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NAME OF PROJECT

PROPOSED CONSTRUCTION OF RESIDENTIAL CUM COMMERCIAL BUILDING CONSISTING OF THREE BASEMENT FLOORS + 45 UPPER FLOORS AT MOUNT ROAD, CHENNAI.

CLIENT

M/s BRIGADE ENTERPRISES LIMITED,
BO-110, RAJIV GANDHI SALAI, OLD SRP TOOLS, OMR,
THIRUVANMIYUR, CHENNAI-600 041.

TITLE

GEOTECHNICAL INVESTIGATION REPORT

REPORT NO.: GT- 2473

DATE	REVISON	DESCRIPTION		AUTHORISED SIGNATORY
06/12/2022	NA	SUBMISSION OF INTERIM GEOTECHNICAL REPORT FOR FOUNDATION DESIGN	SIGN	
09/12/2022	NA	SUBMISSION OF FINAL GEOTECHNICAL REPORT	DATE	06/12/2022
17/03/2023	01	SUBMISSION OF FACTUAL REPORT FOR ADDITIONAL 5 BOREHOLES	DESIGNATION	MANAGING DIRECTOR
10/04/2023	02	SUBMISSION OF FINAL GEOTECHNICAL REPORT		
			NAME	**DR. C.V.PRASAD**

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REPORT TEXT

CHAPTER-1

INTRODUCTION

1.0 PROJECT INFORMATION MATRIX:

Nature of project : **RESIDENTIAL CUM COMMERCIAL BUILDING**

Structure : **3 BASEMENTS +45 UPPER FLOORS**

Project Client : **M/s BRIGADE ENTERPRISES LIMITED**

Project Location : **MOUNT ROAD, CHENNAI**

Job Code : **GT-2473**

1.1 SCOPE OF WORK:

1.1.1 FIELD WORK:

- Conducting twelve 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 case of rock formation the core drilling shall be carried out and checked for recovery at every 1.5m depth interval
- The depth of investigation varies from 21.0m to 26.0m 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 disturbed soil sample (Split Spoon Sample) and rock core sample.
- 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
- 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
- Liquefaction Studies
- Foundation System
- Recommendation
- Annexure

CHAPTER-2

INVESTIGATION METHODOLOGY & TEST RESULTS

2.0 PREAMBLE:

Twelve 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).

2.1.4 COLLECTION OF SOIL SAMPLES:

2.1.4.1 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.

2.1.5 COLLECTION OF GROUND WATER SAMPLES:

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

Note on Groundwater Table Record:

- Groundwater table observation in geotechnical report is predominantly to arrive at foundation design criteria and shall not be construed as design guidelines for the design of dewatering systems
- The groundwater level indicated in the bore logs is specific to the duration of investigation and intensity of the monsoon rains during the time of investigation. Hence, the level shall be taken as guidelines only to plan the investigation for the dewatering system

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 2.12. The graphical representation of grainsize distribution curve for the representative samples in each bore is presented in Fig. 2.16 to 2.27

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 2.12. The graphical representation of hydrometer analyses curve for the representative samples in each bore is presented in Fig. 2.28 to 2.40.

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 2.13 & 2.14.

2.3 SUMMARY:

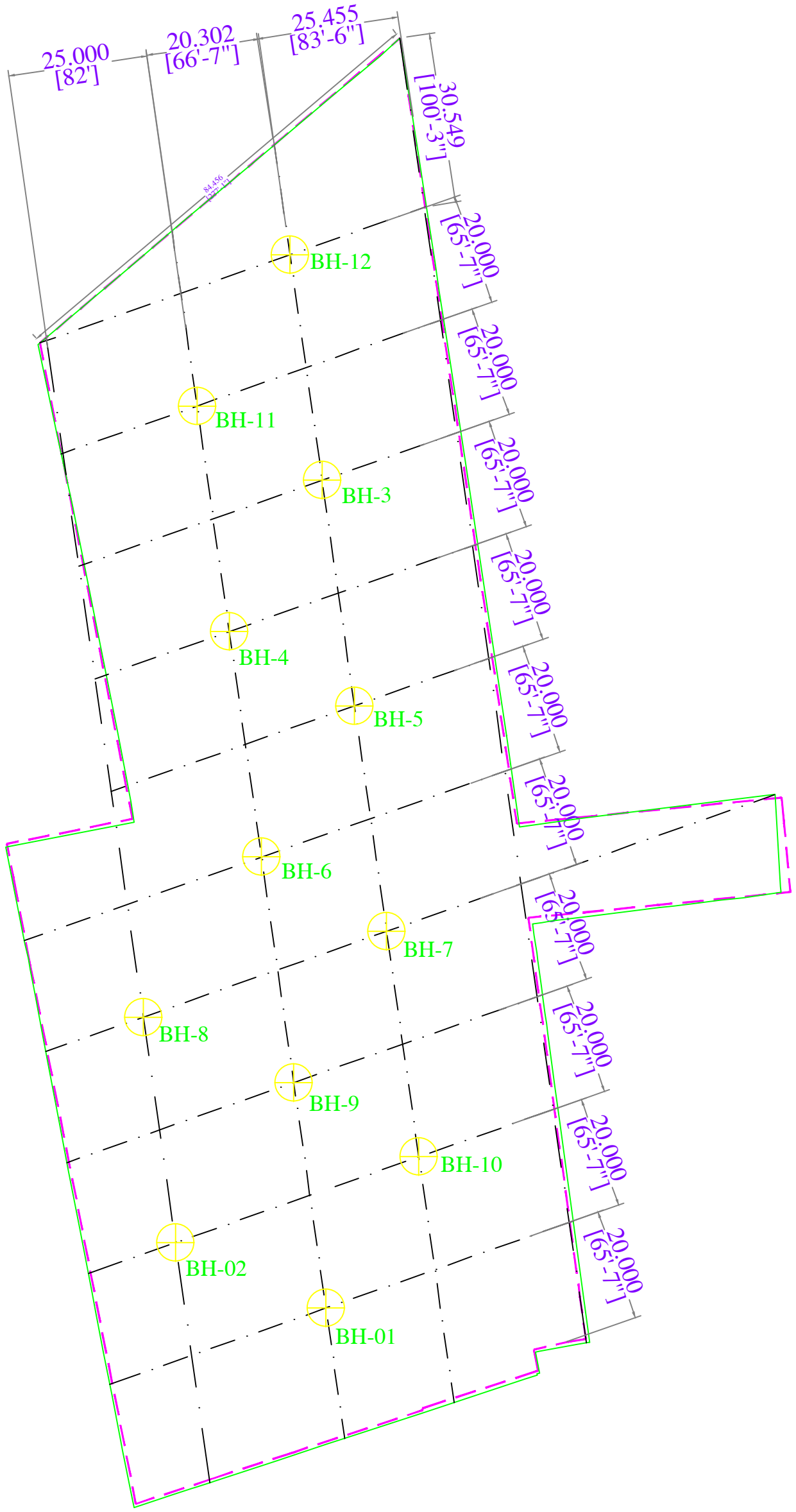
- The locations of the field investigation tests are shown in site plan given in Fig.2.0
- The sub soil profiles encountered at each location along with their classification and engineering properties are presented in Fig. 2.1 to 2.12.
- The laboratory test results are presented in Table 2.1 to 2.12.
- The chemical test results are presented in Table 2.13 & 2.14.
- The rock test results are presented in Table 2.15.

SITE PLAN

BOREHOLE LOCATIONS

NOMENCLATURE:

BOREHOLE- BH



SOIL PROFILES

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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-01		
SHEET	1	OF	3
DIA OF BORE HOLE	150mm ✓		
	NX		

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING					BORE START DATE	25/11/2022
LOCATION	Mount Road, Chennai	MACHINE No.	-	CHAINAGE (m)	-		
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	27/11/2022
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
		14	00													L1	0.8	Concrete Flooring/ Filled Up
1		To		SC	-	-												
		14	02				4	7	11	18	1.25	1	SS	-1.3				
		14	20								2.45							Brown,Moist,Very Stiff,**Silty CLAY (Cl) With Sand** Lean Clay of Medium Plasticity
		To		SC	-	-												
2		14	22				11	15	15	30	2.00	2	SS	-2.0				
		14	45								2.45					L2	2.3	
		To		SC	-	-												
		14	47															
3							8	10	18	28	3.00	3	SS	-3.0				
		15	10								3.45							
		To		SC	-	-												
	25/11/2022	15	12															
4							10	10	10	20	4.00	4	SS	-4.0				Brown,Brown Grey,Moist,Poorly Graded,Fine & Medium Grains Sands, Medium Dense & Dense,**Poorly Graded SAND - Silty SAND (SP-SM)/ Silty SAND (SM)**
		15	37								4.45							
		To		SC	-	-												
		15	39															
5							11	14	18	32	5.00	5	SS	-5.0				
		16	00								5.45							
		To		SC	-	-												
		16	02															
6							4	3	3	6	6.00	6	SS	-6.0		L3	6.0	
		16	30								6.45							
		To		SC	-	-												
		16	32															Brown,Moist,Medium Stiff,**Silty CLAY (Cl)** Clay of Medium Plasticity
7																		
							8	12	16	28	7.50	7	SS	-7.5		L4	7.5	
											7.95							
8		09	00															
		To		SC	-	-												
	26/11/2022	09	03															
9							8	12	13	25	9.00	8	SS	-9.0				Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Medium Dense & Dense,**Silty SAND (SM) & Poorly Graded SAND - Silty SAND (SP-SM)**
		09	30								9.45							
		To		SC	-	-												
10		09	32															

CS - Core Sample	DS - Disturbed Sample	LOGGED	S. Stephenraj	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	26/11/2022	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	G. Sharmila	WATER TABLE (m) 4.00	
WS - Wash Sample	DB - Diamond Bit	DATE	29/11/2022	CASING DEPTH (m) 0.00	

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SITE INVESTIGATION RECORD

BORE HOLE No.	BH-01		
SHEET	2	OF	3
DIA OF BORE HOLE	150mm ✓		
	NX ✓		

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING					BORE START DATE	25/11/2022
LOCATION	Mount Road, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE END DATE	27/11/2022
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	TOTAL DRILL DAYS	3
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -		

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	Blows/cm. 15-30	Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
11	26/11/2022	10	00	SC	-	-	10	12	20	32	10.50	10	SS	-10.5				
		To									10.95							Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Medium Dense & Dense,**Silty SAND (SM) & Poorly Graded SAND - Silty SAND (SP-SM)**
12		10	05				10	27	27	54	12.00	11	SS	-12.0		L5	12.0	
											12.45							
13		10	35	SC	-	-												
		To																
14		10	40				26	40	46	86	14.00	12	SS	-14.0				Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Very Dense,**Silty SAND (SM) & Poorly Graded SAND - Silty SAND (SP-SM)**
											14.45							
15		11	20	SC	-	-												
		To																
16		11	25				26	23	25	48	16.00	13	SS	-16.0		L6	16.0	
											16.45							
17		12	00	SC	-	-												Grey,Moist,Poorly Graded,Fine & Medium Grains Sands With Traces of Coarse Sand & Gravels,Dense,**Silty SAND (SM) With Binder**
		To																
18		12	10				75	SPT Hammer Rebound		>100	18.00	14	SS	-18.0		L7	18.0	
											18.15				+ +			
		12	30															
		To		DB	0	0												Brown,Moist,Fine to Coarse Grain Sand Size Particles With Gravel, Medium to Coarse Grain Structure, Very Dense,**Completely Weathered Rock - Grade W5 Rock Formation** Disintegrated Hypersthene Granitic Rock
19		13	00				SPT Hammer Rebounded			>100	19.00	-	WS	-19.0				
20																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	S. Stephenraj	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	26/11/2022	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	G. Sharmila	WATER TABLE (m) 4.00	
WS - Wash Sample	DB - Diamond Bit	DATE	29/11/2022	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 CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm / NX ✓

LOCATION	Mount Road, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	25/11/2022
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	27/11/2022
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
21	26/11/2022	13	30	DB	0	0									+ + + + + + + + +			Brown,Moist,Fine to Coarse Grain Sand Size Particles With Gravel, Medium to Coarse Grain Structure,Very Dense,**Completely Weathered Rock - Grade W5 Rock Formation** Disintegrated Hypersthene Granitic Rock
		To						SPT Hammer Rebounded		>100	21.00	-	WS	-21.0		L8	21.0	
22		14	30															
		15	00	DB	20	0									+ + + + + + + + +			Brown,Grey Brown,Medium to Coarse Grain Structure,Highly Fractured & Disintegrated,Discoloured,**Highly Weathered Rock - Grade W4 Rock Formation** Hypershtene Granitic Rock
		To																
23		16	15															
							-	-	-	-	22.50	15	CS	-22.5		L9	22.5	
		09	00												+ + + + + + + + +			Grey,Black Grey,Medium to Coarse Grain Structure,Fractured at Places, **Moderately Weathered Rock - Grade W3 Rock Formation** Hypersthene Granitic Rock
		To		DB	50	35												
24		10	30															
	27/11/2022						-	-	-	-	24.00	16	CS	-24.0				
		11	00															
		To		DB	50	36												
25		12	15															
							-	-	-	-	25.00	17	CS	-25.0		L10	25.0	
		13	30												+ + + + + + + + +			Grey,Black Grey,Medium to Coarse Grain Structure,Extremely Strong,Fractured Feebly,**Fresh Granitic Rock - Grade W1** Hypersthene Granitic Rock
		To		DB	75	75												
26		15	00															
							-	-	-	-	26.00	18	CS	-26.0		L11	26.0	
27																		
28																		
29																		
30																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	S. Stephenraj	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	27/11/2022	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	G. Sharmila	WATER TABLE (m)	4.00	
WS - Wash Sample	DB - Diamond Bit	DATE	29/11/2022	CASING DEPTH (m)	0.00	

Borehole terminated at 26 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

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm ✓ / NX

LOCATION	Mount Road, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	01/12/2022
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	03/12/2022
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
0		14	00															
		To		SC	-	-										L1	0.8	Concrete Flooring/ Filled Up
		14	04															
1							8	10	12	22	1.25	1	SS	-1.3				
		14	30								2.45							Brown,Moist,Fine & Medium Grains Sands,**Silty SAND (SM) With Clay Binder**
		To		SC	-	-												
		14	32													L2	2.0	
2							10	17	17	34	2.00	2	SS	-2.0				
		14	50								2.45							
		To		SC	-	-												
		14	52															
3							13	19	21	40	3.00	3	SS	-3.0				
		15	20								3.45							
		To		SC	-	-												
		15	22															Brown, Mosit,Poorly Graded,Fine & Medium Grains Sand,Dense to Medium Dense,**Silty SAND (SM) & Poorly Graded SAND - Silty SAND (SP-SM)**
4							10	13	17	30	4.00	4	SS	-4.0				
		15	40								4.45							
		To		SC	-	-												
	01/12/2022	15	42															
5							13	15	14	29	5.00	5	SS	-5.0				
		16	00								5.45							
		To		SC	-	-												
		16	02															
6							5	4	5	9	6.00	-	*SS	-6.0		L3	6.0	
		16	20								6.45							
		To		SC	-	-												
		16	22															
7																		Sample Failed @ 6.0m depth & Interpretted as Sandy Silty Clay @ 7.5m, Grey,Moist,Poorly Graded,Fine & Medium Grains Sand,Very loose,**Clayey Silty SAND (SC)**
							2	2	2	4	7.50	6	SS	-7.5				
											7.95							
8		17	00															
		To		SC	-	-												
		17	02															
9							7	10	11	21	9.00	7	SS	-9.0		L4	9.0	
											9.45							
		17	30															Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Medium Dense,**Poorly Graded - Silty SAND (SP-SM)**
		To		SC	-	-												
10		17	32															

