22	400	-
11.0	21.00	22.50	1.50	Completely Weathered Rock	-	CRR 0% & RQD 0%					
12.0	22.50	24.00	1.50	Highly Weathered Rock	Grey Brown	CRR 16% & RQD 0%					

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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							(C_u) kPa	(ϕ) Deg.
1.0	0.00	1.25	1.25	Filled up	-	-	-	-	-	-	-
2.0	1.25	2.00	0.75	Silty Clay	Grey Brown	24	-	Very Stiff	20.5	160	-
3.0	2.00	5.00	3.00	Clayey Silty Sand	Brown	46	Dense	-	20	-	40.1
4.0	5.00	9.00	4.00	Clayey Silty Sand	Grey	6	Loose	-	14.5	-	29.2
5.0	9.00	16.00	7.00	Silty Sand	Brown Grey	40	Dense	-	20	-	38.75
6.0	16.00	20.00	4.00	Clayey Silty Sand	Brown	>100	Very Dense	-	21	-	42.5
7.0	20.00	21.00	1.00	Silty Clay	Grey	71	-	Hard	22	400	-
8.0	21.00	22.50	1.50	Completely Weathered Rock	-	CRR 0% & RQD 0%					
9.0	22.50	24.00	1.50	Highly Weathered Rock	Grey Brown	CRR 20% & RQD 0%					

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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 stilt and five upper floors and is meant for residential occupancy. For this kind of structure, the column loads could vary between 1,500 kN to 2,000 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 SURFACE STRATIFICATION:

The geological stratification of the project location is:

Stratum-I	0.0m to 2.0m/4.0m	Stiff & Very Stiff, Silty Clay
Stratum-II	2.0m/4.0m to 5.0m/7.5m	Medium Dense, Clayey Sand/Silty Sand
Stratum-III	5.0m/7.0m to 7.5m/9.0m	Loose, Silty Sand/Clayey Sand
Stratum-IV	7.5m/9.0m to 18.0m/20.0m	Dense & Very Dense, Silty Sand/Clayey Sand
Stratum-V	18.0m/20.0m to 21.0m	Hard, Fissile Silty Clay
Stratum-VI	21.0m to 22.0m	Very Dense, Completely Weathered Rock
Stratum-VII	22.0m to 23.5m/24.0m	Highly to Moderately Weathered Rock

4.3 FOUNDATION SYSTEM:

For the kind of proposed construction and the sub soil condition the following two options are possible to adopt:

1. Option-I Shallow Foundation – Strip Raft
2. Option-II Deep pile foundation

The above two options are discussed in the following sub section:

4.3.1 OPTION-I (SHALLOW FOUNDATION SYSTEM):

The sub soil stratification in the project site is highly heterogeneous in the top 5.0m depth. Considering the lateral variation within influence zone below the foundation, it is ideal to adopt R.C.C Strip Raft.

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Further, in view of the soil volume change characteristics at founding level, it is recommended to adopt ground improvement technique within the foundation trench. The ideal ground improvement is soil replacement with a non-swelling & non-shrinking type of soil or coarse grain material.

Provide strip raft at a depth of 1.05m over a well compacted Sand-Gravel (1:1) Mix or Quarry Dust or Granular Sub Base (GSB) of 450mm thickness. The 450mm thick layer shall be laid in a non-compacted layer thickness of 200mm & compacted using plate compactor or hand rammer. Thus, the overall depth of foundation excavation shall be 1.5m below the existing ground level.

The schematic arrangement of foundation is presented in Figure 4.1. The R.C.C Strip can be located at a depth 1.05m and shall be designed for a net allowable safe bearing pressure of 175 kPa.

Typical computation is presented in Annexure-I.

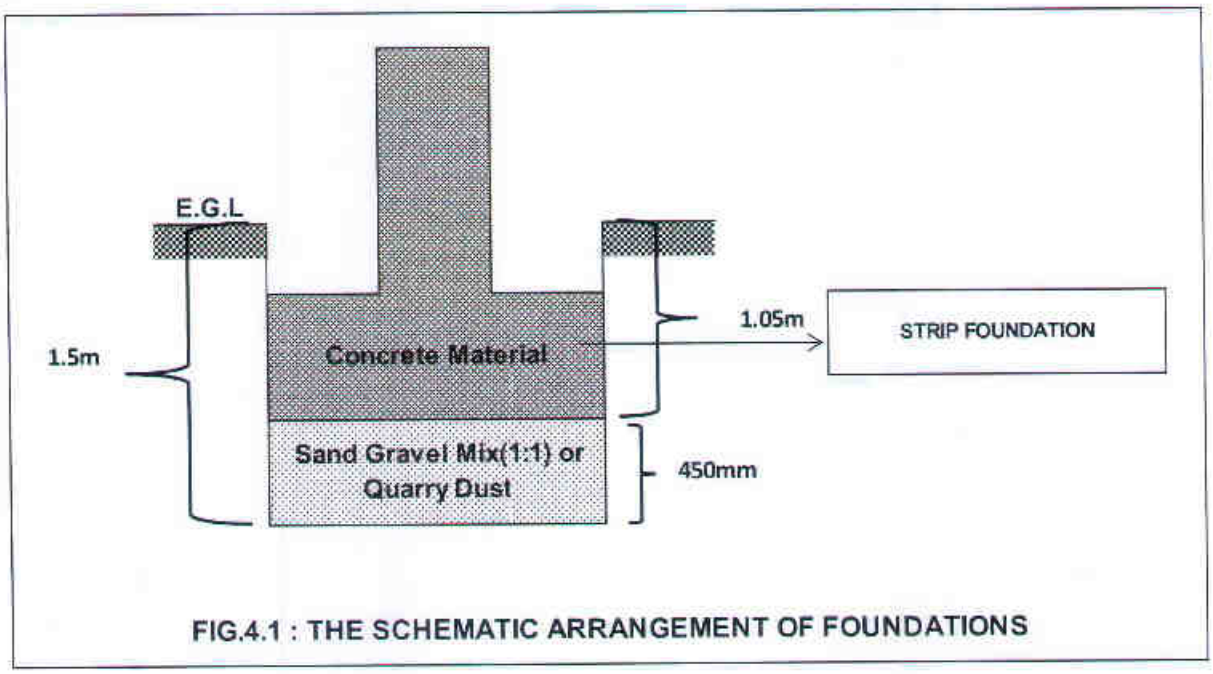


FIG.4.1 : THE SCHEMATIC ARRANGEMENT OF FOUNDATIONS

4.3.2 OPTION-II (DEEP PILE FOUNDATION):

In case of the allowable bearing pressure of Strip Raft foundation is not feasible to adopt shallow foundation, alternatively pile foundation can be adopted. The piles can be installed by drilling with direct mud circulation technique (Bored Cast Insitu Piles) and the recommended safe load carrying capacity of bored cast insitu piles in compression, tension and lateral for different diameters is worked out as per IS 2911-Part-I-Section-2 and are presented in Table:4.1.

Typical computations are presented in Annexure-I

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TABLE: - 4.1 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
1.0	BH-01	22.5	1.0	21.50	500	1400	700	55
2.0					550	1600	800	60
3.0					600	1900	900	70
4.0					650	2200	1000	75
5.0					750	2700	1200	85

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RECOMMENDATIONS

CHAPTER-5

RECOMMENDATIONS

5.1 RECOMMENDATION FOR SHALLOW FOUNDATION SYSTEM:

- In case of shallow foundation is adopted, the Strip Raft can be located at a depth of 1.05m over a well compacted sand-gravel (1:1) mix or quarry dust of 450mm thickness
- The strip foundation can be designed for an allowable net safe bearing pressure of 175kPa.

5.2 RECOMMENDATION FOR DEEP FOUNDATION SYSTEM:

- In case of shallow foundation is not feasible, pile foundation can be adopted. For the kind of proposed construction and the project location, 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 is not only depends upon the sub soil properties, but also depends on the care and experience of installation 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.

5.2.1 CONSTRUCTION METHOD STATEMENT OF PILE FOUNDATION:

- For the bored cast in situ piles, a guide casing of suitable length can be adopted
- The mud used shall be made out of sodium bentonite with minimum frees swell index of more than 300% and liquid limit more than 100%. The silt content in bentonite shall not more than 5%.
- The mud was prepared using sodium bentonite with a density of 1.10 to 1.15 g/cc.

5.3 GENERAL RECOMMENDATIONS:

- 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 steel is required.
- 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 shall be adopted.

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ANNEXURE-I

GEO MARINE

TYPICAL BEARING CAPACITY COMPUTATIONS FOR SHALLOW FOUNDATIONS

1.0 COMPUTATION OF BEARING CAPACITY AS PER IS:6403

BH-01

1.1 Geometrical Data :

Shape of the Foundation	Strip
Depth of foundaiton excavation (m)	1.5
Soil replacement within foundation trench (m)	0.45
Depth of foundation below E.G.L "D_f" (m)	1.05
Breadth of footing "B" (m)	2.5
Length of footing "L" (m)	5.5
B/L:	0.5
Inclination of Vertical Load with the Vertical (a)	0.0
Thickness of Fill (m)	0.0

1.2 Soil Data :

Type of Effective Bearing Strata :	Clay
SPT "M" of the bearing stratum:	12
Type of Shear Failure:	General
Undrained Shear Strength (Cu)	80

1.3 Design Parameters:

Bulk Density of Soil above the foundation depth (γ_{bulk}):	18	kN/m^3
Water Table Correction Factor (w') :	0.50	
Effective Overburden pressure at foundation level including the thickness of fill (q):	12.29	kPa

Bearing Capacity Factors:

N_c = 5.14

N_q = -

N_γ = -

Shape Factors:

S_c = 1.00

S_q = -

S_γ = -

Depth Factors :

D_c = 1.08

D_q = -

D_γ = -

Inclination Factor:

I_c = 1.00

I_q = -

I_γ = -

1.4 Ultimate Bearing Capacity (Qu) :

Qu=Cu*Nc*Sc*Dc*Ic:	445.74	kPa

1.5 Safe Bearing Capacity (Qsafe) :

Factor of Safety (F.S.) :	2.50	
Qsafe :	178	kPa
Recommended Q_{safe}	**175**	**kPa**

2.0 Computation of Settlement for Maximum Pressure and Size of Footing: (as per IS:8009-Part-I-Ref. Eq.11) (Elastic Analysis)

The immediate elastic settlement (S_e)= $qB(1-\mu^2)*I/E_s$

q= bearing pressure:	175.00
Poission's Ratio (μ):	0.25

Modulus of Elasticity (E_s)(Ref. Joseph E Bowels,1996,page316,Table5.6, Japanese design standards)

Modulus of Ealsticity (Es)	40000.00	
Width of footing (m):	2.50	
Influence factor:	1.00	
Rigidity Factor:	0.80	
Depth Factor:	1.00	
Elastic Settlement (S_e)	8.20	mm

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3.0 Computation of Settlement as per IS:8009-Part I

3.1 Compression Parameters:

Average Compression Index (C_c):	0.13
Average Initial Void Ration (e_o):	0.50
Stress history factor (λ)	0.70

3.2 Geometrical Data:

Depth to top of compressible layer below E.G.L:	2.00 m
Depth to bottom of compressible layer below E.G.L:	4.00 m
Depth to top of compressible layer below the foundation level,Z1:	0.95
Depth to bottom of compressible layer below the foundation level,Z2:	2.95
Thickness of compressible soft clay influenced by stress bulb (ΔH)	2.00

3.3 Stress Computations:

Effective overburden pressue at the middle of the compressible layer (P_0):	24.00 kPa
B/Z1	2.63
L/Z1	5.79
B/Z2	0.85
L/Z2	1.86
Stress Reduction Factor (I_B)	0.86
Additional stress due to the superstructure construction (Δp)=Q_{safe}*$I_{B\text{-}avg}$)	150.50 kPa

3.4 Settlement Computations:

Consolidation Settlement (S_c=C_c*λ*ΔH*log{(P_0+Δp)/P_0}/(1+e_0)	101.99 mm
Rigidity Factor	0.80
Corrected Settlement(S_c)=	81.59 mm
Total Settlement:	89.80 mm
	<100 mm

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GEO MARINE

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)	22.5	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	1.0	1.0	Cut-Off Level													
2.0	1.0	4.0	3.0	Silty Clay	11	18.0	18.0	73	-	0.0	24.0	12.0	0.6	-	qf	2	213.3
3.0	4.0	5.0	1.0	Silty Sand	6	14.5	16.3	-	29	24.0	28.5	26.3	-	1.0	qf	3	23.0
4.0	5.0	7.5	2.5	Silty Sand	20	18.0	16.3	-	33	28.5	48.5	38.5	-	1.2	qf	4	113.1
5.0	7.5	9.0	1.5	Silty Sand	6	14.5	16.3	-	29	48.5	55.3	51.9	-	1.0	qf	5	68.3
6.0	9.0	10.5	1.5	Silty Sand	19	18.0	16.3	-	33	55.3	67.3	61.3	-	1.1	qf	6	105.3
7.0	10.5	18.0	7.5	Silty Sand	50	20.5	19.3	-	38	67.3	146.0	106.6	-	1.5	qf	7	1472.2
8.0	18.0	21.0	3.0	Silty Clay	50	21.0	20.8	333	-	146.0	179.0	162.5	0.3	-	qf	8	408.0
9.0	21.0	22.5	1.5	Weathered Rock	100	21.0	21.0	-	38	179.0	195.5	187.3	-	1.5	qf	9	517.1

Summation of Positive Skin Resitance (kN) Q_f= 2920.29

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

Computation of End Bearing Resistance

		SPT	ϕ	C_u	N_q	N_c			
Bearing Stratum	Weathered Rock	100	38.00	-	82.03	-	Eff.Ht.of Overburden	8	m
							Effective Overburden Pressure	60.00	kN/m²

End Bearing Resistance (kN) Q_p= 966.34

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 $\pi*d^2/4*Q*N_c$

Ultimate Load Carrying Capacity (Q_{ult})	$Q_u=Q_f-Q_f+Q_p$ (kN)	3886.63
Safe Load Carrying Capacity (Q_{safe})	$Q_u/2.5$ (kN)	1554.65
Allowable Safe Load Carrying Capacity	$Q_{A\text{-}safe}$ (kN)	1554.65
Allowable Safe Pull out Capacity	$Q_{A\text{-}pull}$: Qf/3 (kN)	973.43

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_c=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)

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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)	22.5	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	1.0	1.0	Cut-Off Level													
2.0	1.0	3.0	2.0	Silty Clay	19	20.0	20.0	127	-	0.0	20.0	10.0	0.4	-	qf	2	139.6
3.0	3.0	6.0	3.0	Silty Sand	35	19.5	19.8	-	37.4	20.0	48.5	34.3	-	1.4	qf	3	169.3
4.0	6.0	7.5	1.5	Silty Sand	7	14.5	17.0	-	29.4	48.5	55.3	51.9	-	1.0	qf	4	68.9
5.0	7.5	10.5	3.0	Silty Sand	13	16.5	15.5	-	30.9	55.3	74.8	65.0	-	1.0	qf	5	191.7
6.0	10.5	16.0	5.5	Silty Sand	45	20.0	18.3	-	38.0	74.8	129.8	102.3	-	1.5	qf	6	1035.3
7.0	16.0	20.0	4.0	Silty Sand	50	20.5	20.3	-	38.0	129.8	171.8	150.8	-	1.5	qf	7	1110.0
8.0	20.0	21.0	1.0	Silty Clay	50	21.0	20.8	333	-	171.8	182.8	177.3	0.3	-	qf	8	136.0
9.0	21.0	22.5	1.5	Weathered Rock	100	21.0	21.0	-	38.0	182.8	199.3	191.0	-	1.5	qf	9	527.4

Summation of Positive Skin Resitance (kN) Q_f= 3378.22

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

Computation of End Bearing Resistance

		SPT	ϕ	C_u	N_q	N_c			
Bearing Stratum	Weathered Rock	100	38.00	-	82.03	-	Eff.Ht.of Overburden	8	m
							Effective Overburden Pressure	67.97	kN/m²

End Bearing Resistance (kN) Q_p= 1094.68

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

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

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)	4472.90
Safe Load Carrying Capacity (Q_{safe})	$Q_u/2.5$ (kN)	1789.16
Allowable Safe Load Carrying Capacity	$Q_{A\text{-}safe}$ (kN)	1789.16
Allowable Safe Pull out Capacity	$Q_{A\text{-}pull}$: Qf/3 (kN)	1126.07

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)

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GEOMARINE

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

Type of Pile	Bored	Diameter of Pile	500	mm	Length of Pile below G.L. (m)	22.5	As Per IS:2911-(P-I,S-2)-2010
Reference Bore Hole	BH-03				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	1.0	1.0	Cut-Off Level													
2.0	1.0	2.0	1.0	Silty Clay	24	20.5	20.5	160	-	0.0	10.5	5.3	0.3	-	qf	2	75.4
3.0	2.0	5.0	3.0	Silty Sand	46	20.0	20.3	-	38.0	10.5	40.5	25.5	-	1.5	qf	3	140.8
4.0	5.0	9.0	4.0	Clayey Sand	6	14.5	17.3	-	29.2	40.5	58.5	49.5	-	1.0	qf	4	173.8
5.0	9.0	16.0	7.0	Silty Sand	42	20.0	17.3	-	38.0	58.5	128.5	93.5	-	1.5	qf	5	1177.4
6.0	16.0	20.0	4.0	Silty Sand	50	20.5	20.3	-	38.0	128.5	170.5	149.5	-	1.5	qf	6	1100.8
7.0	20.0	21.0	1.0	Silty Clay	50	21.0	20.8	333	-	170.5	181.5	176.0	0.3	-	qf	7	136.0
8.0	21.0	22.5	1.5	Weathered Rock	100	21.0	21.0	-	38.0	181.5	198.0	189.8	-	1.5	qf	8	524.0

Summation of Positive Skin Resitance (kN) Q_f= 3328.23

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

Computation of End Bearing Resistance

		SPT	ϕ	C_u	N_q	N_c			
Bearing Stratum	Weathered Rock	100	38.00	-	82.03	-	Eff.Ht.of Overburden	8	m
							Effective Overburden Pressure	72.05	kN/m²

End Bearing Resistance (kN) Q_p= 1160.47

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

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

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})	$Q_u=Q_f-Q_t+Q_p$ (kN)	4488.69
Safe Load Carrying Capacity (Q_{safe})	$Q_u/2.5$ (kN)	1795.48
Allowable Safe Load Carrying Capacity	$Q_{A\text{-}safe}$ (kN)	1795.48
Allowable Safe Pull out Capacity	$Q_{A\text{-}pull}$: Qf/3 (kN)	1109.41

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=Thickness of Layer

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

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GEOMARINE

LATERAL LOAD CARRYING CAPACITY OF BORED CAST- SITU PILES

1.0 Geometrical Data

Type of Pile Head Considered		Fixed	
Diameter of Pile (d)	:	0.75	m
Free standing Length of Pile (e)	:	0	m
Length of Pile below E.G.L (Le)	:	22.5	m
Cut-Off Level From E.G.L	:	1.0	
Length of Pile below Cut-Off Level (Le)	:	21.5	m
Grade of Concrete (M)	:	25	MN/m^2
Young's Modulus of Concrete (E)	:	25000000	kN/m^2
Momemnt of Inertia (I)	:	0.015532	m^4

2.0 Determination of Depth of Fixity

Type of Soil Strata	:	Clay	
Ground Water Condition	:	Submerged	
Design SPT "N" Value	:	11	
K=((k1/1.5)*(0.3/B))			
(n can be read as h in the above and below equation in case of Sand)			
K1=	:	27000	kN/m^3
K=	:	7200	kN/m^4
R=	:	2.91	m
L1/R	:	0.00	
Lf/R	:	2.20	
Depth of Fixity below Cut off (z_f)	:	6.41	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	:	88.61	kN
Recommended Design Lateral Load carrying Capacity	:	**89**	**kN**
Fixed End Moment,M_F=H(e+z_f)/2		284	
Reduction Factor (L_1/T)	:	0.67	m
Actual Moment (Fixed End Moment/Reduction Factor),M_F		**190**	kN-m

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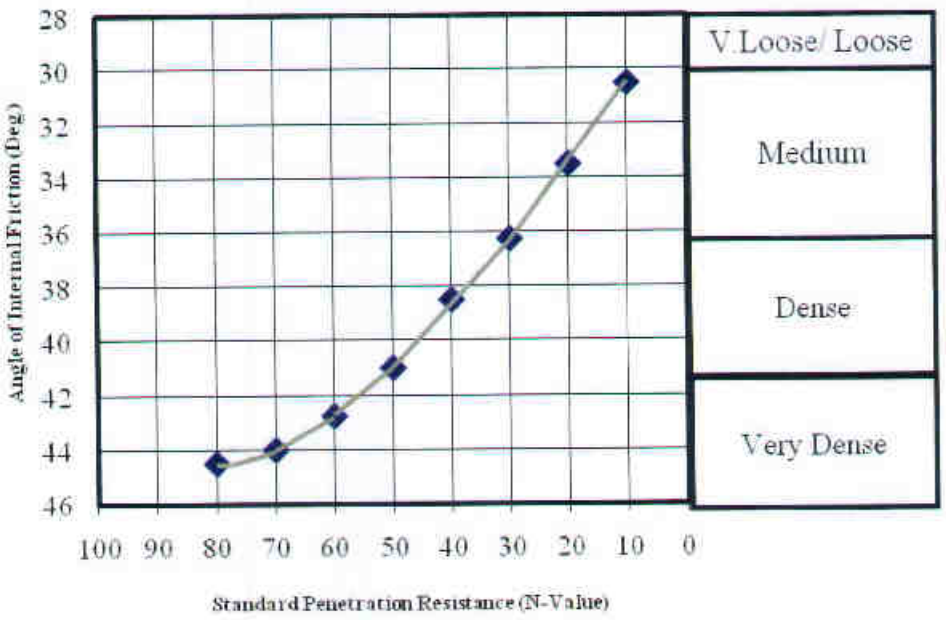