CS - Core Sample	DS - Disturbed Sample	LOGGED	S. Stephen Raj	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	01/12/2022	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m)	4.10	(*SS)= Sample Slipped
WS - Wash Sample	DB - Diamond Bit	DATE	05/11/2022	CASING DEPTH (m)	0.00	

SITE INVESTIGATION RECORD

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BORE HOLE No.	BH-02	SHEET	2 OF 3				
PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING					DIA OF BORE HOLE	150mm ✓ / NX ✓
LOCATION	Mount Road, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	01/12/2022
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N: -	BORE END DATE	03/12/2022
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E: -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Date	Time Hr.	Time Min.	Type of Drill Bit (SC / TCB / DB)	Total Core Recovery %	R.Q.D %	Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Depth	No.	Type	RL (m)	Layer No	Layer Depth	Geotechnical Description
	02/12/2022														L5	10.5	Grey,Moist,Poorly Graded,**Poorly Graded - Silty SAND (SP-SM)**
10.5							12	16	20	**36**	10.50 – 10.95	8	SS	-10.5			Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Dense,**Poorly Graded SAND - Silty SAND (SP-SM) With Shells**
11		09 To 09	00 To 04	SC	-	-											
12							14	19	28	**47**	12.00 – 12.45	9	SS	-12.0			
13		09 To 09	30 To 34	SC	-	-											
14							17	18	19	**37**	14.00 – 14.45	10	SS	-14.0	L6	14.0	Green Grey,Moist,Poorly Graded,Fine & Medium Grain Sands With Traces of Gravels,Dense,**Silty SAND (SM) With Binder & Partially Residual Soil Texture @ 16.0m Depth**
15		09 To 09	20 To 55	SC	-	-											
16							12	17	30	**47**	16.00 – 16.45	11	SS	-16.0			
17		10 To 10	35 To 59	SC	-	-											
18							SPT Hammer Rebounded			**>100**	18.00	-	WS	-18.0	L7	18.0	Brown,Moist,Fine to Coarse Grain Sand Size Particles With Gravel,Medium to Coarse Grain Structure,Very Dense,**Completely Weathered Rock - Grade W5 Rock Formation** Disintegrated Hypersthene Granitic Rock
19		14 To 15	00 To 30	DB	0	0											
20							SPT Hammer Rebounded			**>100**	20.00	-	WS	-20.0			

CS - Core Sample	DS - Disturbed Sample	LOGGED	S. Stephen Raj	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	02/12/2022	GROUND LEVEL (m): 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m): 4.10	
WS - Wash Sample	DB - Diamond Bit	DATE	05/11/2022	CASING DEPTH (m): 0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-02
SHEET	3 OF 3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm / NX ✓

LOCATION	Mount Road, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	01/12/2022
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	03/12/2022
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
21	03/11/2022	09 To 10	00 30	DB	0	0									+ + +			Brown,Moist,Fine to Coarse Grain Sand Size Particles With Gravel,Medium to Coarse Grain Structure,Very Dense,**Completely Weathered Rock - Grade W5 Rock Formation** Disintegrated Hypersthene Granitic Rock
22		10 To 11	45 30	DB	25	0	SPT Hammer Rebounded			>100	22.00	-	WS	-22.0	+ + +	L8	22.0	
23		11 To 12	45 45	DB	27	0	-	-	-	-	23.00	12	CS	-23.0	+ + +			Brown,Grey Brown,Medium to Coarse Grain Structure,Highly Fractured & Disintegrated,Discoloured,**Moderately Weathered Rock - Grade W3 Rock Formation** Hypershtene Granitic Rock
24		14 To 15	00 00	DB	35	0	-	-	-	-	24.00	13	CS	-24.0	+ + +			
25							-	-	-	-	25.00	14	CS	-25.0	+ + +	L9	25.0	
26																		
27																		
28																		
29																		
30																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	S. Stephen Raj	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	03/11/2022	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m)	4.10	
WS - Wash Sample	DB - Diamond Bit	DATE	05/11/2022	CASING DEPTH (m)	0.00	

Borehole terminated at 25 m depth below E.G.L

FIG.2.2 Sub Soil Profile at BH-02 Location

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-03
SHEET	1 OF 3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm ✓ / NX

LOCATION	Mount Road, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	01/04/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	04/03/2023
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
1		14	00															
		To		SC	-	-												
		14	02				5	13	17	30	1.25	1	SS	-1.3				Brown Moist,Hard,**Sandy Silty CLAY (Cl)** of High Plasticity Filled Up Soil in the Top 1.0m
		14	10								1.70							
		To		SC	-	-												
2		14	12				10	12	20	32	2.00	2	SS	-2.0		L1	2.0	
		14	40								2.45							
		To		SC	-	-												
		14	42															
3							9	12	17	29	3.00	3	SS	-3.0				
		15	05								3.45							
		To		SC	-	-												
		15	07															
4							10	13	17	30	4.00	4	SS	-4.0				Brown,Moist,Poorly Graded,Fine & Medium Grains Sands,Medium Dense & Dense,**Silty SAND (SM) & Poorly Graded SAND - Silty SAND (SP-SM)**
		15	30								4.45							
		To		SC	-	-												
		15	32															
5	01/04/2023						9	13	20	33	5.00	5	SS	-5.0				
		16	00								5.45							
		To		SC	-	-												
		16	01															
6							1	1	1	2	6.00	6	SS	-6.0		L2	6.0	
		16	25															
		To		SC	-	-					6.45							
		16	26															
		16	30															
7		To		SC	-	-	-	-	-	-	7.00	-	*UDS	-7.0				
		16	31															
							2	3	3	6	7.50	7	SS	-7.5				Grey,Black,Moist,Poorly Graded,Fine & Medium Grains,Very Loose & Loose,**Clayey Silty SAND (SC)**
8		16	40								7.95							
		To		SC	-	-												
		16	42															
9							2	15	17	32	9.00	8	SS	-9.0		L3	9.0	
											9.45							
	03/04/2023	09	00															Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Dense,**Silty SAND (SM)**
		To		SC	-	-												
10		09	10															

CS - Core Sample	DS - Disturbed Sample	LOGGED	S.Stephen raj	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	03/04/2023	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m)	3.60	*(UDS) - Sample Failed
WS - Wash Sample	DB - Diamond Bit	DATE	06/04/2023	CASING DEPTH (m)	0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-03
SHEET	2 OF 3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm ✓ / NX ✓

LOCATION	Mount Road, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	01/04/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	04/03/2023
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	Blows/cm. 15-30	Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Legend	Layer Data: No	Depth	Geotechnical Description
																L4	10.5	Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Dense,**Silty SAND (SM)**
11		09	40				15	25	36	**61**	10.50	10	SS	-10.5				
		To		SC	-	-					10.95							
		09	42															
12							18	25	30	**55**	12.00	11	SS	-12.0				Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Very Dense,**Silty SAND (SM)**
											12.45							
		10	05															
13		**To**		SC	-	-												
		10	12															
14							18	5Cm Penet for 35 Blows		**>100**	14.00	12	SS	-14.0		L5	14.0	
											14.20							
		10	20															Grey,Brown Grey,Moist,Poorly Graded, Fine & Medium Grains Sands,Very Dense,**Clayey Silty SAND (SC) & Residual Soil - Disintegrated Hypersthene Rock**
15	**03/04/2023**	**To**		TCB	0	0												
		10	25															
16							SPT Hammer Rebounded			**>100**	16.00	-	WS	-16.0		L6	16.0	
		10	40															No Core Recovery Wash Cutting Observed to be Disintegrated Hypersthene Granitic Rock
		To		TCB	0	0												
17		11	50															
18							SPT Hammer Rebounded			**>100**	18.00	-	WS	-18.0		L7	18.0	
		12	10															Grey,Pink Shades,Brown Discolouration at Parts,Medium & Coarse Grain Structure,Fractured at Times,**Moderately Weathered Rock to Slightly Weathered Rock - Grade W3 & W2 Rock Formation** Hypersthene Granitic Rock
19		**To**		DB	75	0												
		13	15				-	-	-	**-**	19.50	13	CS	-19.5				
20																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	S.Stephen raj
SS - Split Spoon Sample	SC - Soil Cutter	DATE	03/04/2023
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj
WS - Wash Sample	DB - Diamond Bit	DATE	06/04/2023

PROJECT SITE DETAILS		REMARKS
GROUND LEVEL (m)	0.00	
WATER TABLE (m)	3.60	
CASING DEPTH (m)	0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-03
SHEET	3 OF 3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm / NX ✓

LOCATION	Mount Road, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	01/04/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	04/03/2023
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Layer Data: Geotechnical Description
21	04/04/2023	09	00	DB	67	10	-	-	-	-	21.00	14	CS	-21.0	+ + + + + + + + + + + +	L8	21.0	Grey,Pink Shades,Brown Discolouration at Parts,Medium & Coarse Grain Structure,Fractured at Times,**Moderately Weathered Rock to Slightly Weathered Rock - Grade W3 & W2 Rock Formation** Hypersthene Granitic Rock
22		To																
23		11	20															
24		Total drilling time 1hr 45min		DB	97	97									+ + + + + + + + + + + +			Grey,Pink Grey,Medium & Coarse Grain Structure,Massive,Extreme Strong, **Fresh Hypersthene Granitic Rock Formation - Grade W1 Rock Formation** Hypersthene Granitic Rock Formation
25							-	-	-	-	22.50	15	CS	-22.5	+ + +	L9	22.5	
26																		
27																		
28																		
29																		
30																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	S.Stephen raj	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	04/04/2023	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m)	3.60	
WS - Wash Sample	DB - Diamond Bit	DATE	06/04/2023	CASING DEPTH (m)	0.00	

Borehole terminated at 22.5 m depth below E.G.L

FIG.2.3 Sub Soil Profile at BH-03 Location

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-04
SHEET	1 OF 3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING					DIA OF BORE HOLE	150mm ✓ / NX
LOCATION	Mount Road, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	23/03/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	24/03/2023
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	2

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
1		11	30															
		To		SC	-	-												
		11	32				8	11	17	28	1.25	1	SS	-1.3				
		11	50								1.70							
		To		SC	-	-												
2		11	52				8	15	15	30	2.00	2	SS	-2.0				
		12	20								2.45							Brown,Moist,Poorly Graded,Fine & Medium Grains Sands,Medium Dense, **Silty SAND (SM) & Poorly Graded SAND - Silty SAND (SP-SM)/ Top 1.0m Filled Up Soil**
		To		SC	-	-												
3		12	22				8	12	9	21	3.00	3	SS	-3.0				
		13	00								3.45							
		To		SC	-	-												
4		13	02				7	10	15	25	4.00	4	SS	-4.0				
		14	00								4.45							
	23/03/2023	To		SC	-	-												
5		14	02				7	3	2	5	5.00	5	SS	-5.0		L1	5.0	
		14	20								5.45							
		To		SC	-	-												
6		14	22				1	1	1	2	6.00	6	SS	-6.0				Grey,Black,Moist,Poorly Graded,Fine & Medium Grains Sands,Very Loose & Loose,**Silty SAND (SM) & Clayey Silty SAND (SC)**
		15	35								6.45							
		To		SC	-	-												
7		15	38															
							17	16	20	36	7.50	7	SS	-7.5		L2	7.5	
											7.95							
8		16	50															
		To		SC	-	-												
		16	53															Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Dense,**Poorly Graded SAND - Silty SAND (SP-SM) & Silty SAND (SM)**
9							14	20	21	41	9.00	8	SS	-9.0				
											9.45							
	24/03/2023	09	00															
		To		SC	-	-												
10		09	03															

CS - Core Sample	DS - Disturbed Sample	LOGGED	S.Stephen raj	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	24/03/2023	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m) 3.50	*(F) - Sample Failed
WS - Wash Sample	DB - Diamond Bit	DATE	03/04/2023	CASING DEPTH (m) 0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-04
SHEET	2 OF 3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm ✓ / NX ✓

LOCATION	Mount Road, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	23/03/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	24/03/2023
JOB CODE	GT-2473	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 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
11		09	30				11	16	17	33	10.50	9	SS	-10.5				Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Dense,**Poorly Graded SAND - Silty SAND (SP-SM) & Silty SAND (SM)**
		To		SC	-	-					10.95							
		09	33															
12							3	5	18	23	12.00	10	SS	-12.0		L3	12.0	
											12.45							
		10	05															Grey,Moist,Very Stiff,**Silty CLAY (CI) With Sand Lenses** Clays of Medium Plasticity
13		To		SC	-	-												
		10	10															
14							14	16	22	38	14.00	11	SS	-14.0		L4	14.0	
											14.45							
		11	00															Green,Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Dense, **Clayey Silty SAND (SC)/ Cemented SAND**
15	24/03/2023	To		DB	0	0												
		11	16															
16							15Cm Penet for 57 Blows			>100	16.00	12	SS	-16.0		L5	16.0	
											16.15							
		11	30															Brown,Brown Grey,Moist,Fine to Coarse Grain Sand Size Particles & Gravel Size Particles,Very Dense, **Completely Weathered Rock - Grade W5 Rock Formation** Disintegrated Hypersthene Granitic Rock Formation
17		To		DB	0	0												
		12	00															
							SPT Hammer Rebounded			>100	17.50	-	WS	-17.5				
18																		
		14	00															
		To		DB	0	0												
		14	40															
19							SPT Hammer Rebounded			>100	19.00	-	WS	-19.0		L6	19.0	
																		Grey,Pink Grey,Brown Shades at times, Medium & Coarse Grain Structure,Strong to Extreme Strong, **Moderately to Slightly Weathered Rock - Grade W3 & W2 Rock** Hypersthene Granitic Rock Formation
		14	50															
20		To		DB	54	10												
		16	10															

CS - Core Sample	DS - Disturbed Sample	LOGGED	S.Stephen raj	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	24/03/2023	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m)	3.50	
WS - Wash Sample	DB - Diamond Bit	DATE	03/04/2023	CASING DEPTH (m)	0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-04		
SHEET	3	OF	3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm / NX ✓

LOCATION	Mount Road, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	23/03/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	24/03/2023
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	2

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer No	Layer Depth	Geotechnical Description
21	24/03/2023	16 To 17	20 35	DB	57	20	-	-	-	-	20.50	13	CS	-20.5	+ +			Grey,Pink Grey,Brown Shades at times, Medium & Coarse Grain Structure,Strong to Extreme Strong, **Moderately to Slightly Weathered Rock - Grade W3 & W2 Rock** Hypersthene Granitic Rock Formation
22							-	-	-	-	22.00	14	CS	-22.0		L7	22.0	
23																		
24																		
25																		
26																		
27																		
28																		
29																		
30																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	S.Stephen raj	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	24/03/2023	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m) 3.50	
WS - Wash Sample	DB - Diamond Bit	DATE	03/04/2023	CASING DEPTH (m) 0.00	