FIG. A1 Relation Ship between Angle of Internal Friction & N-value (Reproduced from IS:6403-1981)

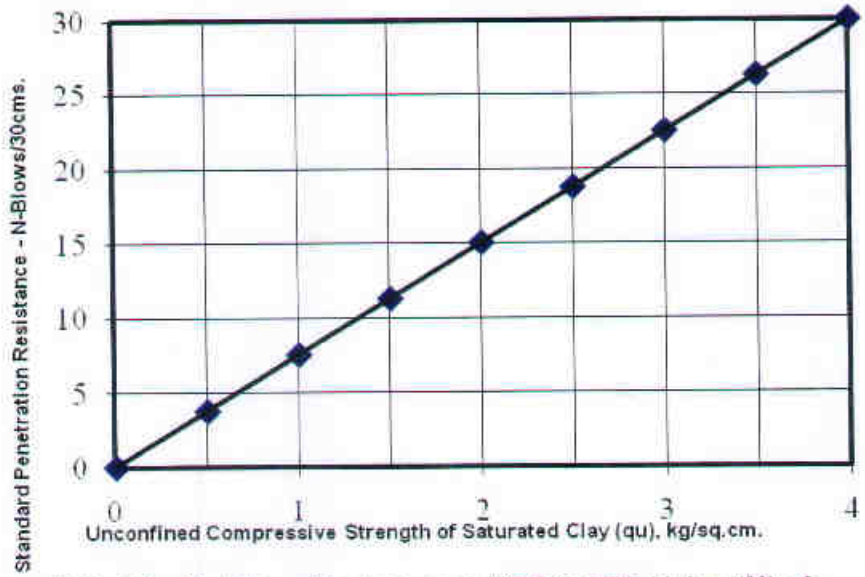


FIG. A2 : Relationship between UCC & SPT-Value (N) of Saturated Clay (AfterTerzhagi & Peck, 1948)

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ANNEXURE-II

CONSOLIDATION TEST GRAPH

GEOMARINE
Phone No.: 044-24480305
ULR No : TC114102300000166F

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

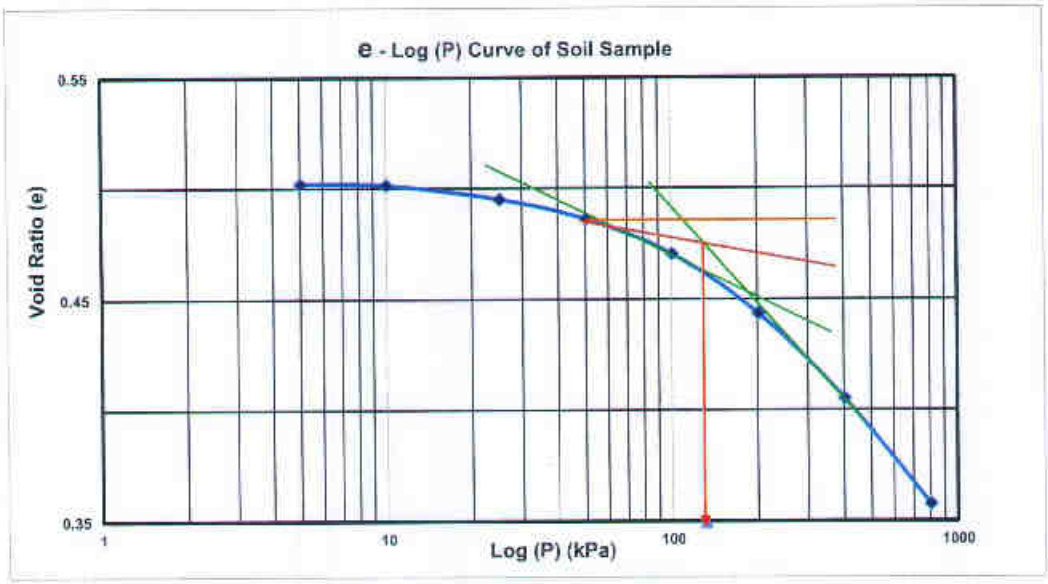
TC-11410

CONSOLIDATION TEST AS PER IS 2720-Part-15 : 1965 (RA 2021)

Name & Address of the Customer:	**M/s CHAITANYA FOUNDATIONS PVT LTD**		
Sample Description:	Soil	**Sample Identification Number:**	GMC/0923/741
Source of Sample:	Customer Supplied	**Period of Testing:**	12/09/2023
Sample Condition:	Satisfactory	**Report Date:**	20/09/2023
Test Method	As per Bureau of Indian Standards	**Test Report No.:**	GT-2651
Sample Receipt Date:	09/09/2023	**Test Report Pages:**	One Page
Bore Hole Number:	BH-02	**Depth of Sample,m**	2.0

Before Test:			**After Test:**		
Diameter of consolidation ring	60	mm	Mass of the consolidation ring + Sample	257.44	g
Height of consolidation ring	20	mm	Mass of sample	119.24	g
Mass of consolidation ring	138.2	g	Dry Mass	97.09	g
Mass of consolidation ring + sample	256.67	g	Specific Gravity	2.58	g
Mass of sample	118.47	g	Height of Solids	13.32	mm
Bulk Unit weight	20.56	kN/m^3	Dry Unit Weight	16.7	kN/m^3

Initial Moisture Content of sample			**Final Moisture Content of sample**			
Can No	A1		Can No	A1		
Mass of can	6.4	g	Mass of can	45.16	g	
Can + Wet mass	17.22	g	Can + Wet mass	164.4	g	
Can + Dry mass	15.69	g	Can + Dry mass	142.25	g	
Initial Moisture Content	16.5	%	Final Moisture Content	22.81	%	



Results :

Natural Moisture Content	16.5 %
Initial Void Ratio	0.502
Pre Consolidation Pressure	130 kPa
Compression Index	0.127

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ANNEXURE-III

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	01
PAGE No.	01
DIA OF BORE HOLE	150mm: 4 / 100mm:
BORE START DATE	07/09/2023
BORE END DATE	08/09/2023
TOTAL DRILLING DAYS	1

PROJECT NAME	CHAITANYA, NUNGAMBAKKAM						
LOCATION		MACHINE No.	CR-04	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
		12	19												Filled up Soil
		12	20	SC			3	7	7	14	0.50	1	SS		Greyish Brown Stiff Sandy clay
1		12	29												
		12	30	SC			4	6	8	14	1.25	2	SS		Brownish Stiff Sandy Clay
	07	12	36												
2		12	37	SC			~~4~~	~~5~~	7	12	2.00	3	SS		Brownish Stiff Sandy Clay
		12	43												
		12	44	SC			2	3	5	8	3.00	4	SS		Greyish Brown Stiff Sandy Clay
3															
		12	50												
		12	51	SC			4	3	3	6	4.00	5	SS		Brownish Loose Silty fine Sand
4															
		2	08												
		2	09	SC			5	8	12	20	5.00	6	SS		Brownish medium Dense Silty fine Sand
5	09														
		2	17												
		2	18	SC			12	11	9	20	6.00	7	SS		Brownish medium Dense Silty M. Coarse to fine Sand
6															
		2	29												
7		2	30												
				SC			2	3	3	6	7.50	8	SS		Brownish Loose Clayey Sand
8	2023														
		2	39												
		2	40	SC			7	9	10	19	9.00	9	SS		Greyish Brown Medium Dense Silty fine to Coarse Sand
9															
0															

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	M. Loganathan	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	ESL
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	07/09/2023	WATER TABLE (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

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GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	01
PAGE No.	02
DIA OF BORE HOLE	150mm: 4 / 100mm:
BORE START DATE	07/09/2023
BORE END DATE	08/09/2023
TOTAL DRILLING DAYS	1

PROJECT NAME	CHAITANYA, NUNGAMBAKKAM, CHENNAI				
LOCATION		MACHINE No.	CR-04	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	07	2	54												
		2	55	SC			21	29	31	60	10.50	10	SS		Brownish Very Dense Silty fine to M. coarse Sand
		3	14												
2		3	15	SC			32	41	35	76	12.00	11	SS		Brownish Very Dense Silty fine to M. coarse Sand
3		3	36												
		3	37												
4	09			SC			21	22	24	46	14.00	12	SS		Brownish Dense Silty fine Sand
5		3	58												
		4	00												
6				SC			15cm/53 blows HR N>100				16.00	13	SS		Brownish Very Dense Silty fine Sand with Boulders
7	2023	4	55												
		6	58												
8				SC			29	45	52	97	18.00	14	SS		Brownish Grey Very Dense Cemented Sand
	08	9	09												
9		9	20												
	09														
	2023			SC			27	39	13cm/62 blows HR N>100		20.00	15	SS		Brownish Grey very Hard Compacted clay with Sand and Shale pieces

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	Mr. Loganathan	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	EGL
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	08/09/2023	WATER TABLE (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	—

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GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	01
PAGE No.	03
DIA OF BORE HOLE	150mm: 4 / 100mm:
BORE START DATE	07/09/2023
BORE END DATE	08/09/2023
TOTAL DRILLING DAYS	1

PROJECT NAME	CHAITANYA - NUNGAMBAKKAM, Chennai				
LOCATION		MACHINE No.	CR-04	CHAINAGE (m)	
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N
IOB 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
0	08	10	01												
		10	07	SC							20.50				
1		10	25												
		10	45	DB											
	09				1%	0%	Hammer Rebound N0/part N7.00				22.00	16	CS+GU		Greyish Brown Very Weak Completely Weathered Rock
2															
		11	10												
3	2023	11	35												
				DB	18%	0%					23.00	17	CS		Greyish Brown Weak Highly Weathered Rock
4															
	Borehole Terminated at 23.50m Depth below G.L.														
5															
6															
7															
8															
9															
10															

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CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	K. Loganathan	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	GSC
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	08/09/2023	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. 01
DIA OF BORE HOLE 150mm ✓ / 100mm
BORE START DATE 08/09/2023
BORE END DATE 09/09/2023
TOTAL DRILLING DAYS 1

PROJECT NAME: CHAITANYA, NUNGAMBAKKAM.
LOCATION:
STRUCTURE:
JOB CODE:
MACHINE No.: CR-DA
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
0		2	20												Filled up soil
		2	21	SC			1	2	5	7	0.50	1	SS		Brownish Medium stiff Sandy clay
1	08	2	30												
		2	31	SC			4	6	13	19	1.25	2	SS		Brownish very stiff silty Clay with sand
		2	39												
2		2	40	SC			30cm/60b				2.00	3	UDS		Brownish Sandy Clay
		2	54												
		2	55	SC			9	15	18	33	3.00	4	SS		Brownish Dense silty M-coarse to fine Sand
3		3	04												
		3	05	SC			19	22	23	45	4.00	5	SS		Brownish Dense M-coarse to fine Sand
4		3	15												
		3	16	SC			9	14	13	27	5.00	6	SS		Brownish Medium Dense fine to M-coarse Sand
5	09	3	28												
		3	29	SC			3	3	4	7	6.00	7	SS		Greyish loose clayey Sand
6		3	39												
		3	40	SC			3	5	6	11	7.50	8	SS		Brownish Grey medium Dense clayey Sand
7	2023	3	50												
		3	51	SC			4	7	8	15	9.00	9	SS		Brownish Medium Dense fine to M-coarse Sand
8															
9															
0															