Borehole terminated at 22 m depth below E.G.L

FIG.2.4 Sub Soil Profile at BH-04 Location

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-05
SHEET	1 OF 3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm ✓ / NX

LOCATION	Mount Road, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	20/03/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	22/03/2023
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
1	20/03/2023				-	-												Filled Up Soil Building Debris With Sand Mixture
2		09	00	SC	-	-	8	10	11	21	2.00 2.45	1	SS	-2.0		L1	2.0	
		To																
3		09	02				11	10	10	20	3.00 3.45	2	SS	-3.0				
		09	20	SC	-	-												
		To																
4		09	22				11	11	12	23	4.00 4.45	3	SS	-4.0				
		10	00	SC	-	-												
		To																
5		10	02				13	15	15	30	5.00 5.45	4	SS	-5.0				
		10	30	SC	-	-												
		To																
6	21/03/2023	10	32				6	7	10	17	6.00 6.45	5	SS	-6.0				Brown,Moist,Poorly Graded,Fine & Medium Grains Sands,Medium Dense & Dense,**Silty SAND (SM) & Poorly Graded SAND - Silty SAND (SP-SM)**
		11	00	SC	-	-												
		To																
7		11	03															
							7	7	9	16	7.50 7.95	6	SS	-7.5				
8		11	30	SC	-	-												
		To																
		11	33															
9							10	14	15	29	9.00 9.45	7	SS	-9.0				
		12	00	SC	-	-												
		To																
10		12	03															

CS - Core Sample	DS - Disturbed Sample	LOGGED	S.Stephen raj	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	21/03/2023	GROUND LEVEL (m)	0.00	*(F) - Sample Failed
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m)	3.60	
WS - Wash Sample	DB - Diamond Bit	DATE	03/04/2023	CASING DEPTH (m)	0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-05
SHEET	2 OF 3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm ✓ / NX ✓

LOCATION	Mount Road, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	20/03/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	22/03/2023
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	Blows/cm. 15-30	Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
11		12	30				11	14	14	28	10.50	8	SS	-10.5				
		To		SC	-	-					10.95							
		12	33															
12							11	8	11	19	12.00	9	SS	-12.0				Brown,Moist,Poorly Graded,Fine & Medium Grains Sands,Medium Dense & Dense,**Silty SAND (SM) & Poorly Graded SAND - Silty SAND (SP-SM)**
											12.45							
		14	00															
13		To		SC	-	-												
		14	30															
14	21/03/2023						17	27	5Cm Penet for 45Blows	>100	14.00	10	SS	-14.0		L2	14.0	
											14.35							
		15	00															Green Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Very Dense, **Silty SAND (SM)**
15		To		SC	-	-												
		15	35															
16							5Cm Penet for 59 Blows			>100	16.00	11	SS	-16.0		L3	16.0	
											16.05				+ + +			
		16	00												+ + +			
		To		DB	0	0									+ + +			
17		16	30												+ + +			Grey Green to Grey Brown,Moist,Fine to Coarse Grains Sand Size Particles With Gravels Size Particles Mixture,Very Dense,**Completely Weathered Rock - Grade W5 Rock Formation**
							SPT Hammer Rebounded			>100	17.50	-	WS	-17.5	+ + +			
															+ + +			
18		09	00												+ + +			Disintegrated Hypersthene Granitic Rock
		To		DB	0	0									+ + +			
	22/03/2023	09	40												+ + +			
19							SPT Hammer Rebounded			>100	19.00	-	WS	-19.0	+ + +	L4	19.0	
															+ + +			
		10	30												+ + +			Grey,Pink Grey,Brown Shades at times, Medium & Coarse Grain Structure,Strong to Extreme Strong, **Moderately to Slightly Weathered Rock - Grade W3 & W2 Rock**
20		To		DB	67	12									+ + +			
		11	15												+ + +			Hypersthene Granitic Rock Formation

CS - Core Sample	DS - Disturbed Sample	LOGGED	S.Stephen raj	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	22/03/2023	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m) 3.60	*(F) - Sample Failed
WS - Wash Sample	DB - Diamond Bit	DATE	03/04/2023	CASING DEPTH (m) 0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-05
SHEET	3 OF 3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm / NX ✓

LOCATION	Mount Road, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	20/03/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	22/03/2023
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Layer Data: Geotechnical Description
21	22/02/2023	12 To 13	00 45	DB	69	16	-	-	-	-	20.50	16	CS	-20.5	+ +			Grey,Pink Grey,Brown Shades at times, Medium & Coarse Grain Structure,Strong to Extreme Strong, **Moderately to Slightly Weathered Rock - Grade W3 & W2 Rock** Hypersthene Granitic Rock Formation
22							-	-	-	-	22.00	16	CS	-22.0		L5	22.0	
23																		
24																		
25																		
26																		
27																		
28																		
29																		
30																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	S.Stephen raj	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	22/02/2023	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m)	3.60	
WS - Wash Sample	DB - Diamond Bit	DATE	03/04/2023	CASING DEPTH (m)	0.00	

Borehole terminated at 22 m depth below E.G.L

FIG.2.5 Sub Soil Profile at BH-05 Location

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-06
SHEET	1 OF 3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm ✓ / NX

LOCATION	Mount Road, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	07/03/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	09/03/2023
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
0	07/03/2023	16	00															
			To	SC	-	-												
		16	02				3	2	3	5	0.50	1	SS	-0.5				Brown,Moist,Poorly Graded,Fine & Medium Grains Sands,Loose,**Silty SAND (SM)**
		16	15								2.45							**Sand With Clay Lenses**
1			To	SC	-	-										L1	1.25	
		16	17				2	5	20	25	1.25	2	SS	-1.3				
		16	40								2.45							Brown,Moist,Poorly Graded,Fine & Medium Grains Sands,Traces of Gravels,Medium Dense,**Clayey Silty SAND (SC)**
			To	SC	-	-												
2		16	44				5	18	15	33	2.00	3	SS	-2.0		L2	2.0	
		16	59								2.45							
			To	SC	-	-												
		17	02															
3							8	10	10	20	3.00	4	SS	-3.0				
		17	20								3.45							
			To	SC	-	-												
		17	23															
4							5	9	9	18	4.00	5	SS	-4.0				
		09	00								4.45							
			To	SC	-	-												
		09	04															
5							3	7	8	15	5.00	6	SS	-5.0				
		09	25								5.45							
			To	SC	-	-												
		09	28															Brown Grey,Grey Beyond 5.0m,Moist, Poorly Graded, Pred. Fine Grains Sands & Medium Grains Sands Mix,Medium Dense & Dense,**Silty SAND (SM) & Poorly Graded SAND (SP-SM)**
6							4	8	8	16	6.00	7	SS	-6.0				
		09	55								6.45							
			To	SC	-	-												
	08/03/2023	09	58															& Traces of Shells @ Times
7																		
							10	13	17	30	7.50	8	SS	-7.5				
											7.95							
8		10	17															
			To	SC	-	-												
		10	22															
9							10	12	14	26	9.00	9	SS	-9.0				
											9.45							
		10	45															
			To	SC	-	-												
10		10	47															

CS - Core Sample	DS - Disturbed Sample	LOGGED	K.Sivasankaran	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	08/03/2023	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	G.Sharmila	WATER TABLE (m)	3.80	
WS - Wash Sample	DB - Diamond Bit	DATE	10/03/2023	CASING DEPTH (m)	0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-06
SHEET	2 OF 3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm ✓ / NX ✓

LOCATION	Mount Road, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	07/03/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	09/03/2023
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
11		11	15				4	8	10	**18**	10.50	10	SS	-10.5				
		To		SC	-	-					10.95							
		11	20															Brown Grey,Grey Beyond 5.0m,Moist, Poorly Graded, Pred. Fine Grains Sands & Medium Grains Sands Mix,Medium Dense & Dense,**Silty SAND (SM),Poorly Graded SAND (SP-SM) & Clayey Silty SAND (SC)** & Traces of Shells @ Times
12							3	8	17	**25**	12.00	11	SS	-12.0				
											12.45							
		12	00															
13		To		SC	-	-												
		12	05															
14							22	52	60	**112**	14.00	12	SS	-14.0		L3	14.0	
											14.45				+ + +			Grey Green,Moist,Fine & Medium Grains Sand Size Particles,Very Dense, **Residual Soil to Completely Weathered Rock - Grade W5 Rock Formation** Disintegrated Hypersthene Granitic Rock
		12	35												+ + +			
15	08/03/2023	To		SC	-	-									+ + +			
		12	48												+ + +			
16							5Cm Penet for 56 Blows			**>100**	16.00	13	SS	-16.0	+ + +	L5	16.0	
											16.05				+ + +			
		Total Drilling Time 55 mins		DB	9	0									+ + +			Grey Brown,Moist,Medium to Coarse Grains Structure,Highly Fractured, Disintegrated at Parts,**Highly Weathered Rock - Grade W4 Rock Formation** Hypersthene Granitic Rock Formation
17															+ + +			
															+ + +			
18							-	-	-	-	18.00	14	CS	-18.0	+ + +	L6	18.0	
															+ + +			
		16	09												+ + +			
19		To		DB	27	0									+ + +			Grey,Brown Grey,Medium to Coarse Grains Structure,Fractured Moderately, Discoloured @ Times,**Moderately Weathered Rock - Grade W3 Rock Formation** Hypersthene Granitic Rock Formation
		17	00												+ + +			
							-	-	-	-	19.50	15	CS	-19.5	+ + +			
20	09/03/223														+ + +			

CS - Core Sample	DS - Disturbed Sample	LOGGED	K.Sivasankaran	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	08/03/2023	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	G.Sharmila	WATER TABLE (m)	3.80	
WS - Wash Sample	DB - Diamond Bit	DATE	10/03/2023	CASING DEPTH (m)	0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-06
SHEET	3 OF 3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm / NX ✓

LOCATION	Mount Road, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	07/03/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	09/03/2023
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
21	09/03/2023	09	25	DB	27	0	-	-	-	-	21.00	16	CS	-21.0	+ + +	L7	21.0	Grey,Brown Grey,Medium to Coarse Grains Structure,Fractured Moderately, Discoloured @ Times,**Moderately Weathered Rock - Grade W3 Rock Formation** Hypersthene Granitic Rock Formation
		To																
		10	45															
		11	15	DB	95	45												
		To																
22		12	40				-	-	-	-	22.00	17	CS	-22.0				
		Total Drilling Time 1hr 5mins		DB	95	81												Grey,Pink Shades,Medium to Coarse Grain Structure,Fractured @ Times, **Slighlty Weathered Rock & Fresh Rock Formation - Grade W2 & W3 Rock Formation** Hypersthene Granitic Rock
23							-	-	-	-	23.00	18	CS	-23.0				
		15	15															
		To		DB	83	83												
		15	45															
24							-	-	-	-	24.00	19	CS	-24.0				
		15	15															
		To		DB	80	80												
		15	45															
25							-	-	-	-	25.00	20	CS	-25.0	+ + +	L8	25.0	
26																		
27																		
28																		
29																		
30																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	K.Sivasankaran	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	09/03/2023	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	G.Sharmila	WATER TABLE (m)	3.80	
WS - Wash Sample	DB - Diamond Bit	DATE	10/03/2023	CASING DEPTH (m)	0.00	

Borehole terminated at 25 m depth below E.G.L

FIG.2.6 Sub Soil Profile at BH-06 Location

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-07
SHEET	1 OF 3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm ✓ / NX

LOCATION	Mount Road, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	21/02/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	04/03/2023
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
0		14	45															
		To		SC	-	-												
		14	47				6	6	4	10	0.50	1	SS	-0.5				
		15	00								2.45							
1		To		SC	-	-												Brown,Moist,Poorly Graded,Fine & Medium Grains Sands,Very Loose & Loose,**Clayey Silty SAND (SC) With Brick Pats**
		15	03				2	2	2	4	1.25	-	*SS	-1.3				
		15	15								2.45							
		To		SC	-	-												
2		15	16				2	4	6	10	2.00	2	SS	-2.0		L1	2.0	
		15	30								2.45							
		To		SC	-	-												
		15	31															
3							6	4	6	10	3.00	3	SS	-3.0				Brown,Moist,Poorly Graded,Fine Grains Sands,Fine & Medium Grains Sands,Loose,**Silty SAND (SM) & Poorly Graded SAND - Silty SAND (SP-SM)**
		15	39								3.45							
		To		SC	-	-												
		15	41															
4							6	8	14	22	4.00	4	SS	-4.0		L3	4.0	
		16	04								4.45							
		To		SC	-	-												
	21/02/2023	16	05															
5							4	6	8	14	5.00	5	SS	-5.0				
		16	15								5.45							
		To		SC	-	-												
		16	16															
6							4	4	6	10	6.00	6	SS	-6.0				
		16	45								6.45							
		To		SC	-	-												Brown @ Times,Grey Beyond 5.0m, Moist,Poorly Graded,Fine & Medium Grains Sands,Loose & Medium Dense, **Poorly Graded SAND (SP), Silty SAND (SM) & Poorly Graded SAND - Silty SAND (SP-SM)**
		16	47															
7							8	8	10	18	7.50	-	*SS	-7.5				
											7.95							
8		17	15															
		To		SC	-	-												
		17	17															
9							8	8	14	22	9.00	7	SS	-9.0				
											9.45							
	22/02/2023	09	00															
		To		SC	-	-												
10		09	02															

CS - Core Sample	DS - Disturbed Sample	LOGGED	S.Stephen raj	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	22/02/2023	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m) 4.30	*(SS) - Sample Failed
WS - Wash Sample	DB - Diamond Bit	DATE	01/03/2023	CASING DEPTH (m) 0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-07
SHEET	2 OF 3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm ✓ / NX ✓