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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: B. Loganathan
SIGNATURE: B. Loga
DATE: 08/09/2023
CLIENT IN-CHARGE:

PROJECT SITE DETAILS
GROUND LEVEL (m): EGL
WATER TABLE (m): 3.50m
CASING DEPTH (m): —

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SITE INVESTIGATION RECORD

BORE HOLE No.	02
PAGE No.	02
DIA OF BORE HOLE	150mm: 4 / 100mm:
BORE START DATE	08/09/2023
BORE END DATE	09/09/2023
TOTAL DRILLING DAYS	1

PROJECT NAME	CHAITANYA, NUNGAMBAKKAM.					
LOCATION		MACHINE No.	CR-04	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
0		4	01												
		4	02				12	15	18	33	10.50	10	SS		Brownish Grey Dense Silty fine Sand
1	08														
		4	15												
		4	16												
2							27	29	37	66	12.00	11	SS		Yellowish Brown Very Dense fine to M. coarse Sand
		4	32												
3		4	33												
	09														
4							16	17	18	35	14.00	12	SS		Greyish Brown Dense Silty fine Sand
		4	52												
5	2023	4	53												
6							51	10cm / 52b	HR N×100		16.00	13	SS		Greyish Brown Very Dense Silty fine to M. coarse Sand
	09														
7		9	11												
		9	15												
8							41	15cm / 56b	HR N×100		18.00	14	SS		Yellowish Grey Very Dense Cemented Sand
	09														
9		9	50												
		10	05												
10	2023						29	31	67	98	20.00	15	SS		Brownish Grey Very Hard Compacted Clay with Shale

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CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	M. Loganathan	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	ESL
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	09/09/2023	WATER TABLE (m)	3.50 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. 03
DIA OF BORE HOLE 150mm 4
100mm
BORE START DATE 08/09/2023
BORE END DATE 09/09/2023
TOTAL DRILLING DAYS 1

PROJECT NAME: CHAITANYA, NUNGAMBAKKAM.
LOCATION:
STRUCTURE:
JOB CODE:
MACHINE No.: CR-04
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	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	09	10	32	DB			HR	NO/penetration			21.00	16	WS		Greyish Brown Very weak Completely Weathered Rock
		10	38												
		11	05												
2		11	32												
	09			DB			HR	NO/penetration			22.50	17	WS		Greyish Brown Very weak Completely Weathered Rock
3		11	50												
	2023	12	13												
4				DB	16%	0%					24.00	18	CS		Brownish Grey weak Highly Weathered Rock
5	Bore hole Terminated at 24.00m Depth below in GL														
6															
7															
8															
9															
0															

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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. Loganathan
SIGNATURE:
DATE: 09/09/2023
CLIENT IN-CHARGE:

PROJECT SITE DETAILS
GROUND LEVEL (m): ESL
WATER TABLE (m): 3.50m
CASING DEPTH (m): —

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SITE INVESTIGATION RECORD

BORE HOLE No.	03		
PAGE No.	01		
DIA OF BORE HOLE	150mm	4	
	100mm		
BORE START DATE	09/09/2023		
BORE END DATE	11/09/2023		
TOTAL DRILLING DAYS	1		

PROJECT NAME	CHAITANYA - NUNGAMBAKKAM.					
LOCATION		MACHINE No.	CR-04	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
0		2	51	-			Excavated				0.50	1	SS		Filled up soil Building materials
1		2	52	SC			8	10	14	24	1.25	2	SS		Greyish Brown very stiff Sandy clay
		3	00												
	09	3	02												
2				SC			15	26	27	53	2.00	3	SS		Brownish Dense silty fine Sand
		3	12												
		3	13												
3				SC			17	21	26	47	3.00	4	SS		Brownish Dense silty Sand with Pebbles
		3	25												
		3	26												
4				SC			11	19	20	39	4.00	5	SS		Brownish Dense silty M.coarse to fine Sand
		3	38												
		3	39												
5	09			SC			7	4	3	7	5.00	6	SS		Greyish Medium stiff Sandy silty clay
		3	48												
		3	49												
6				SC			1	2	4	6	6.00	7	SS		Greyish Loose Clayey Sand with sea shell
		3	59												
		4	00												
7															
				SC			2	2	4	6	7.50	8	SS		Brownish Grey Loose clayey Sand
8	2023	4	10												
		4	11												
9				SC			14	23	24	47	9.00	9	SS		Brownish Grey Dense silty fine to M.coarse Sand
0															

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CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	M. Loganathan	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	EGL
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	09/09/2023	WATER TABLE (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	—

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SITE INVESTIGATION RECORD

BORE HOLE No. 03
PAGE No. 02

PROJECT NAME: CHAITANYA - NUNGAMBAKKAM.
DIA OF BORE HOLE: 150mm 4, 100mm
LOCATION:
MACHINE No.: CR-04
CHAINAGE (m):
BORE START DATE: 09/09/23
STRUCTURE:
DRILLING METHOD: Rotary
CO-ORDINATES: N, E
BORE END DATE: 11/09/2023
JOB CODE:
FLUSHING MEDIUM: Bentonite
TOTAL DRILLING DAYS: 1

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		4	28												
		4	29	SC			10	12	15	27	10.50	10	SS		Brownish Grey medium Dense Silty fine to M. Coarse Sand
1	09														
		4	47												
		4	48												
2				SC			11	20	35	55	12.00	11	SS		Brownish Grey Dense Silty Coarse to M. Coarse Sand
	09														
3		5	13												
	2023	5	14												
4				SC			8	10	20	30	14.00	12	SS		Greyish Brown medium Dense Silty fine Sand
		9	18												
5	11	9	19												
6				SC			46	100mm/576 HRN>100			16.00	13	SS		Brownish Very Dense Silty fine Sand with Pebbles
		9	51												
7		9	55												
	09														
8				SC			42	100mm/626 HRN>100			18.00	14	SS		Greyish Brown Very Dense Cemented Sand
		10	26												
9		10	36												
	2023														
10				SC			14	27	44	71	20.00	15	SS		Greyish very Hard Shale.

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CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	K. Loganathan	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	BSL
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	11/09/2023	WATER TABLE (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	—

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SITE INVESTIGATION RECORD

BORE HOLE No.	03
PAGE No.	03
DIA OF BORE HOLE	150mm 4 / 100mm
BORE START DATE	09/09/2023
BORE END DATE	11/09/2023
TOTAL DRILLING DAYS	1

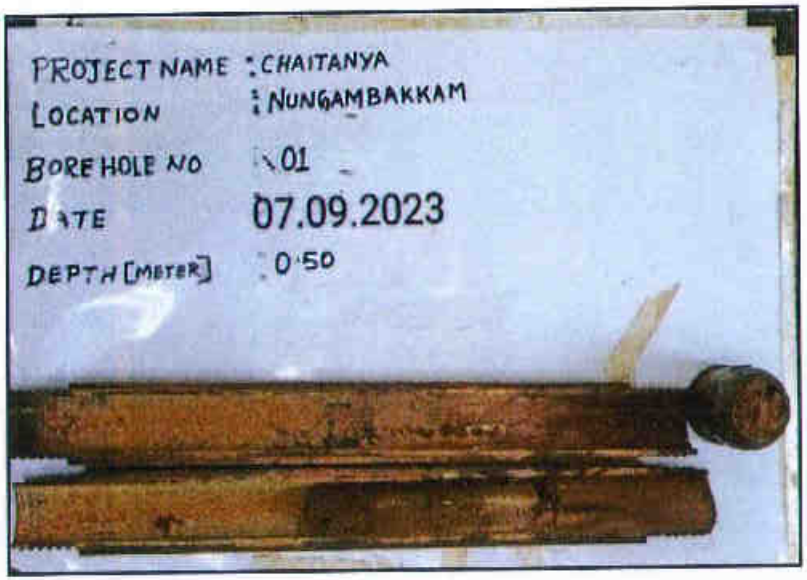
PROJECT NAME	CHAITANYA - NUNGAMBAKKAM.				
LOCATION		MACHINE No.	CR-04	CHAINAGE (m)	
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N
JOB CODE		FLUSHING MEDIUM	Bentonite		E

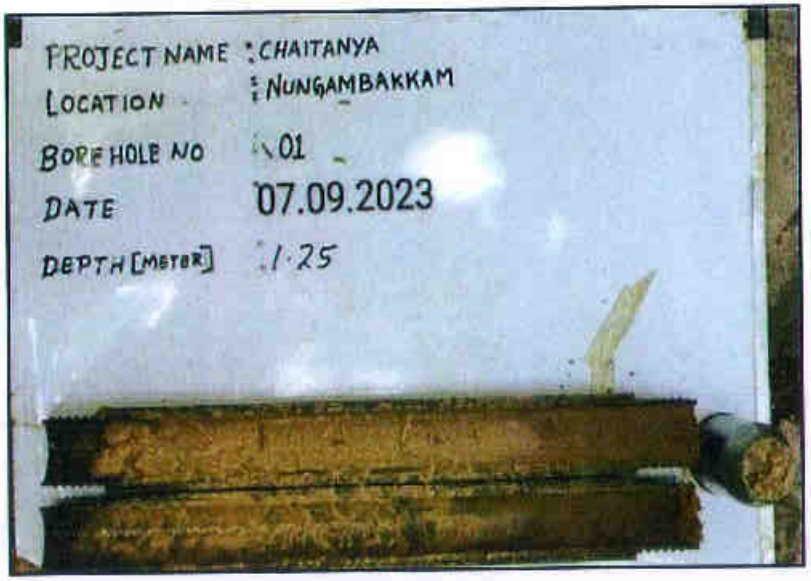
Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
0		11	08												
1	11	11	17	SC			Hammer Rebound No/part N>100				1.00	16	WS		Greyish Brown very weak Completely Weathered Rock
2		11	43												
		12	03												
	09			DB			Hammer Rebound No/part N>100				2.20	17	WS		Greyish Brown very weak Completely Weathered Rock
3															
		12	35												
4	2023	1	00	DB	20%	0%					4.00	18	CS		Greyish Brown weak Highly Weathered Rock
5	Bore log	Terminated at 4.00m Depth below m G.L.													
6															
7															
8															
9															
0															