LOCATION	Mount Road, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	21/02/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	04/03/2023
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
							4	4	4	**8**	10.50	8	SS	-10.5		L4	10.5	Grey,Loose & Medium Dense, **Poorly Graded SAND - Silty SAND (SP-SM)**
11		09	50								10.95							
		To		SC	-	-												Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Loose,**Poorly Graded SAND - Silty SAND (SP-SM)**
		09	52															
12							6	6	10	**16**	12.00	9	SS	-12.0		L5	12.0	
											12.45							
		10	20															
13		**To**		SC	-	-												Grey,Black,Moist,Fine & Medium Grains Sands,Medium Dene,**Silty SAND (SM) With Clay Lenses**
		10	23															
14							10Cm Penet for 75 Blows			**>100**	14.00	10	SS	-14.0		L6	14.0	
											14.10				+ + +			
		10	50												+ + +			
15	**22/02/2023**	**To**		DB	-	-									+ + +			Brown,Grey Brown,Moist,Fine to Coarse Grain Sand Size Particles With Traces of Gravels,Very Dense, **Completely Weathered Rock - Grade W5 Rock Formation**
		11	05												+ + +			
							SPT Hammer Rebounded			**>100**	15.50	-	WS	-15.5	+ + +			
16															+ + +			Disintegrated Hypersthene Granitic Rock
		11	40												+ + +			
		To		DB	10	0									+ + +			
		12	10												+ + +	L7	17.0	
17							-	-	-	**-**	17.00	11	CS	-17.0	+ + +			
															+ + +			
															+ + +			
18		13	30												+ + +			
		To		DB	18	0									+ + +			Grey,Shades of Brown Discolouration, Medium & Coarse Grains Structure,Highly Fractured,**Moderately Weathered Rock - Grade W3 Rock Formation**
		14	30				-	-	-	**-**	18.50	12	CS	-18.5	+ + +			
19															+ + +			Hypersthene Granitic Rock Formation
															+ + +			
		15	30												+ + +			
		To		DB	60	0									+ + +			
20		16	40				-	-	-	**-**	20.00	13	CS	-20.0	+ + +	L8	20.0	
															+ + +			Brown Grey,Medium to Coarse Grain Structure,**Moderately to Slightly Weathered Rock - Grade W3 & W2 Rock**

CS - Core Sample	DS - Disturbed Sample	LOGGED	S.Stephen raj	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	22/02/2023	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m) 4.30	
WS - Wash Sample	DB - Diamond Bit	DATE	01/03/2023	CASING DEPTH (m) 0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-07
SHEET	3 OF 3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm / NX ✓

LOCATION	Mount Road, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	21/02/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	04/03/2023
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Layer Data: Geotechnical Description
21	04/03/2023	09	05	DB	75	7	-	-	-	-	21.50	14	CS	-21.5	+ + +			Grey,Brown Grey @ Times,Medium to Coarse Grain Structure,Highly to Medium Fractures,**Moderately to Slightly Weathered Rock - Grade W3 & W2 Rock Formation** Hypersthene Granitic Rock
22		To																
23		10	25															
24		Total drilling time 1 hr 34 mins		DB	60	14												
25											23.00	15	CS	-23.0				
26		14	15															
27		To		DB	75	67												
28		16	05				-	-	-	-	24.00	16	CS	-24.0		L9	24.0	
29																		
30																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	K.Sivasankaran	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	04/03/2023	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	G.Sharmila	WATER TABLE (m)	4.30	
WS - Wash Sample	DB - Diamond Bit	DATE	07/03/2023	CASING DEPTH (m)	0.00	

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

FIG.2.7 Sub Soil Profile at BH-07 Location

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-08
SHEET	1 OF 3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm ✓ / NX

LOCATION	Mount Road, Chennai	MACHINE No.	GD-03	CHAINAGE (m)	-	BORE START DATE	17/02/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	21/02/2023
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
0	17/02/2023	10	38	SC	-	-												
		To																
		10	39				46	20	6	26	0.50	1	SS	-0.5				Filled Up Soil Sand Mixed in Brick Pats & Debris
		10	49								2.45							
1		To		SC	-	-										L1	1.3	
		10	50				8	8	8	16	1.25	2	SS	-1.3				
		11	02								2.45							
		To		SC	-	-												
2		11	03				6	8	10	18	2.00	3	SS	-2.0				
		11	14								2.45							
		To		SC	-	-												
		11	15															
3							4	4	6	10	3.00	4	SS	-3.0				Yellow,Yellow Brown,Moist,Poorly Graded,Fine & Medium Grains Sands, Loose & Medium Dense,**Silty SAND (SM)**
		11	26								3.45							
		To		SC	-	-												
		11	27															
4							8	8	10	18	4.00	5	SS	-4.0				
		11	38								4.45							
		To		SC	-	-												
		11	39															
5							2	4	0	4	5.00	6	SS	-5.0		L2	5.0	
		11	53								5.45							
		To		SC	-	-												
		11	54															
6							2	1	1	2	6.00	7	SS	-6.0				
		12	15								6.45							
		To		SC	-	-												Grey,Moist,Poorly Graded,Fine Grains Sands & Medium Grains Sands Mix, Very Loose,**Clayey Silty SAND (SC) or Silty SAND With Clay Lenses & Silty SAND (SM)**
		12	16															
7							2	1	2	3	7.50	8	SS	-7.5				
		12	39								7.95							
		To		SC	-	-												
		12	40															
8																		
9							8	10	10	20	9.00	9	SS	-9.0		L3	9.0	
		14	23								9.45							Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Medium Dense,**Poorly Graded SAND - Silty SAND (SP-SM)**
		To		SC	-	-												
10		14	24															

CS - Core Sample	DS - Disturbed Sample	LOGGED	R.Kamalakannan	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	17/02/2023	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	G.Sharmila	WATER TABLE (m)	5.00	
WS - Wash Sample	DB - Diamond Bit	DATE	27/022023	CASING DEPTH (m)	0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-08
SHEET	2 OF 3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm ✓ / NX ✓

LOCATION	Mount Road, Chennai	MACHINE No.	GD-03	CHAINAGE (m)	-	BORE START DATE	17/02/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	21/02/2023
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
11	17/02/2023	14	49	SC	-	-	8	10	8	18	10.50	10	SS	-10.5				Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Medium Dense,**Poorly Graded SAND - Silty SAND (SP-SM)**
		To									10.95							
		14	50															
12							4	6	14	20	12.00	11	SS	-12.0		L4	12.0	
											12.45							
		15	18															Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Medium Dense,**Clayey Silty SAND (SC)/ Silty Sand With Clay Lenses**
13		To		SC	-	-												
		15	20															
14							11Cm Penet for 50 Blows			>100	14.00	12	SS	-14.0		L5	14.0	
											14.11							
		16	05												+ + +			Green Yellow,Brown Shades,Moist, Fine & Medium Grains Sand Size Particles,Very Dense,**Residual Soil - Grade W5 Rock Formation/ Disintegrated Hypersthene Granitic Rock**
		To		SC	-	-									+ + +			
		16	13												+ + +	L5	15.0	
15							SPT-Hammer Rebound			>100	15.00	-	WS	-15.0	+ + +			
	18/02/2023	10	48												+ + +			
		To		DB	8	0									+ + +			
		10	56												+ + +			Green Black,Medium to Coarse Grain Structure,Highly Fractured & Disintegrated,Discoloured,**Highly Weathered Rock - Grade W4 Rock Formation** Disintegrated Hypersthene Granitic Rock
16							-	-	-	-	16.00	13	CS	-16.0	+ + +			
		11	20												+ + +			
		To		DB	9	0									+ + +			
17		11	38												+ + +			
							-	-	-	-	17.50	14	CS	-17.5	+ + +	L6	17.5	
18		Total drilling time 45 mins		DB	89	51									+ + +			Grey,Brown & Yellow Grey Shades, Medium to Coarse Grain Structure,Fractured @ Times,**Slightly Weathered Rock - Grade W2 Rock Formation** Hypersthene Granitic Rock
															+ + +			
19							-	-	-	-	19.00	15	CS	-19.0	+ + +			
															+ + +			
20															+ + +			

CS - Core Sample	DS - Disturbed Sample	LOGGED	R.Kamalakannan	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	18/02/2023	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	G.Sharmila	WATER TABLE (m)	5.00	
WS - Wash Sample	DB - Diamond Bit	DATE	27/022023	CASING DEPTH (m)	0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-08		
SHEET	3	OF	3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm / NX ✓

LOCATION	Mount Road, Chennai	MACHINE No.	GD-03	CHAINAGE (m)	-	BORE START DATE	17/02/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	21/02/2023
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
21	21/02/2023	14 To 15	00 30	DB	87	71	-	-	-	-	22.00	16	CS	-22.0	+ +	L7	22.0	Grey,Brown & Yellow Grey Shades, Medium to Coarse Grain Structure,Fractured @ Times,**Slightly Weathered Rock - Grade W2 Rock Formation** Hypersthene Granitic Rock
22																		
23																		
24																		
25																		
26																		
27																		
28																		
29																		
30																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	S.Stephenraj	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	21/02/2023	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	G.Sharmila	WATER TABLE (m) 5.00	
WS - Wash Sample	DB - Diamond Bit	DATE	27/022023	CASING DEPTH (m) 0.00	

Borehole terminated at 22 m depth below E.G.L

FIG.2.8 Sub Soil Profile at BH-08 Location

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-09
SHEET	1 OF 3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm ✓ / NX

LOCATION	Mount Road, Chennai	MACHINE No.	ATV	CHAINAGE (m)	-	BORE START DATE	17/02/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	20/02/2023
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
1	17/02/2023	15	20	SC	-	-												
		To																
		15	21				2	4	4	8	0.50	1	SS	-0.5				Brown,Moist,Poorly Graded,Fine & Medium Grains Sands,Loose,**Silty SAND**
		15	31								0.95							
		To		SC	-	-										L1	1.3	
		15	32				4	6	8	14	1.25	2	SS	-1.3				
		15	43								2.45							
		To		SC	-	-												
2		15	44				6	8	10	18	2.00	3	SS	-2.0				
		15	57								2.45							
		To		SC	-	-												
		15	58															
3		16	14				6	10	12	22	3.00	4	SS	-3.0				
		To		SC	-	-					3.45							
		16	15															
4		16	26				6	6	8	14	4.00	5	SS	-4.0				
		To		SC	-	-					4.45							
		16	27															
5		09	20				6	8	8	16	5.00	6	SS	-5.0				Brown,Grey Beyond 7.5m Depth,Moist, Poorly Graded,Fine & Medium Grains Sands,Medium Dense,**Silty SAND (SM) & Poorly Graded SAND - Silty SAND (SP-SM)**
		To		SC	-	-					5.45							
		09	22															
6		09	42				6	6	6	12	6.00	-	*SS /WS	-6.0				
		To		SC	-	-					6.45							
		09	44															
7	18/02/2023																	
							4	4	8	12	7.50	7	SS	-7.5				
											7.95							
8		10	30															
		To		SC	-	-												
		10	32															
9							6	4	10	14	9.00	8	SS	-9.0				
											9.45							
		10	52															
		To		SC	-	-												
10		10	54															

CS - Core Sample	DS - Disturbed Sample	LOGGED	S.Stephenraj	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	18/02/2023	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	G.Sharmila	WATER TABLE (m)	3.40	
WS - Wash Sample	DB - Diamond Bit	DATE	21/02/2023	CASING DEPTH (m)	0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-09
SHEET	2 OF 3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm ✓ / NX ✓

LOCATION	Mount Road, Chennai	MACHINE No.	ATV	CHAINAGE (m)	-	BORE START DATE	17/02/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	20/02/2023
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
11	18/02/2023	11	10	SC	-	-	6	8	12	20	10.50 / 10.95	9	SS	-10.5				
		To																
		11	12															
12							16	6	8	14	12.00 / 12.45	10	SS	-12.0				Grey,Moist, Poorly Graded,Fine & Medium Grains Sands,Medium Dense,**Silty SAND (SM) & Clayey Silty SAND (SC)**
		11	41															
13		To		SC	-	-												
		11	44															
14							16	18	20	38	14.00 / 14.45	11	SS	-14.0		L2	14.0	
		12	12															Green,Grey Green,Moist,Poorly Graded, Fine to Coarse Sand With Traces of Gravels,Dense,**Clayey Silty SAND (SC)/ Cemented Binder**
15		To		SC	-	-												
		12	16															
16							70	80	96	>100	16.00 / 16.45	12	SS	-16.0		L3	16.0	
		14	00															Grey Brown,Moist,Fine to Coarse Sand Size Particles,Very Dense,**Residual Soil to Completely Weathered Rock - Grade W5 Rock Formation** Disintegrated Hypersthene Granitic Rock
17		To		DB	-	-												
		14	45															
18							SPT-Hammer Rebound			>100	18.00	-	WS	-18.0		L4	18.0	
		16	00															Grey,Pink Grey,Medium to Coarse Grain Structure,Fractured @ Parts, Discolouration @ Parts,**Slightly Weathered Rock to Fresh Rock Formation - Grade W2 & W1 Rock Formation** Hypersthene Granitic Rock
		To		DB	75	20												
		17	00															
19							-	-	-	-	19.00	13	CS	-19.0				
20																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	S.Stephenraj	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	18/02/2023	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	G.Sharmila	WATER TABLE (m)	3.40	
WS - Wash Sample	DB - Diamond Bit	DATE	21/02/2023	CASING DEPTH (m)	0.00	

GEOMARINE THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-09				
SHEET	3 OF 3				
PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING			DIA OF BORE HOLE	150mm / NX ✓
LOCATION	Mount Road, Chennai	MACHINE No.	ATV	CHAINAGE (m)	-
BORE START DATE	17/02/2023				
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES N	-
BORE END DATE	20/02/2023				
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite	CO-ORDINATES E	-
TOTAL DRILL DAYS	3				

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time Hr.	Time Min.	Type of Drill Bit (SC / TCB / DB)	Total Core Recovery %	R.Q.D %	SPT Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Depth	No.	Type	RL (m)	Layer Legend	No	Depth	Geotechnical Description
	20/02/2023	10 To 11	16 To 37	DB	89	73	-	-	-	-	20.50	14	CS	-20.5	+ + +			Grey,Pink Grey,Medium to Coarse Grain Structure,Fractured @ Parts, Discolouration @ Parts,**Slightly Weathered Rock to Fresh Rock Formation - Grade W2 & W1 Rock Formation** Hypersthene Granitic Rock
21		14 To 15	15 To 40	DB	100	75												
22							-	-	-	-	22.50	15	CS	-22.5		L5	22.5	
23																		
24																		
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	20/02/2023	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	G.Sharmila	WATER TABLE (m)	3.40	
WS - Wash Sample	DB - Diamond Bit	DATE	21/02/2023	CASING DEPTH (m)	0.00	

Borehole terminated at 22.5 m depth below E.G.L

FIG.2.9 Sub Soil Profile at BH-09 Location

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-10
SHEET	1 OF 3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING
DIA OF BORE HOLE	150mm ✓ / NX

LOCATION	Mount Road, Chennai	MACHINE No.	ATV GD-04	CHAINAGE (m)	-	BORE START DATE	14/02/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	17/02/2023
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	4

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
0		15	25															
		To		SC	-	-										L1	0.5	**Filled Up Soil**
		15	26				2	2	3	**5**	0.50	1	SS	-0.5				
		15	36								2.45							
1		To		SC	-	-												Brown,Moist,Poorly Graded,Fine & Medium Grains Sands,Loose,**Silty SAND (SM) With Gravels**
		15	37				2	2	2	**4**	1.25	2	SS	-1.3				
		15	51								2.45							
		To		SC	-	-												
2		15	52				3	3	5	**8**	2.00	3	SS	-2.0		L2	2.0	
		16	01								2.45							
		To		SC	-	-												Brown,Moist,Poorly Graded,Fine & Medium Grains Sands,Loose,**Poorly Graded SAND - Silty SAND (SP-SM)**
	14/02/2023	16	02															
3							17	16	12	**28**	3.00	4	SS	-3.0		L3	3.0	
		16	16								3.45							
		To		SC	-	-												
		16	17															
4							4	6	14	**20**	4.00	5	SS	-4.0				
		16	33								4.45							
		To		SC	-	-												
		16	34															
5							3	5	7	**12**	5.00	6	SS	-5.0				
		16	54								5.45							
		To		SC	-	-												
		16	55															Brown @ Parts,Grey Beyond 5.0m, Moist,Poorly Graded,Fine & Medium Grains Sands,Loose & Medium Dense Sands,**Silty SAND (SM) & Poorly Graded SAND - Silty SAND (SP-SM)** **Traces of Sea Shells @ Location**
6							6	9	11	**20**	6.00	-	WS	-6.0				
											6.45							
		15	50															
		To		SC	-	-												
7		15	51															
							4	4	6	**10**	7.50	7	SS	-7.5				
	15/02/2023										7.95							
8		16	38															
		To		SC	-	-												
		16	39															
9							2	0	2	**2**	9.00	8	SS	-9.0		L4	9.0	
											9.45							
		16	55															Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Very Loose,**Silty SAND (SM)**
		To		SC	-	-												
10		16	56															

CS - Core Sample	DS - Disturbed Sample	LOGGED	K.Loganathan	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	15/02/2023	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	21/02/2023	CASING DEPTH (m) 0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-10
SHEET	2 OF 3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm ✓ / NX ✓

LOCATION	Mount Road, Chennai	MACHINE No.	ATV GD-04	CHAINAGE (m)	-	BORE START DATE	14/02/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	17/02/2023
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	4

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Legend	Layer Data: No	Depth	Geotechnical Description
							6	6	8	**14**	10.50	9	SS	-10.5		L5	10.5	Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Very Loose, **Silty SAND (SM)**
11		10	02								10.95							
		To		SC	-	-												
		10	03															
12							2	2	4	**6**	12.00	10	SS	-12.0				Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Loose & Medium Dense,**Poorly Graded SAND - Silty SAND (SP-SM) & Silty SAND (SM)**
											12.45							
		10	20															
13		**To**		SC	-	-												
		10	22															
14							18	26	34	**60**	14.00	11	SS	-14.0		L6	14.0	
											14.45							
		10	45															
15	**16/02/2023**	**To**		SC	-	-												Brown Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Very Dense, **Clayey Silty SAND (SC)**
		10	49															
16							9Cm Penet for 72 Blows			**>100**	16.00	12	SS	-16.0		L7	16.0	
											16.09							
		11	26															Yellow Brown,Moist,Pred. Gravels,Fine to Coarse Sand Mixture,Very Dense, **Residual Soil to Completely Weathered Rock - W5 Rock Formation**
		To		SC	-	-												
		11	37															
17							SPT Hammer Rebounded			**>100**	17.00	-	WS	-17.0		L8	17.0	
		12	06															
		To		DB	16	0												
18		12	40															
							-	-	-	**-**	18.50	13	CS	-18.5				Yellow,Grey Brown,Fine to Coarse Grain Structure,Highly Fractured, Discoloured @ Parts,**Highly Weathered Rock - Grade W4 Rock Formation**
		14	10															Hypersthene Granitic Rock Formation
19		**To**		DB	0	0												
		14	46															
20							-	-	-	**-**	20.00	-	WS	-20.0		L9	20.0	
																		Grey Brown,Medium to Coarse Grain Structure,Highly Fractured,Discoloured @ Fractures,**Moderately Weathered Rock -**

CS - Core Sample	DS - Disturbed Sample	LOGGED	K.Loganathan	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	16/02/2023	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	21/02/2023	CASING DEPTH (m) 0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-10
SHEET	3 OF 3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm / NX ✓

LOCATION	Mount Road, Chennai	MACHINE No.	ATV GD-04	CHAINAGE (m)	-	BORE START DATE	14/02/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	17/02/2023
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	4

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
21	16/02/203	15	05	DB	40	0												
		To																
		15	49				-	-	-	-	21.50	14	CS	-21.5	+ + +			Grey Brown,Medium to Coarse Grain Structure,Highly Fractured,Discoloured @ Fractures,**Moderately Weathered Rock - Grade W3 Rock Formation** Hypersthene Granitic Rock
22		Total drilling time 56 mins		DB	43	0												
23							-	-	-	-	23.00	15	CS	-23.0	+ + +	L10	23.0	
24	17/02/2023	11	08	DB	91	63												
		To																
		11	51				-	-	-	-	24.50	16	CS	-24.5	+ + +			Grey,Pink Grey,Medium to Coarse Grain Structure,Fractured @ Parts,**Slightly Weathered Rock to Fresh Rock Formation - Grade W2 & W1 Rock Formation** Hypersthene Granitic Rock
25		12	18	DB	95	95												
		To																
		13	10															
26							-	-	-	-	26.00	17	CS	-26.0	+ + +	L11	26.0	
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	17/02/2023	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	21/02/2023	CASING DEPTH (m)	0.00	

Borehole terminated at 26 m depth below E.G.L

FIG.2.10 Sub Soil Profile at BH-10 Location

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-11
SHEET	1 OF 3
DIA OF BORE HOLE	150mm ✓ / NX

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING						
LOCATION	Mount Road, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	25/03/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	28/03/2023
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
1	25/03/2023	14	00 To 14 08	SC	-	-	7	12	19	31	1.25 ↓ 1.70	1	SS	-1.3				Brown,Moist,Poorly Graded,Fine & Medium Grains Sands,Dense & Medium Dense,**Clayey Sitly SAND (SC), Silty SAND (SM) & Poorly Graded SAND - Silty SAND (SP-SM)**
2		14	25 To 14 27	SC	-	-	9	14	17	31	2.00 ↓ 2.45	2	SS	-2.0				
3		15	00 To 15 02	SC	-	-	6	11	14	25	3.00 ↓ 3.45	3	SS	-3.0				
4		16	00 To 16 03	SC	-	-	7	15	31	46	4.00 ↓ 4.45	4	SS	-4.0				
5		17	02 To 17 04	SC	-	-	7	19	9	28	5.00 ↓ 5.45	5	SS	-5.0				
6		09	00 To 09 05	SC	-	-	0	2	2	4	6.00 ↓ 6.45	6	SS	-6.0		L1	6.0	
7	27/03/2023	09	25 To 09 28	SC	-	-	3	12	17	29	7.50 ↓ 7.95	7	SS	-7.5		L2	7.5	Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Loose,**Clayey Silty SAND (SC)**
8		10	00 To 10 03	SC	-	-												
9		10	30 To 10 32	SC	-	-	12	17	20	37	9.00 ↓ 9.45	8	SS	-9.0				Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Medium Dense & Dense,**Silty SAND (SM) & Poorly Graded SAND - Silty SAND (SP-SM)**
10																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	S.Stephen raj	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	27/03/2023	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m) 3.60	
WS - Wash Sample	DB - Diamond Bit	DATE	06/04/2023	CASING DEPTH (m) 0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-11						
SHEET	2 OF 3						
PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING					DIA OF BORE HOLE	150mm ✓ / NX ✓
LOCATION	Mount Road, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	25/03/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N: -	BORE END DATE	28/03/2023
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E: -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Date	Time Hr.	Time Min.	Type of Drill Bit (SC / TCB / DB)	Total Core Recovery %	R.Q.D %	Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Depth	No.	Type	RL (m)	Legend	Layer No	Layer Depth	Geotechnical Description
10.5	27/03/2023						11	18	24	42	10.50 – 10.95	10	SS	-10.5				
11		10 To 10	55 To 58	SC	-	-												
12							11	18	20	38	12.00 – 12.45	11	SS	-12.0				
13		11 To 11	20 To 22	SC	-	-												Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Medium Dense & Dense,**Silty SAND (SM) & Poorly Graded SAND - Silty SAND (SP-SM)**
14							10	20	20	40	14.00 – 14.45	12	SS	-14.0				
15		11 To 12	40 To 00	TCB	-	-												
16							SPT Hammer Rebounded			>100	16.00	-	WS	-16.0		L3	16.0	
17		14 To 14	00 To 25	DB	0	0												
18							SPT Hammer Rebounded			>100	18.00	-	WS	-18.0				No Core Recovery Wash Cutting Observed to be Disintegrated Hypersthene Granitic Rock
19		15 To 17	30 To 30	DB	0	0												
20							SPT Hammer Rebounded			>100	20.00	-	WS	-20.0				

CS - Core Sample	DS - Disturbed Sample	LOGGED	S.Stephen raj	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	27/03/2023	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m)	3.60	
WS - Wash Sample	DB - Diamond Bit	DATE	06/04/2023	CASING DEPTH (m)	0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-11		
SHEET	3	OF	3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm / NX ✓

LOCATION	Mount Road, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	25/03/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	28/03/2023
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
21	27/03/2023	17	35	DB	0	0									+ + + + + + + + + + + +			No Core Recovery Wash Cutting Observed to be Disintegrated Hypersthene Granitic Rock
		To					SPT Hammer Rebounded			>100	21.00	-	WS	-21.0		L4	21.0	
22	28/03/2023	09	00	DB	60	7									+ + + + + + + + + + + +			Grey,Pink Grey,Brown Grey Shades @ Times/Discolouration,Highly Fractured, Medium to Coarse Grain Structures,Strong,**Moderately Weathered Rock - Grade W3 Rock Formation** Hypersthene Granitic Rock Formation
		To					-	-	-	-	22.50	13	CS	-22.5				
23		10	30															
		11	00	DB	67	7												
		To					-	-	-	-	24.00	14	CS	-24.0		L5	24.0	
24		12	30															
25																		
26																		
27																		
28																		
29																		
30																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	S.Stephen raj	PROJECT SITE DETAILS	REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	28/03/2023	GROUND LEVEL (m) 0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m) 3.60	
WS - Wash Sample	DB - Diamond Bit	DATE	06/04/2023	CASING DEPTH (m) 0.00	

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

FIG.2.11 Sub Soil Profile at BH-11 Location

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-12
SHEET	1 OF 3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm ✓ / NX

LOCATION	Mount Road, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	29/03/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	30/03/2023
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	2

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
1	29/03/2023	12	00															
		To		SC	-	-												
		12	01				5	6	7	13	1.25	1	SS	-1.3				Brown,Moist,Stiff,**Sandy Silty CLAY (CI)** Sandy Silty Clay of Medium Plasticity Filled Up Soil @ 1.0m Depth
		12	23								1.70							
		To		SC	-	-												
2		12	25				2	4	5	9	2.00	2	SS	-2.0		L1	2.0	
		12	40								2.45							
		To		SC	-	-												
3		12	41				3	2	2	4	3.00	3	SS	-3.0				
		12	45								3.45							Brown,Moist,Poorly Graded,Fine & Medium Grains,Loose & Very Loose,**Silty SAND (SM) & Clayey Silty SAND (SC)**
		To		SC	-	-												
4		12	46				2	3	3	6	4.00	4	SS	-4.0				
		14	00								4.45							
		To		SC	-	-												
5		14	02				4	6	7	13	5.00	5	SS	-5.0		L2	5.0	
		14	30								5.45							Grey,Moist,Poorly Graded,Fine & Medium Grains,Medium Dense,**Clayey Silty SAND (SC)**
		To		SC	-	-												
6		14	32				14	14	17	31	6.00	6	SS	-6.0		L3	6.0	
		14	40								6.45							
		To		SC	-	-												
7		14	43															
							18	23	25	48	7.50	7	SS	-7.5				
											7.95							Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Dense,**Silty SAND (SM) & Poorly Graded SAND - Silty SAND (SP-SM)**
8		15	10															
		To		SC	-	-												
		15	12															
9							13	16	17	33	9.00	8	SS	-9.0				
											9.45							
		15	35															
		To		SC	-	-												
10		15	38															

CS - Core Sample	DS - Disturbed Sample	LOGGED	S.Stephen raj	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	29/03/2023	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m)	2.50	
WS - Wash Sample	DB - Diamond Bit	DATE	03/04/2023	CASING DEPTH (m)	0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-12
SHEET	2 OF 3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm ✓ / NX ✓

LOCATION	Mount Road, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	29/03/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	30/03/2023
JOB CODE	GT-2473	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 'N' Value	Sample Details: Depth	No.	Type	RL (m)	Layer Data: Legend	No	Depth	Geotechnical Description
10																L4	10.5	Grey,Moist,Poorly Graded,Fine & Medium Grains Sands,Dense,**Silty SAND (SM) & Poorly Graded SAND - Silty SAND (SP-**
11		16 10 To 16 13		SC	-	-	14	26	35	**61**	10.50 / 10.95	10	SS	-10.5				
12	29/03/2023						63	SPT Hammer Rebound		**>100**	12.00 / 12.15	11	SS	-12.0		L5	12.0	Green Grey,Moist,Poorly Graded,Fine & Medium Grains Sand,Very Dense,**Sitly SAND (SM)**
13		16 35 To 17 05		SC	-	-												Green Grey,Moist,Fine to Coarse Grain Sand Size Particles,Traces of Gravels,Very Dense,**Clayey Silty SAND (SC)/Cemented Sand**
14							SPT Hammer Rebounded			**>100**	14.00	-	WS	-14.0		L6	14.0	
15		09 00 To 10 00		TCB	0	0												No Core Recovery Wash Cutting Observed to be Disintegrated Hypersthene Granitic Rock
16							SPT Hammer Rebounded			**>100**	16.00	-	WS	-16.0				
17	30/03/2023	10 20 To 11 15		DB	0	0												
18							SPT Hammer Rebounded			**>100**	17.50	-	WS	-17.5		L7	17.5	
19		11 30 To 13 00		DB	66	7												Grey,Pink Grey,Brown Grey Shades @ Times/Discolouration,Highly Fractured, Medium to Coarse Grain Structures,Strong,**Moderately to Slightly Weathered Rock - Grade W3 & W2 Rock Formation**
20		14 00 To 15 45		DB	71	38	-	-	-	**-**	19.00	12	CS	-19.0				Hypersthene Granitic Rock Formation

CS - Core Sample	DS - Disturbed Sample	LOGGED	S.Stephen raj	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	30/03/2023	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m)	2.50	
WS - Wash Sample	DB - Diamond Bit	DATE	03/04/2023	CASING DEPTH (m)	0.00	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH-12
SHEET	3 OF 3

PROJECT NAME	PROPOSED CONSTRUCTION OF A RESIDENTIAL CUM COMMERCIAL BUILDING	DIA OF BORE HOLE	150mm / NX ✓

LOCATION	Mount Road, Chennai	MACHINE No.	-	CHAINAGE (m)	-	BORE START DATE	29/03/2023
STRUCTURE	3 Basement + 45 Upper Floors	DRILLING METHOD	Rotary	CO-ORDINATES	N -	BORE END DATE	30/03/2023
JOB CODE	GT-2473	FLUSHING MEDIUM	Bentonite		E -	TOTAL DRILL DAYS	2