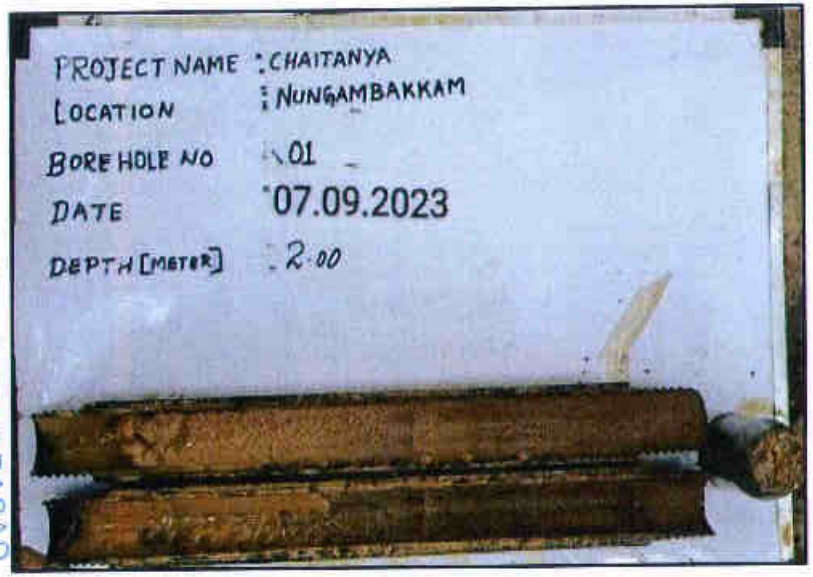
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CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	B. Loganathan	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	ESL
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	11/09/2023	WATER TABLE (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	—

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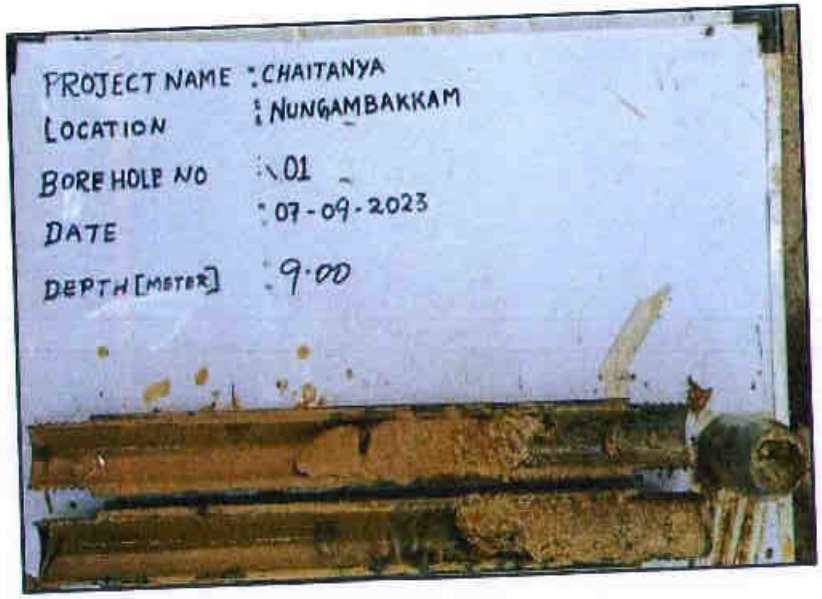


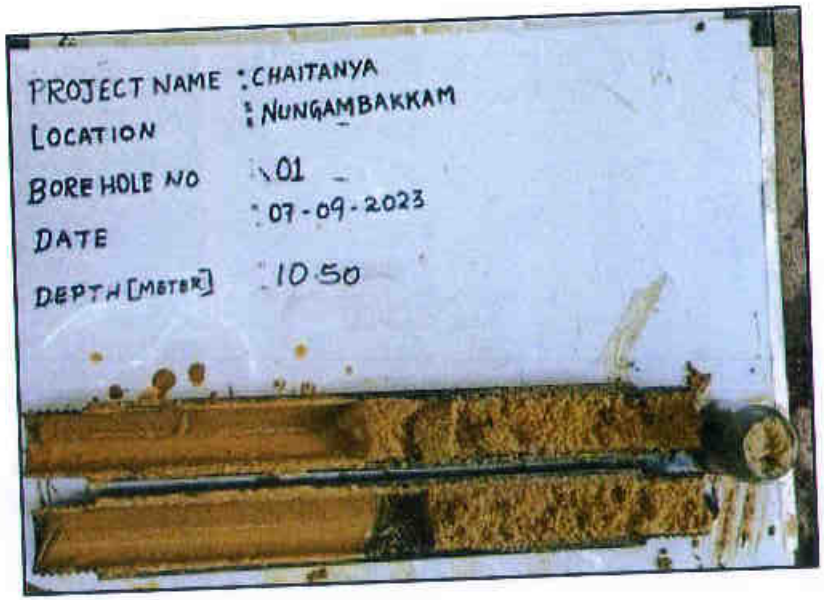


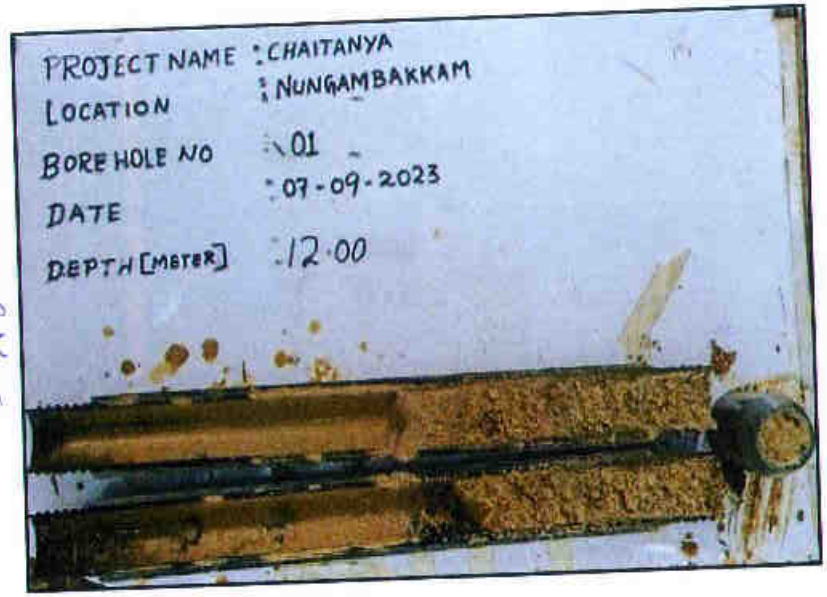


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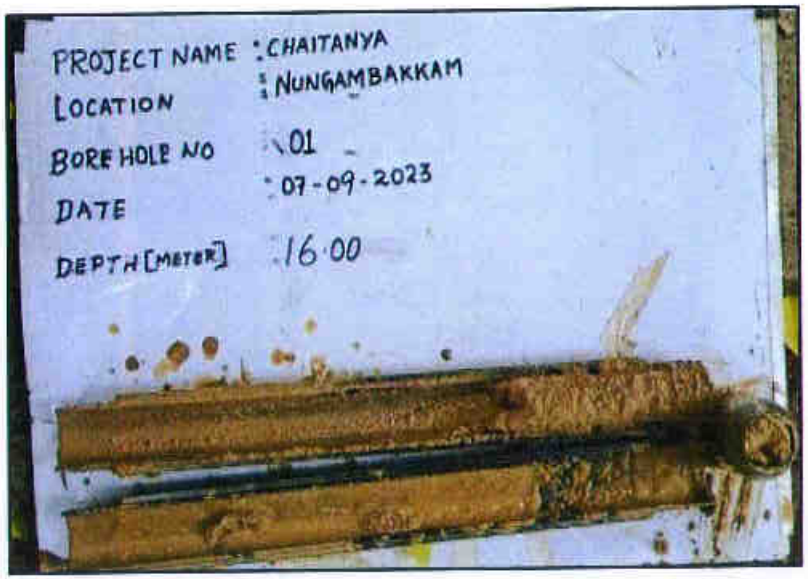




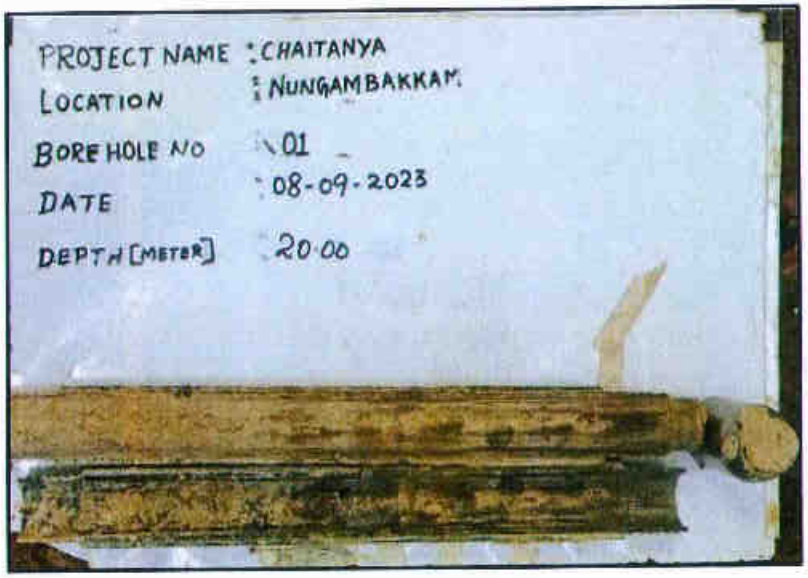


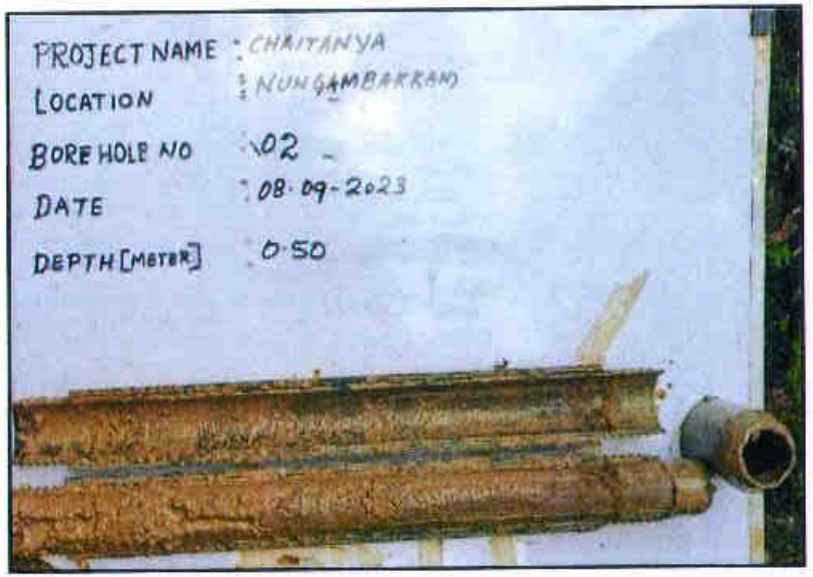
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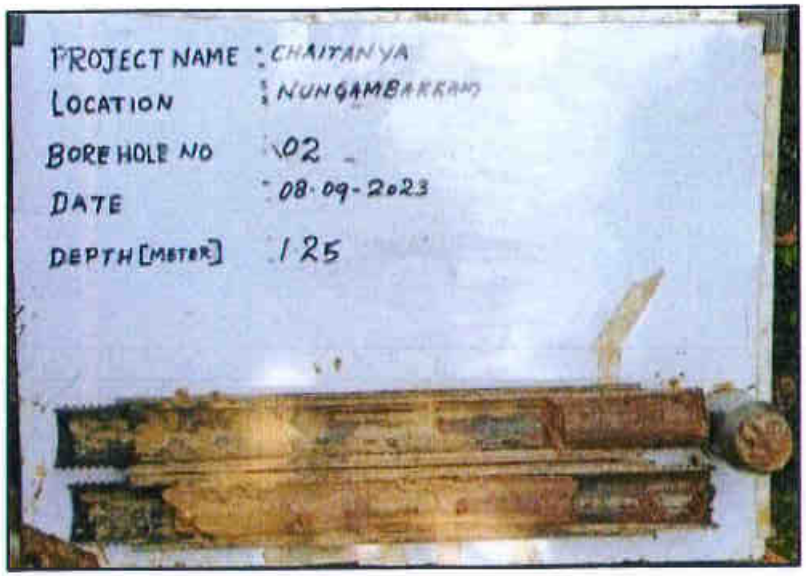


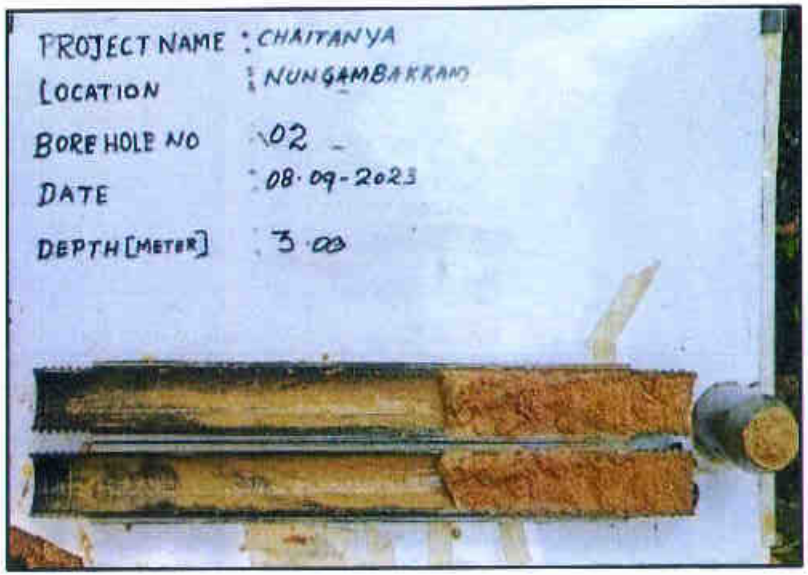


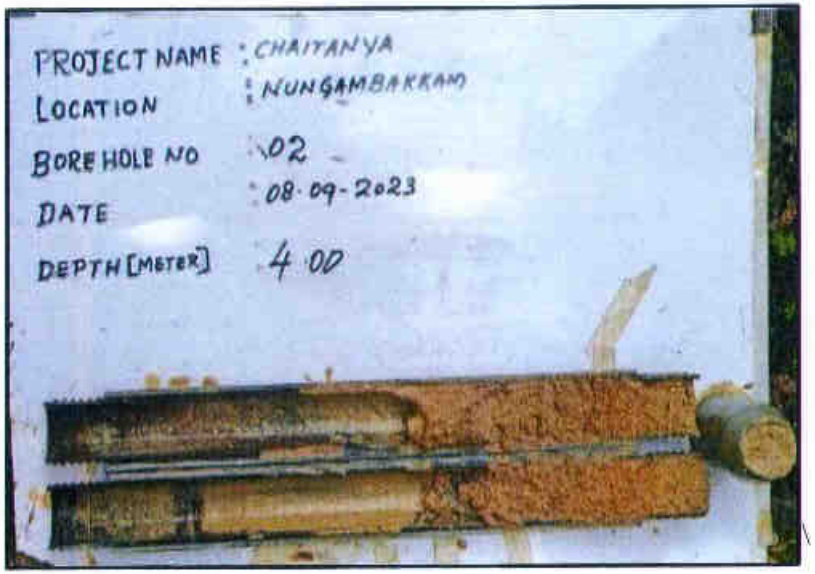


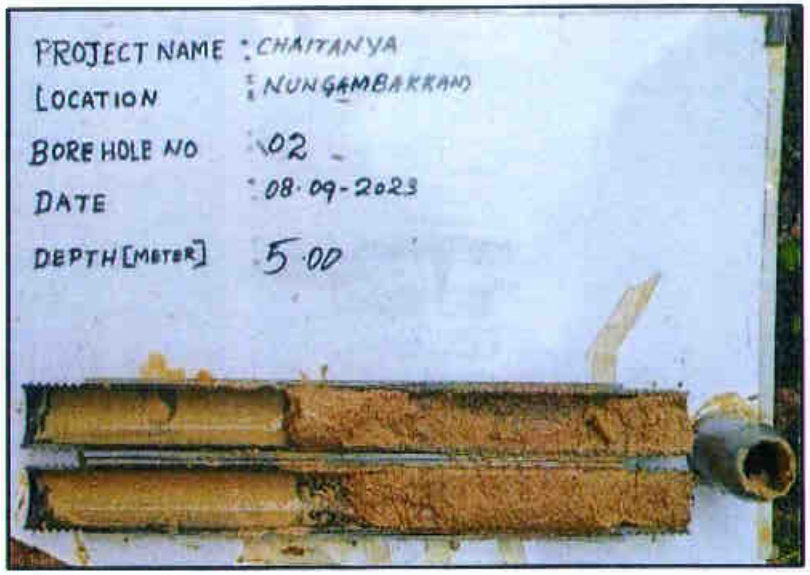
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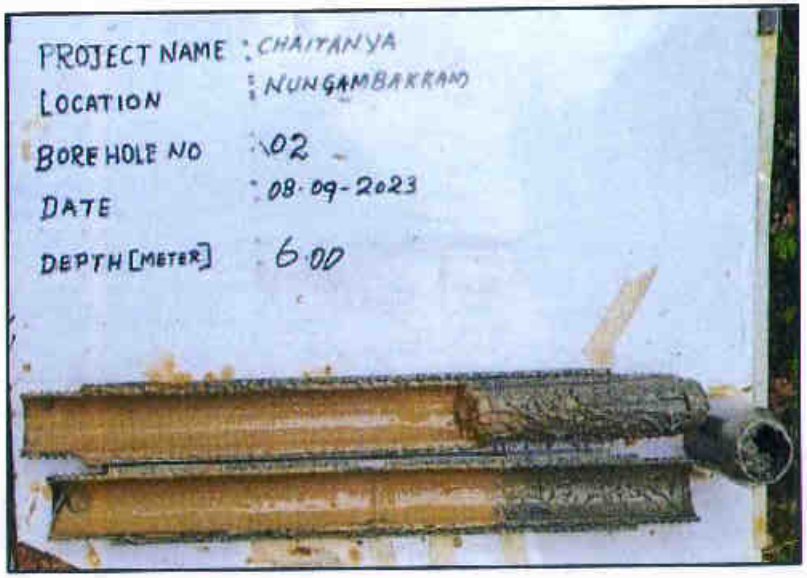