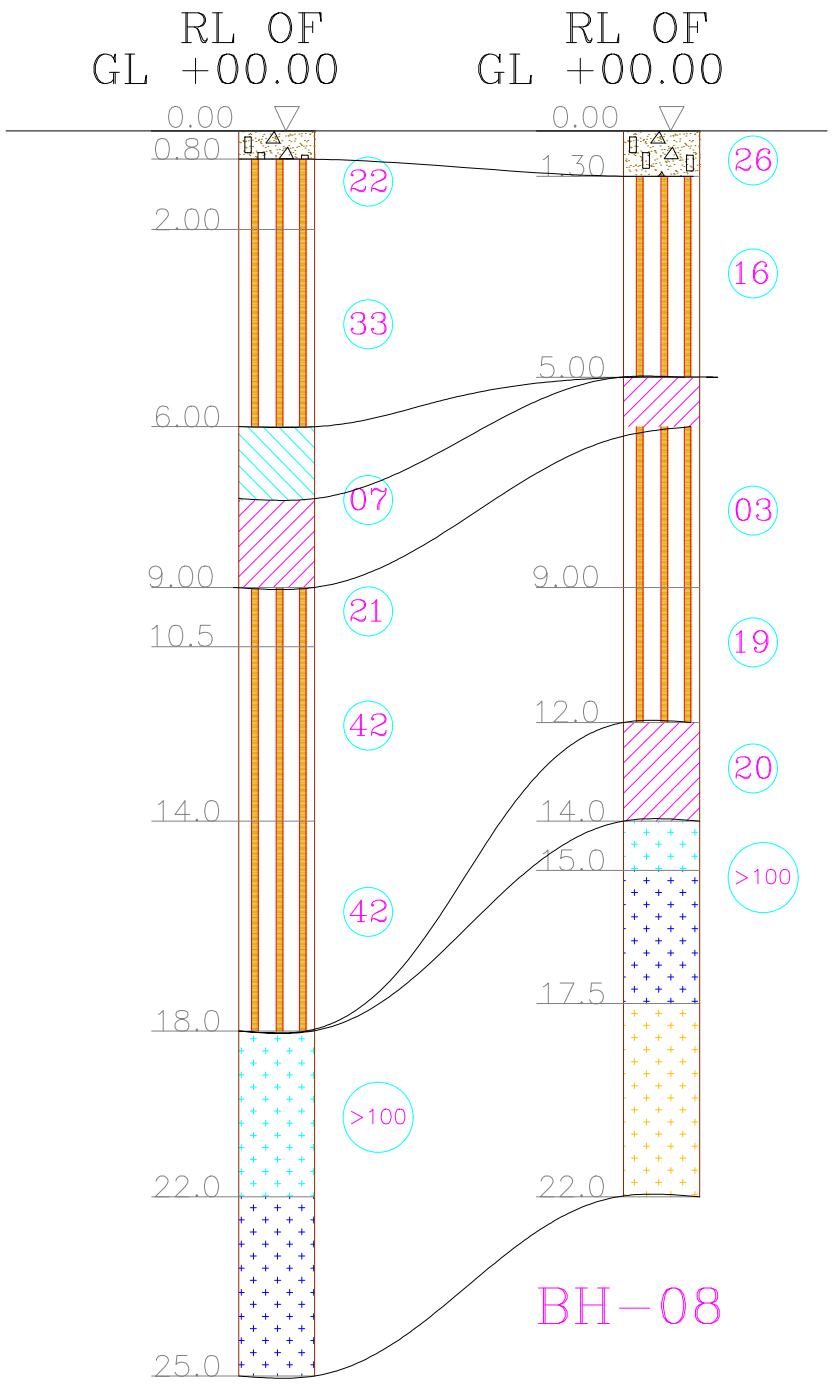
Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min.	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Sample Details: RL (m)	Layer Data: Legend	Layer Data: No	Layer Data: Depth	Geotechnical Description
21	30/03/2023						-	-	-	-	↓ 20.50	13	CS	-20.5	+ + + + + + + + +	L8	20.5	Grey,Pink Grey,Brown Grey Shades @ Times/Discolouration,Highly Fractured, Medium to Coarse Grain Structures,Strong,**Moderately to Slightly Weathered Rock - Grade W3 & W2 Rock Formation** Hypersthene Granitic Rock Formation
22																		
23																		
24																		
25																		
26																		
27																		
28																		
29																		
30																		

CS - Core Sample	DS - Disturbed Sample	LOGGED	S.Stephen raj	PROJECT SITE DETAILS		REMARKS
SS - Split Spoon Sample	SC - Soil Cutter	DATE	30/03/2023	GROUND LEVEL (m)	0.00	
UDS- Undisturbed Sample	TCB - Tungsten Carbide Bit	CHECKED	S.Tysonraj	WATER TABLE (m)	2.50	
WS - Wash Sample	DB - Diamond Bit	DATE	03/04/2023	CASING DEPTH (m)	0.00	

Borehole terminated at 20.5 m depth below E.G.L

FIG.2.12 Sub Soil Profile at BH-12 Location

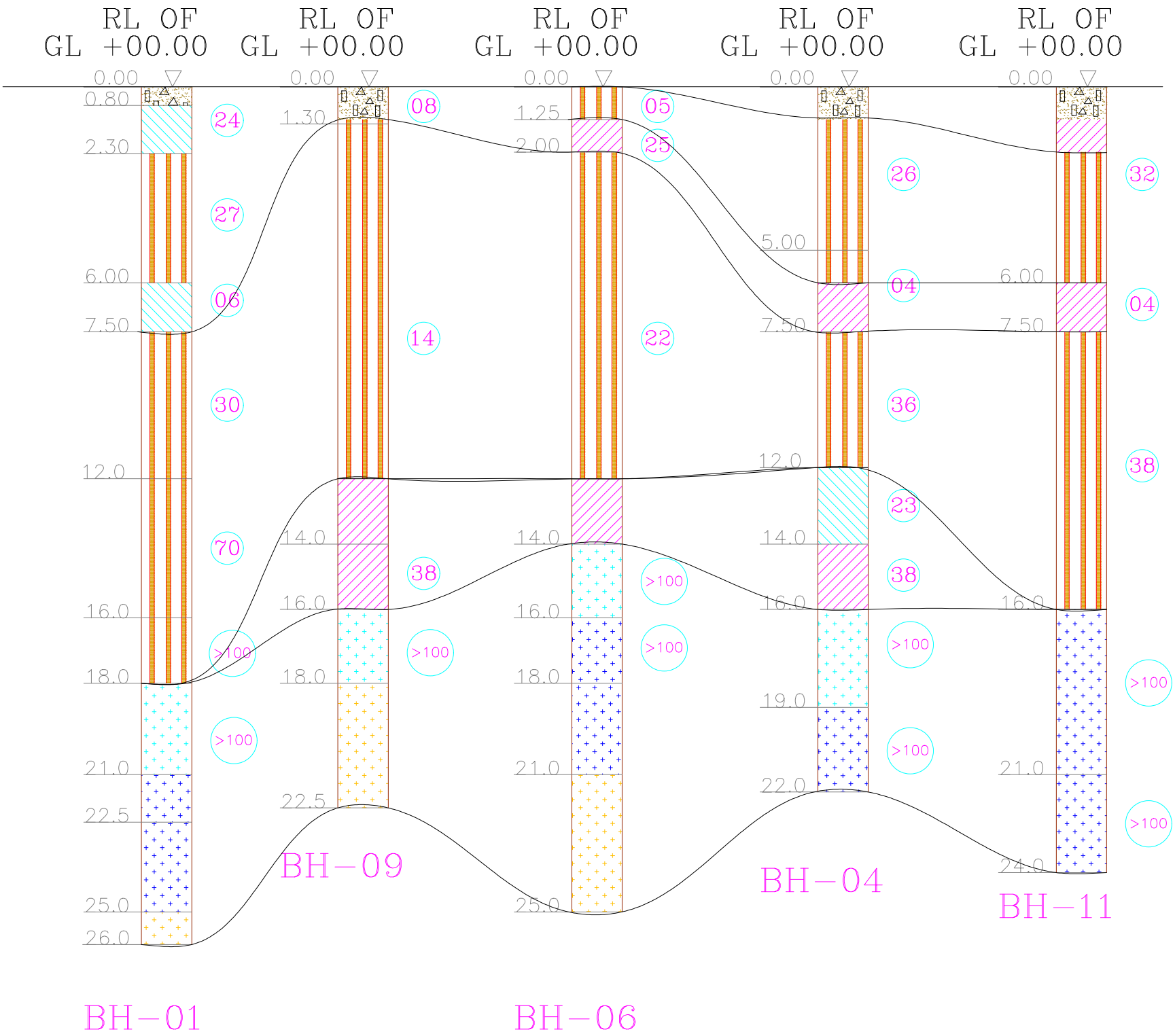
CROSS SECTION PROFILE



LEGEND

- Filled Up Soil
- SILTY SAND (SM)
- SILTY CLAY (CI)
- CLAYEY SILTY SAND (SC)
- Highly & Moderately Weathered Rock- Grade W4 & W5 Rock
- Slightly Weathered Rock & Fresh Rock - Grade W2 & W3 Rock
- Residual Soil & Completely Weathered Rock - Grade W5 Rock Formation
- Poorly Graded SAND (SP)

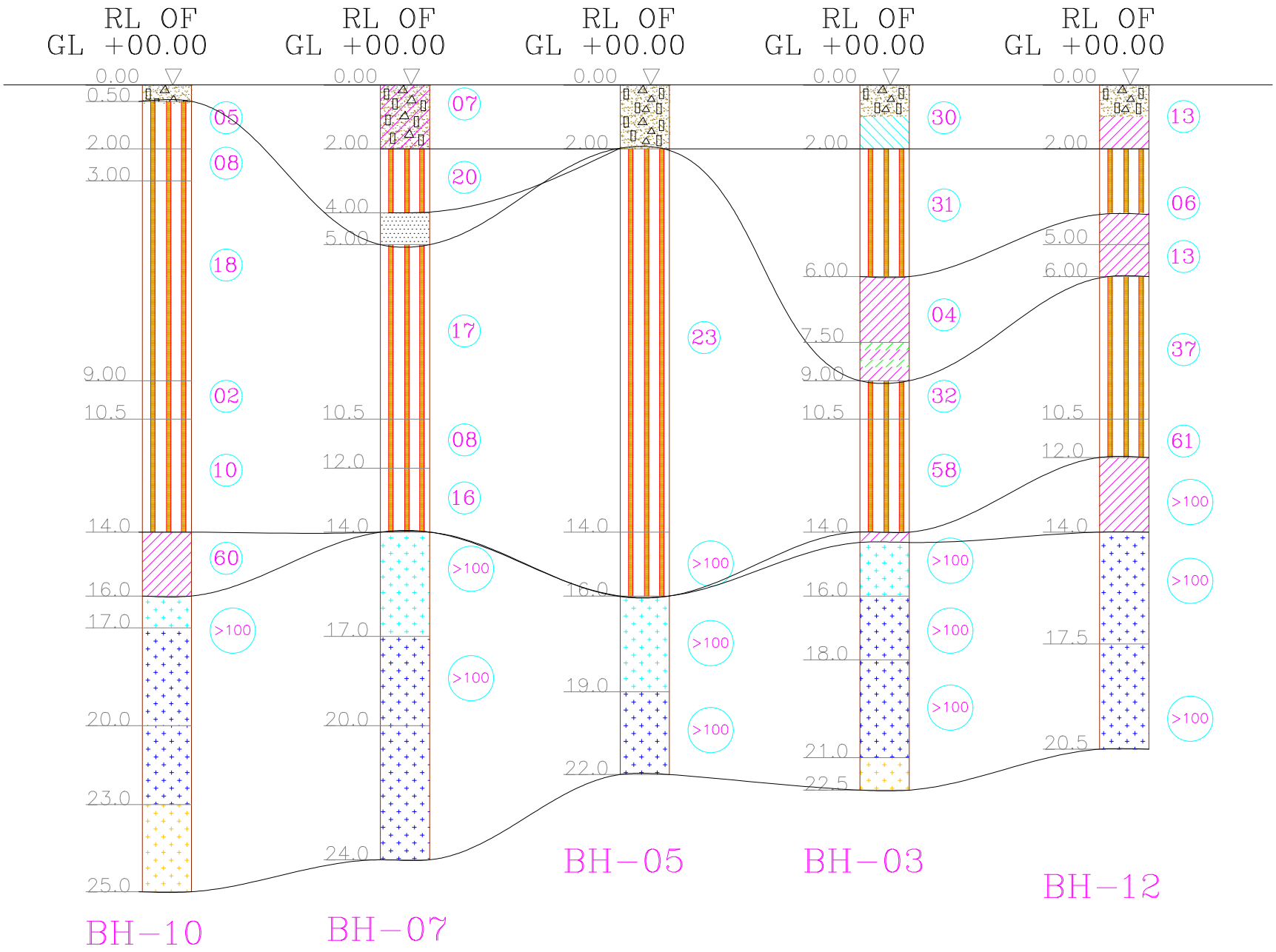
FIG.2.13 CROSS SECTIONAL VARIATION OF SUB SOIL PROFILE THROUGH BH-02 & 08



LEGEND

- Filled Up Soil
- SILTY SAND (SM)
- SILTY CLAY (CI)
- CLAYEY SILTY SAND (SC)
- Highly & Moderately Weathered Rock- Grade W4 & W5 Rock
- Slightly Weathered Rock & Fresh Rock - Grade W2 & W3 Rock
- Residual Soil & Completely Weathered Rock - Grade W5 Rock Formation
- Poorly Graded SAND (SP)

FIG.2.14 CROSS SECTIONAL VARIATION OF SUB SOIL PROFILE THROUGH BH-01,09,06,04 & 11



LEGEND

- Filled Up Soil
- SILTY SAND (SM)
- SILTY CLAY (CI)
- CLAYEY SILTY SAND (SC)
- Highly & Moderately Weathered Rock- Grade W4 & W5 Rock
- Slightly Weathered Rock & Fresh Rock - Grade W2 & W3 Rock
- Residual Soil & Completely Weathered Rock - Grade W5 Rock Formation
- Poorly Graded SAND (SP)