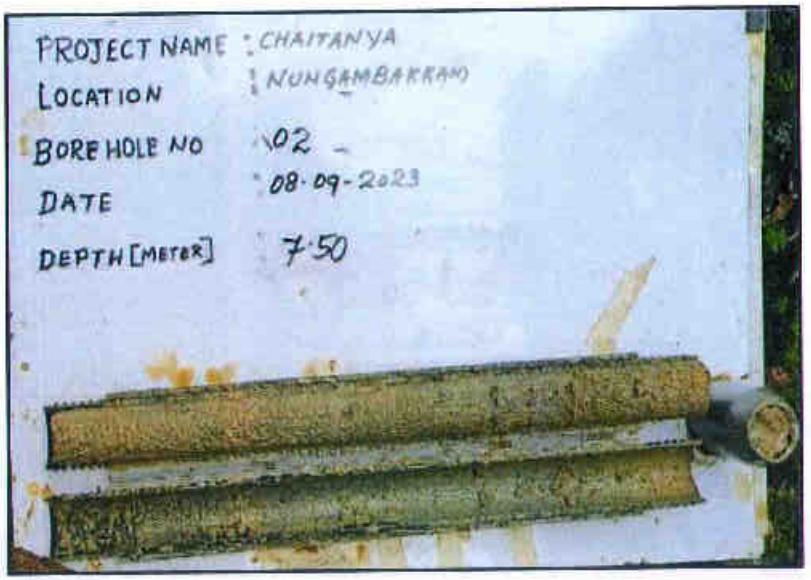


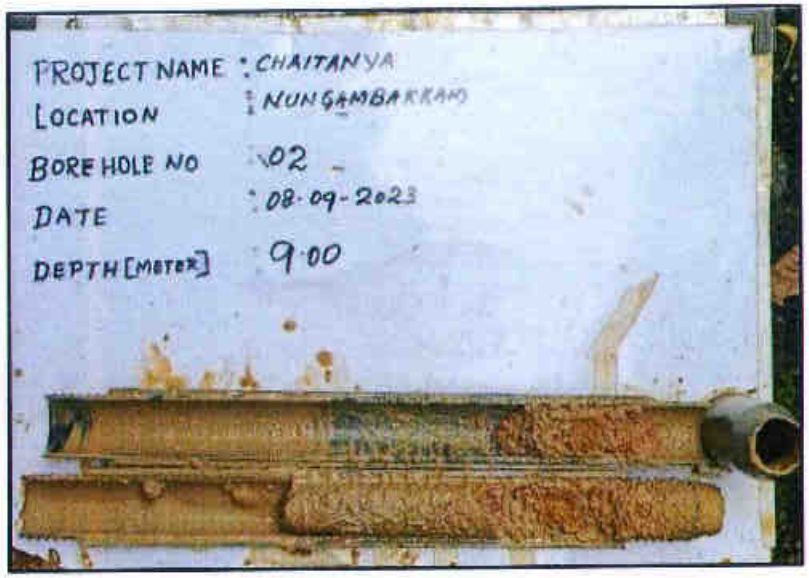


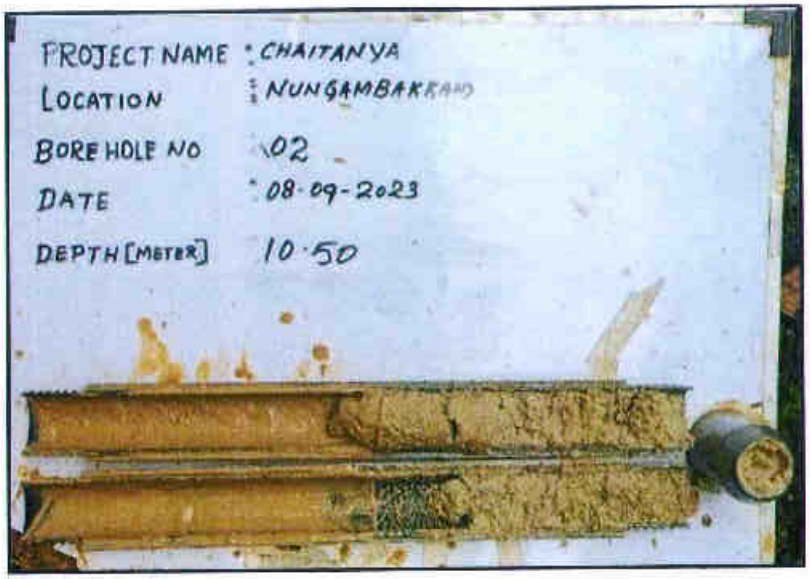
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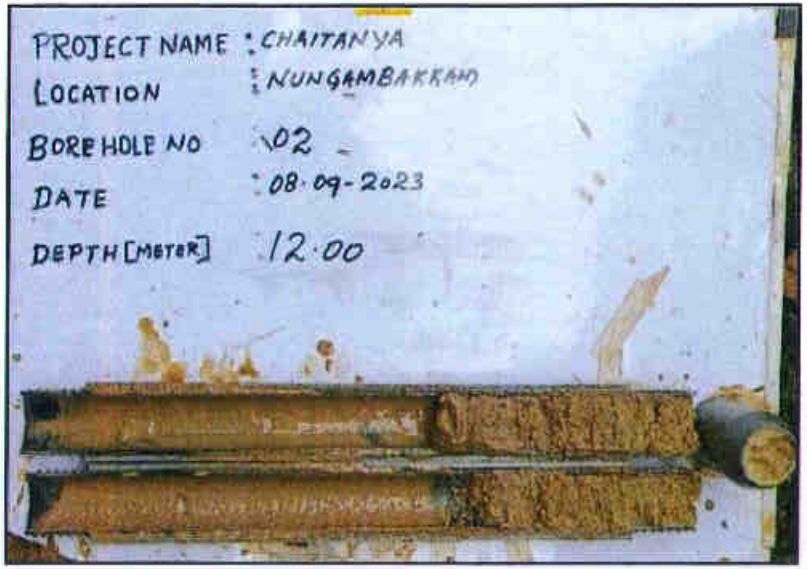


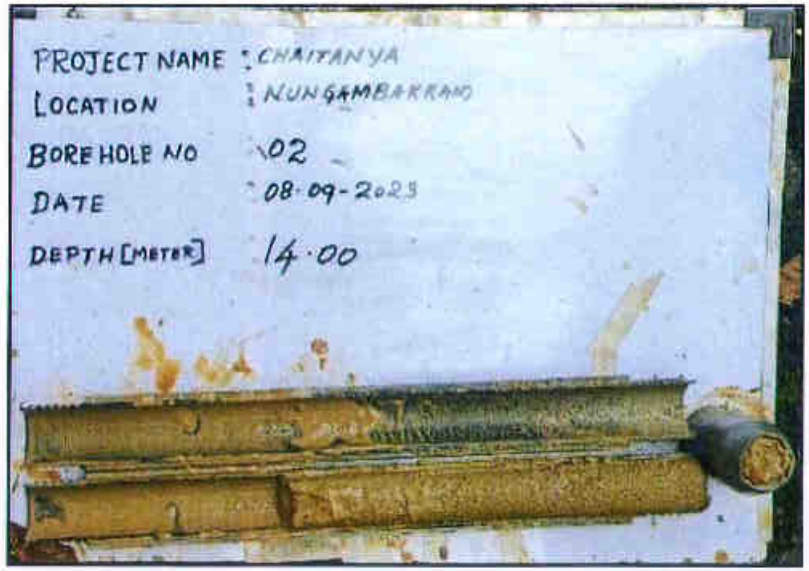


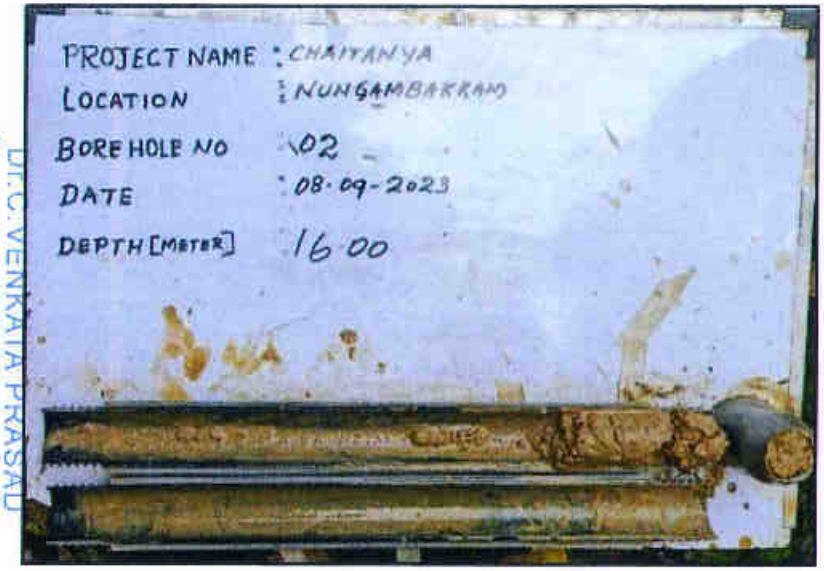


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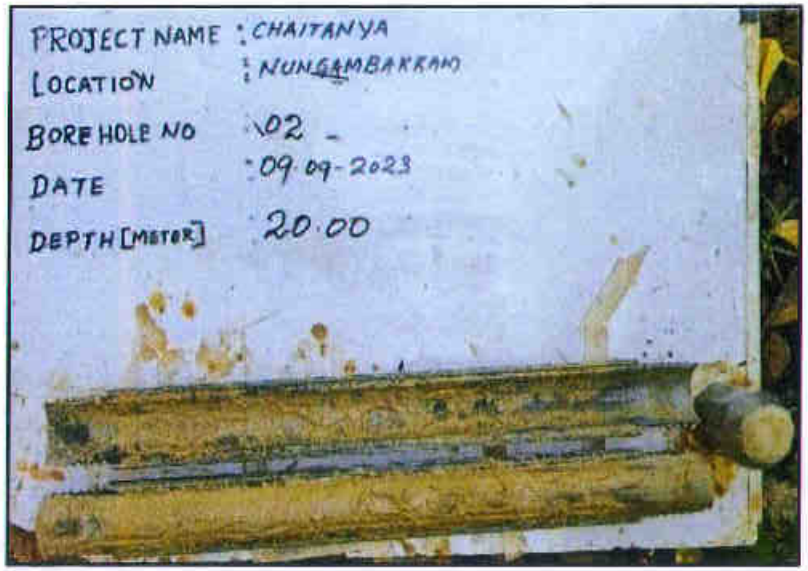


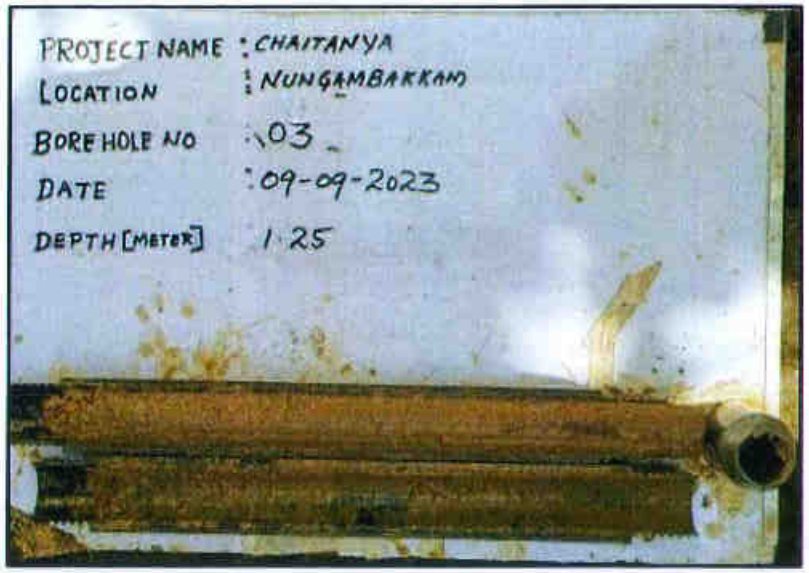




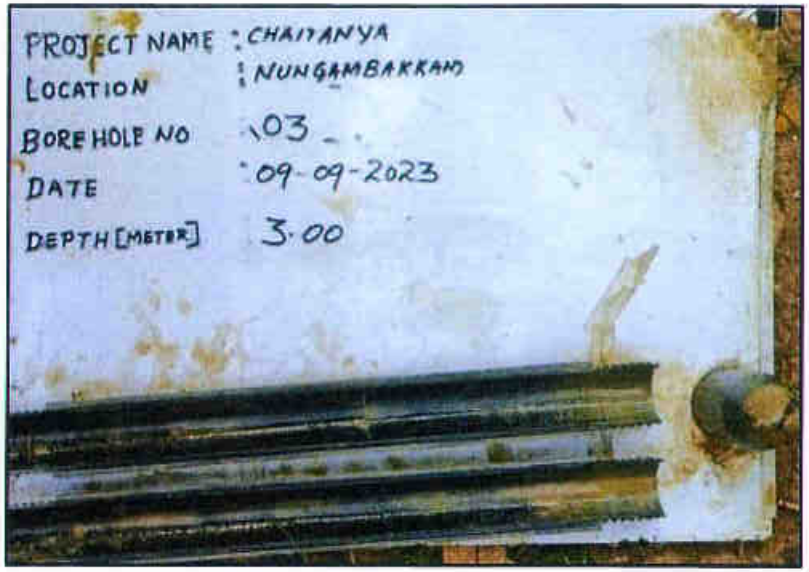
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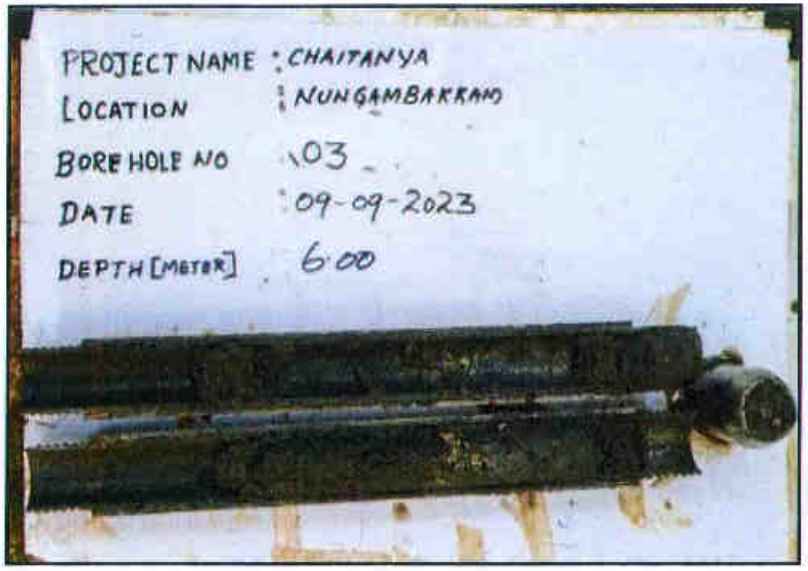