FIG.2.15 CROSS SECTIONAL VARIATION OF SUB SOIL PROFILE THROUGH BH-10,07,05,03 & 12

GRAIN SIZE DISTRIBUTION CURVE

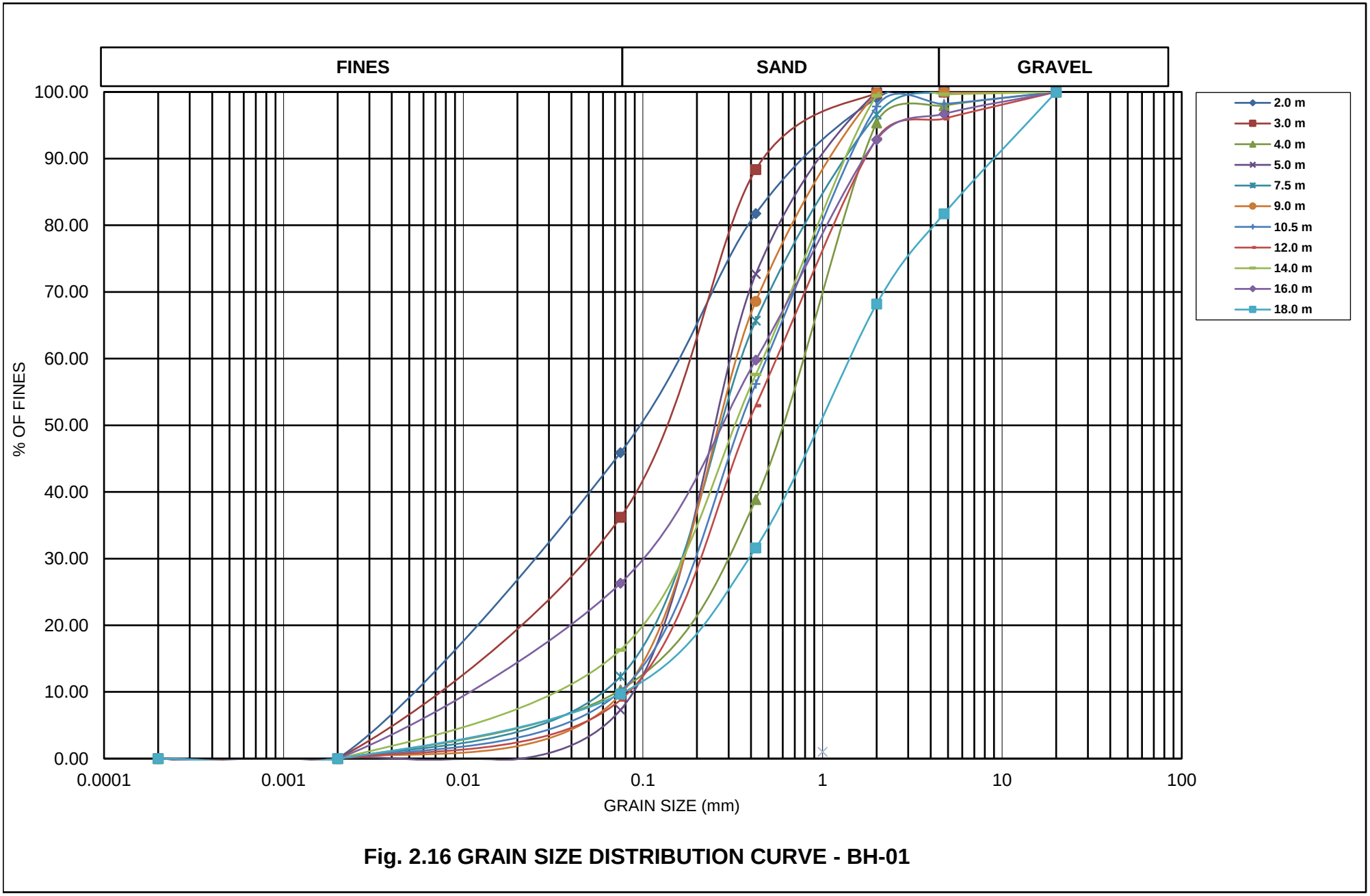


Fig. 2.16 GRAIN SIZE DISTRIBUTION CURVE - BH-01

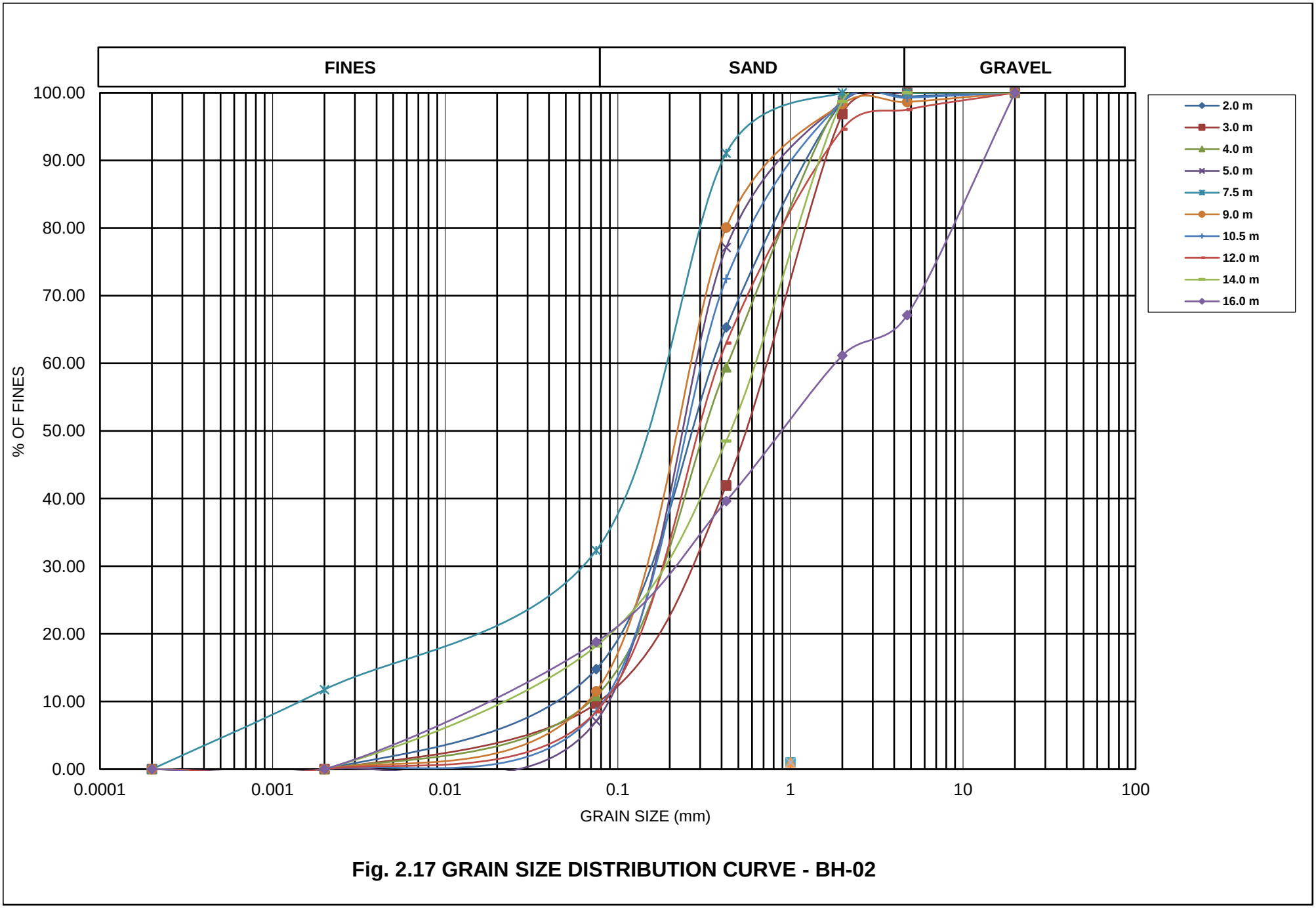


Fig. 2.17 GRAIN SIZE DISTRIBUTION CURVE - BH-02

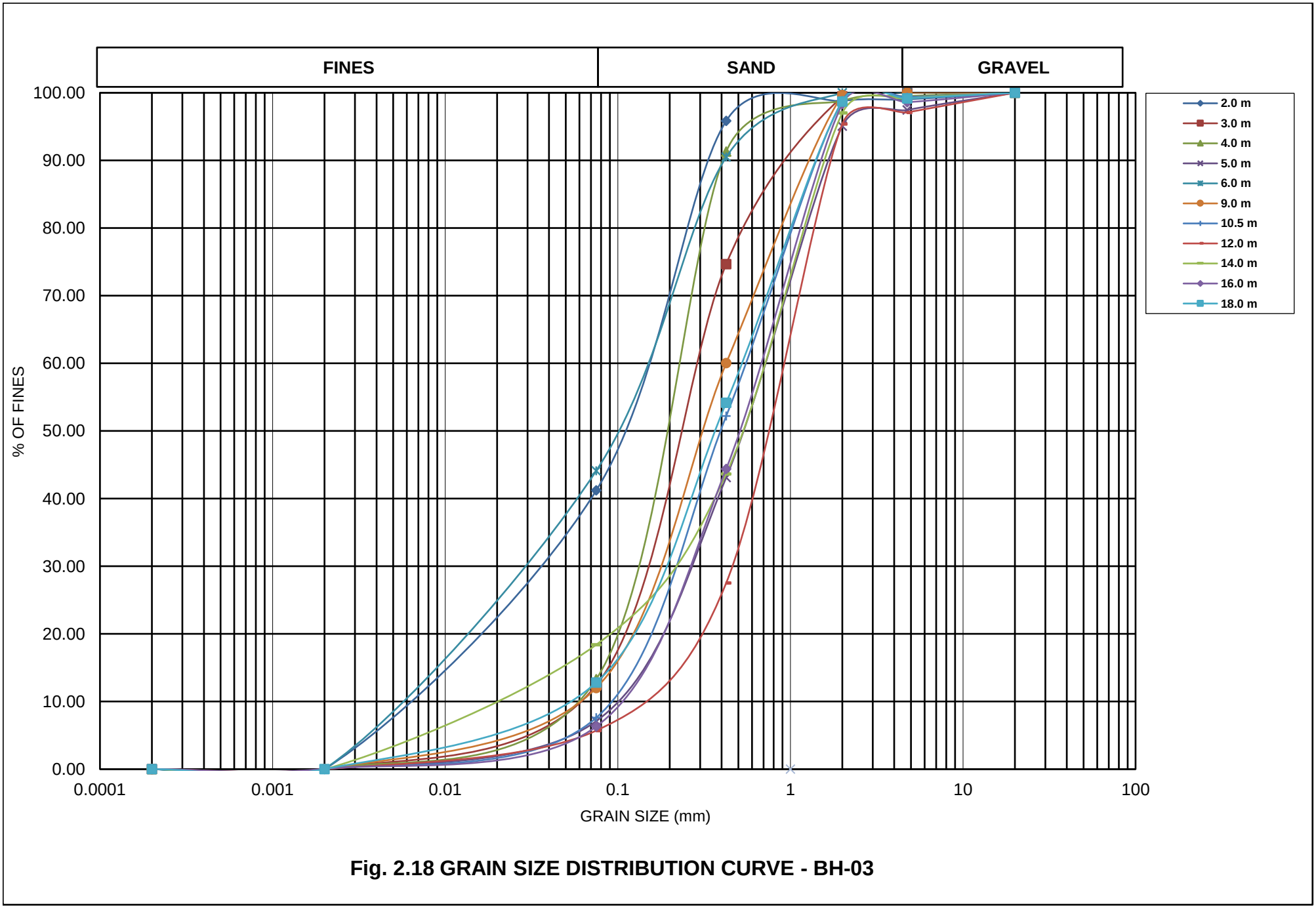


Fig. 2.18 GRAIN SIZE DISTRIBUTION CURVE - BH-03

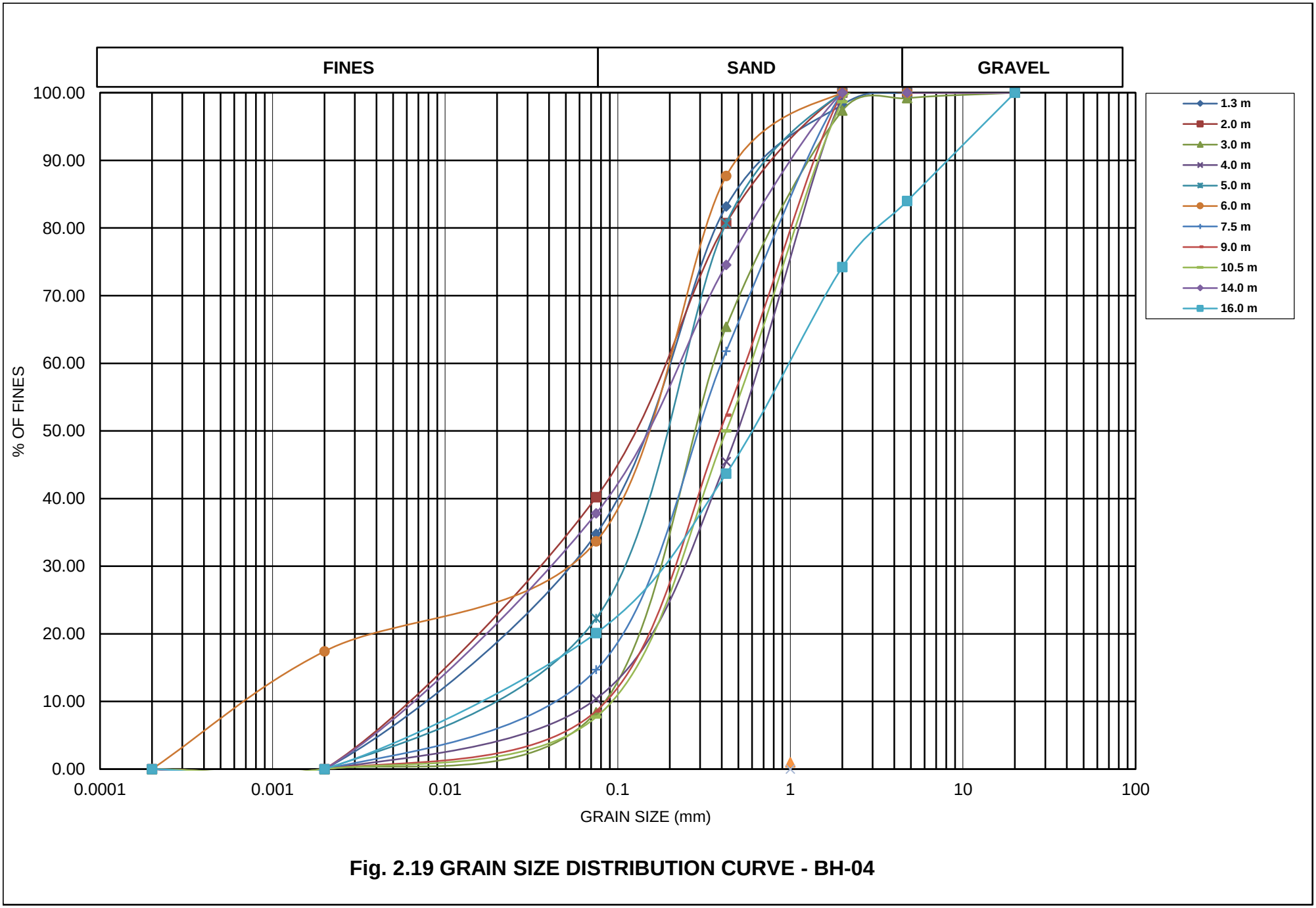