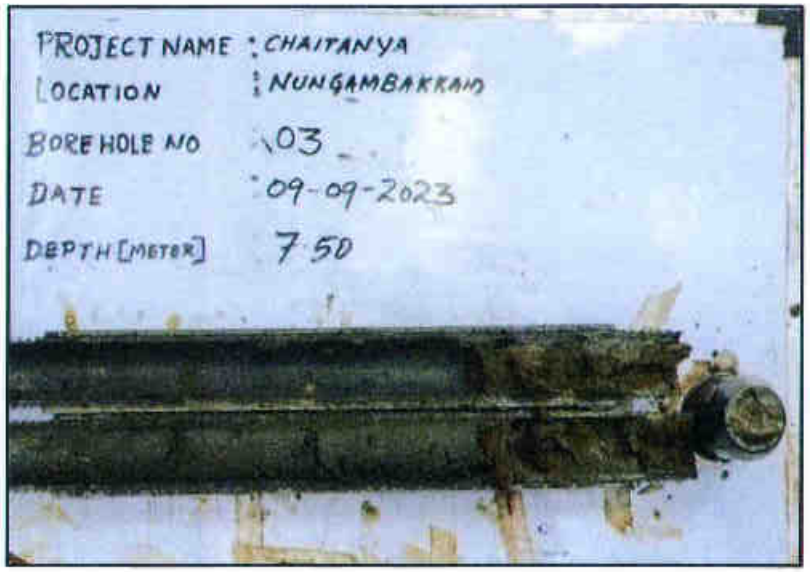
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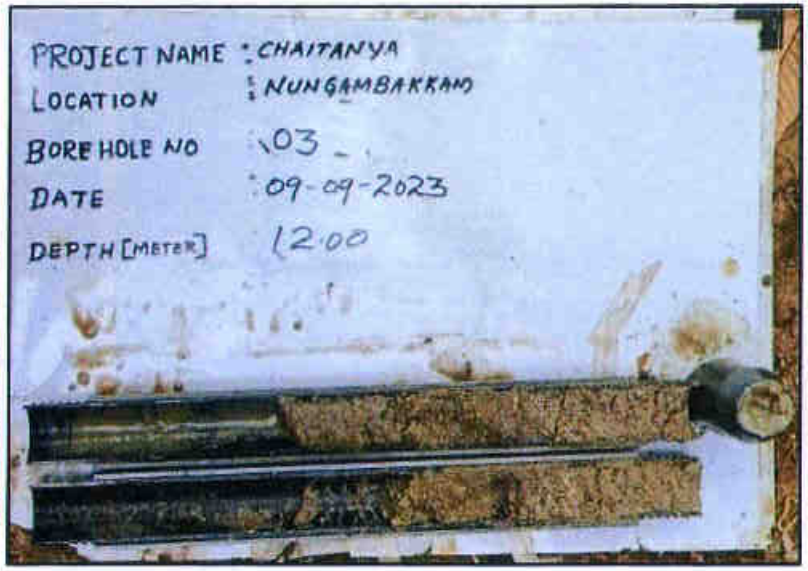


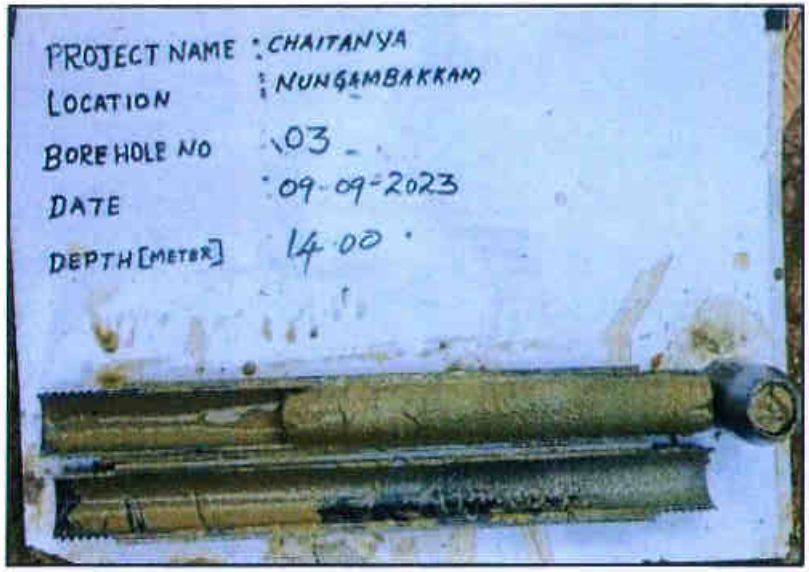
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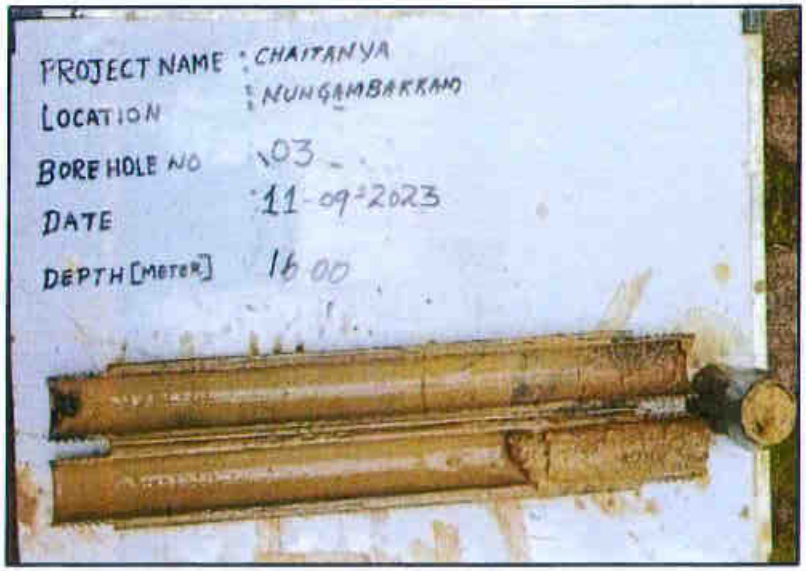


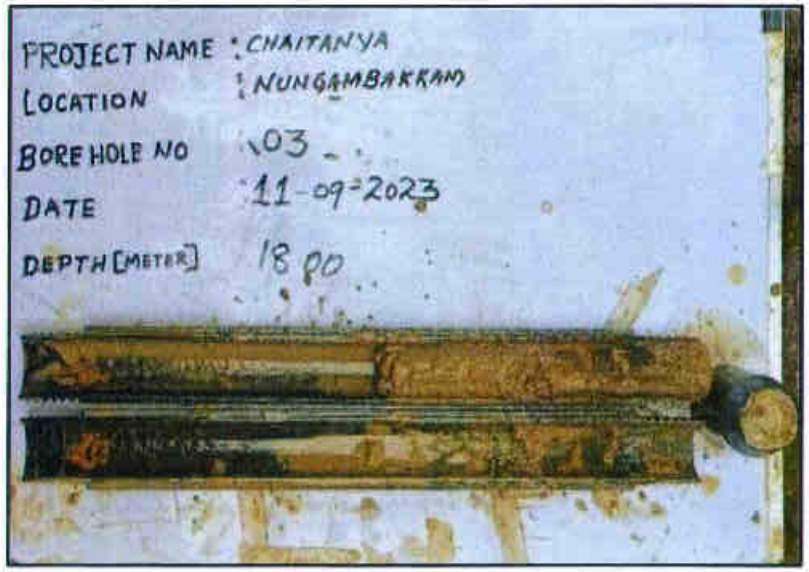


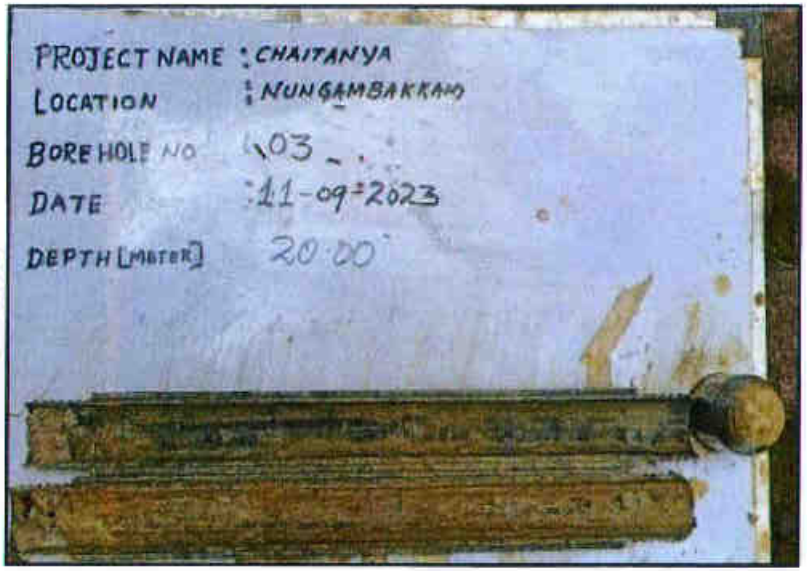


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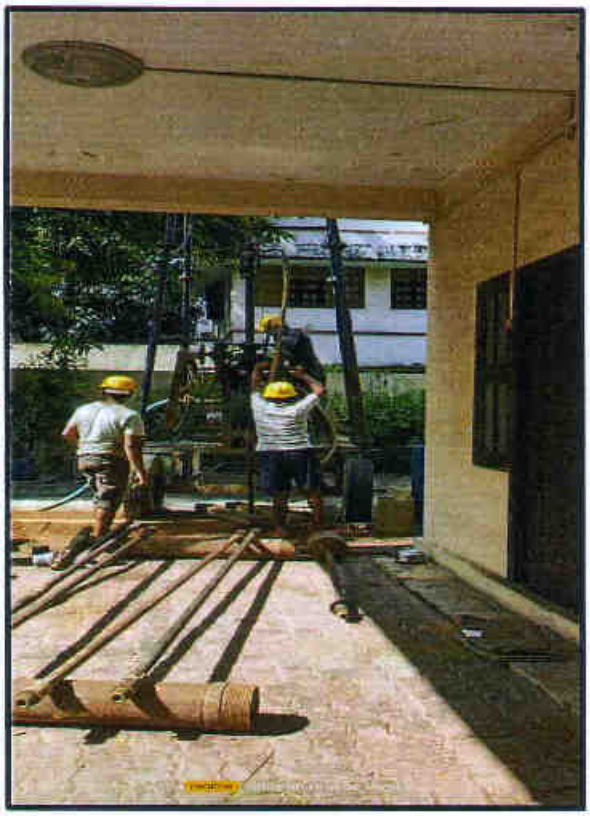


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