Fig. 2.19 GRAIN SIZE DISTRIBUTION CURVE - BH-04

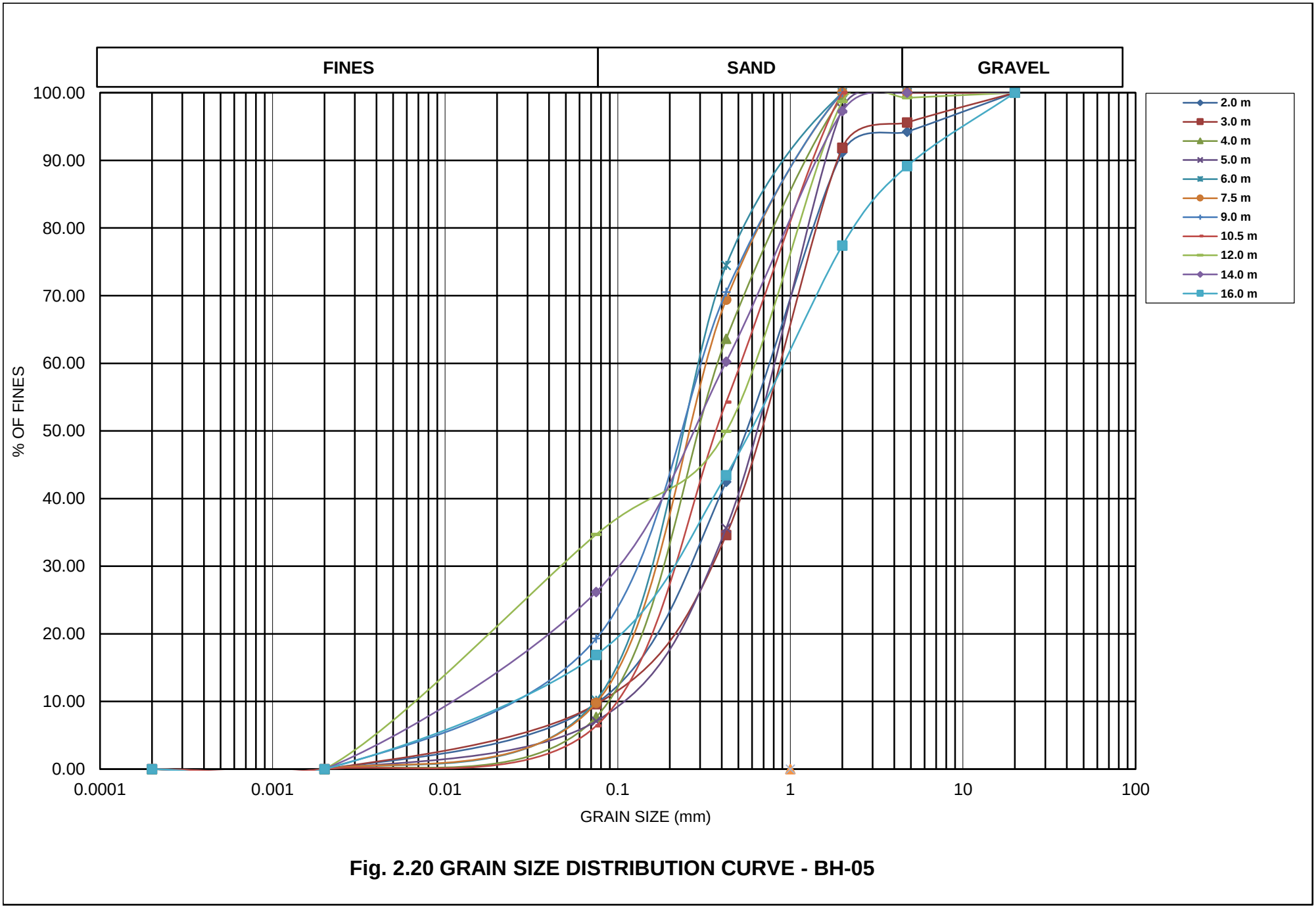


Fig. 2.20 GRAIN SIZE DISTRIBUTION CURVE - BH-05

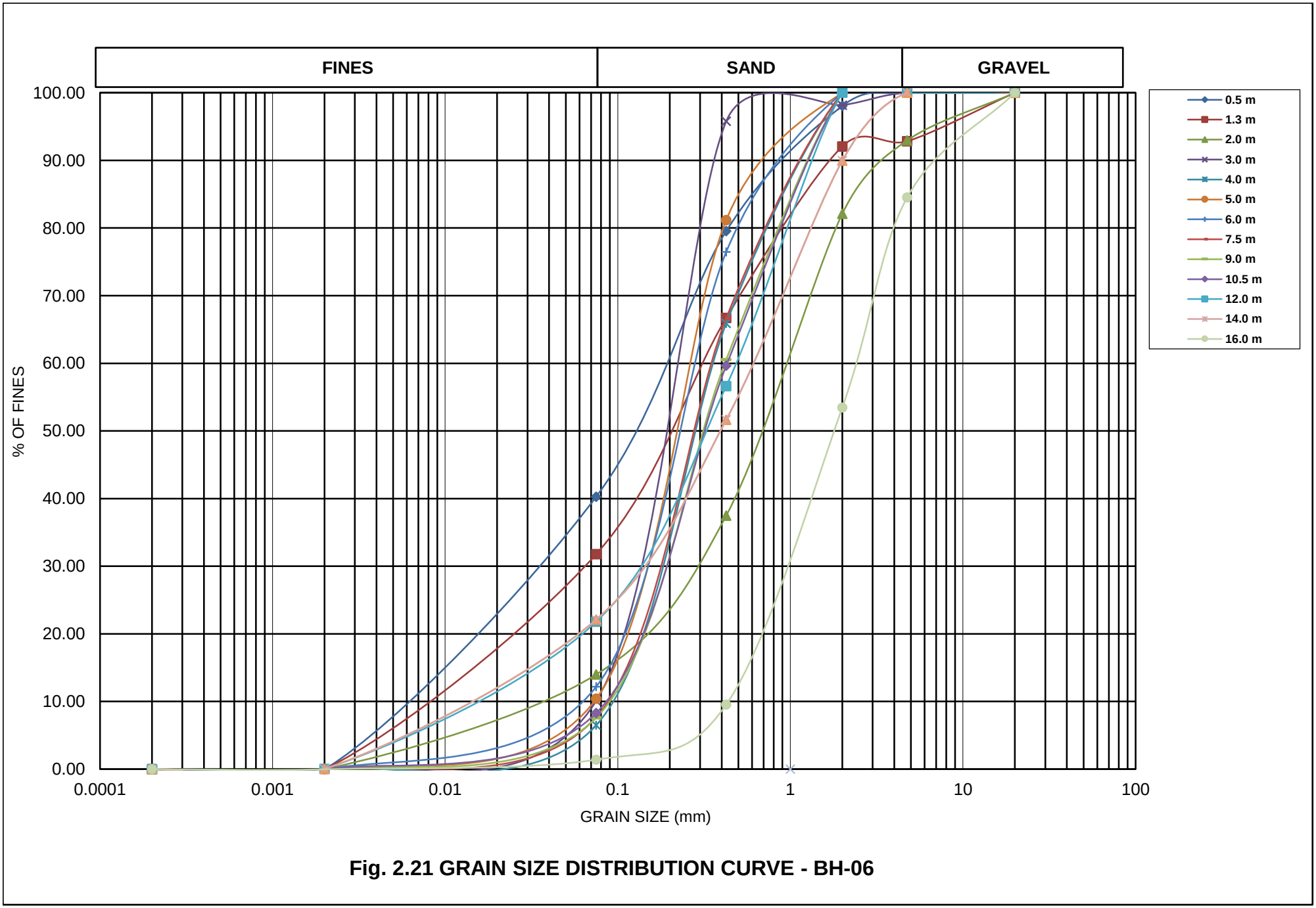


Fig. 2.21 GRAIN SIZE DISTRIBUTION CURVE - BH-06



Fig. 2.22 GRAIN SIZE DISTRIBUTION CURVE - BH-07

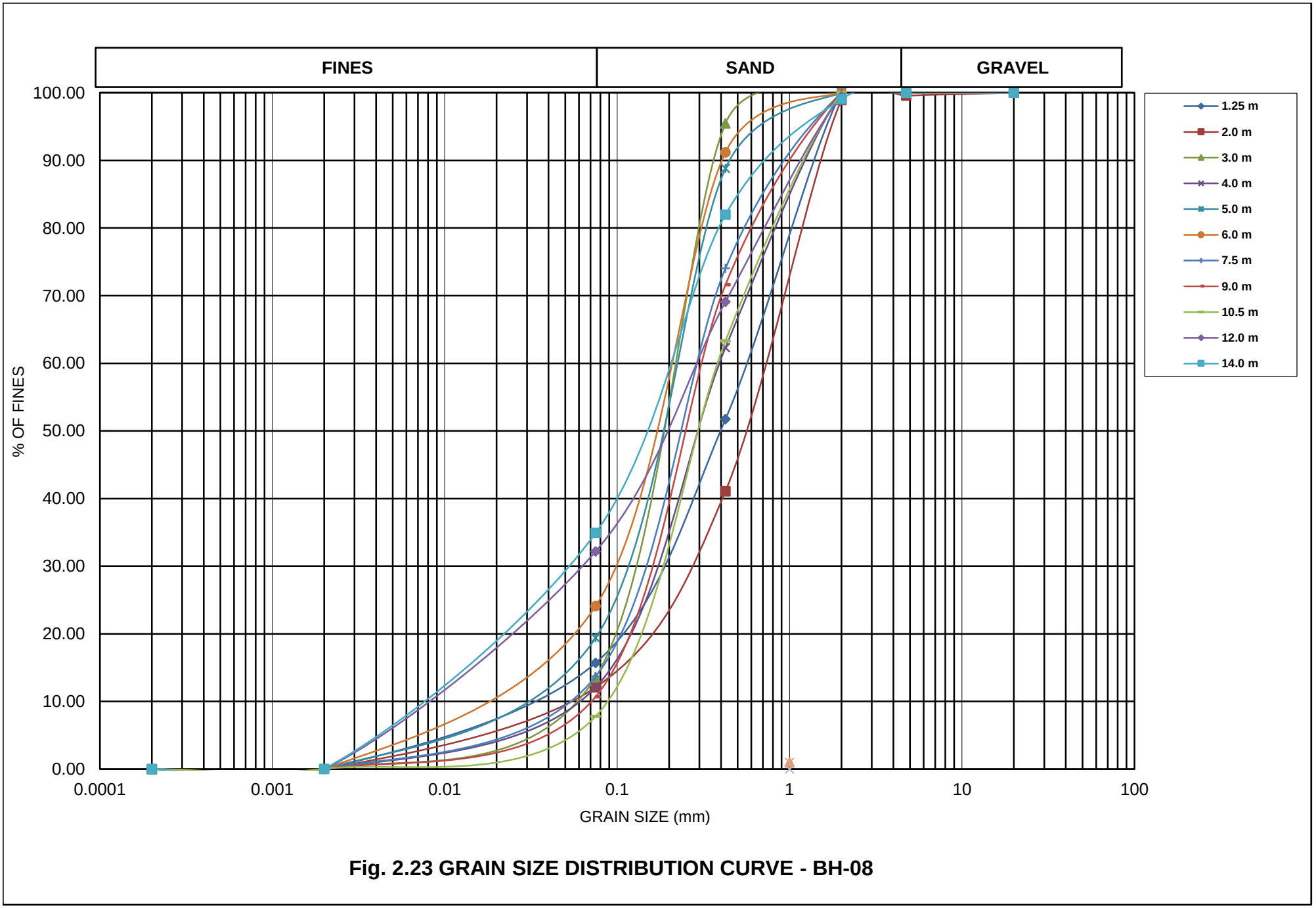


Fig. 2.23 GRAIN SIZE DISTRIBUTION CURVE - BH-08

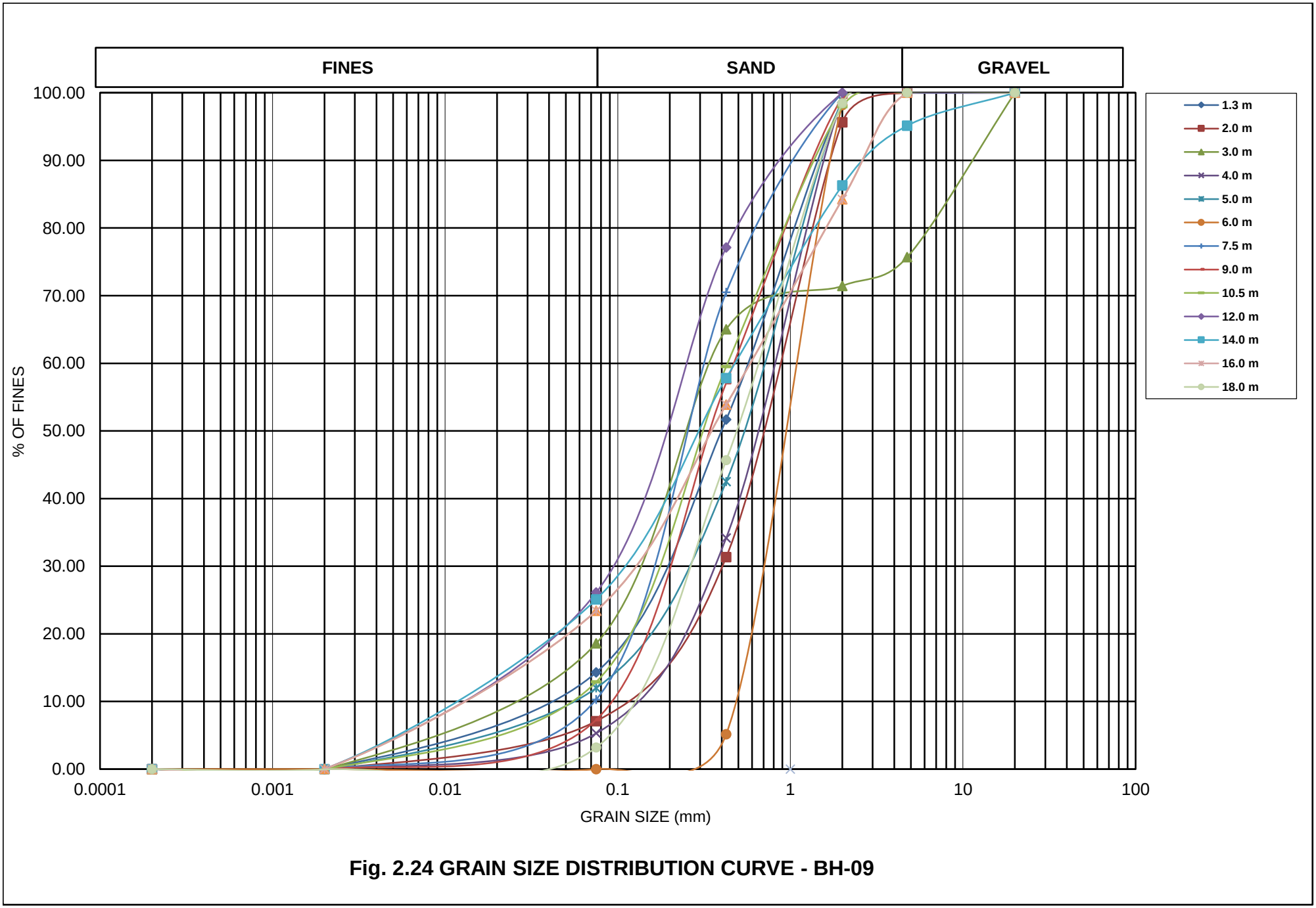


Fig. 2.24 GRAIN SIZE DISTRIBUTION CURVE - BH-09

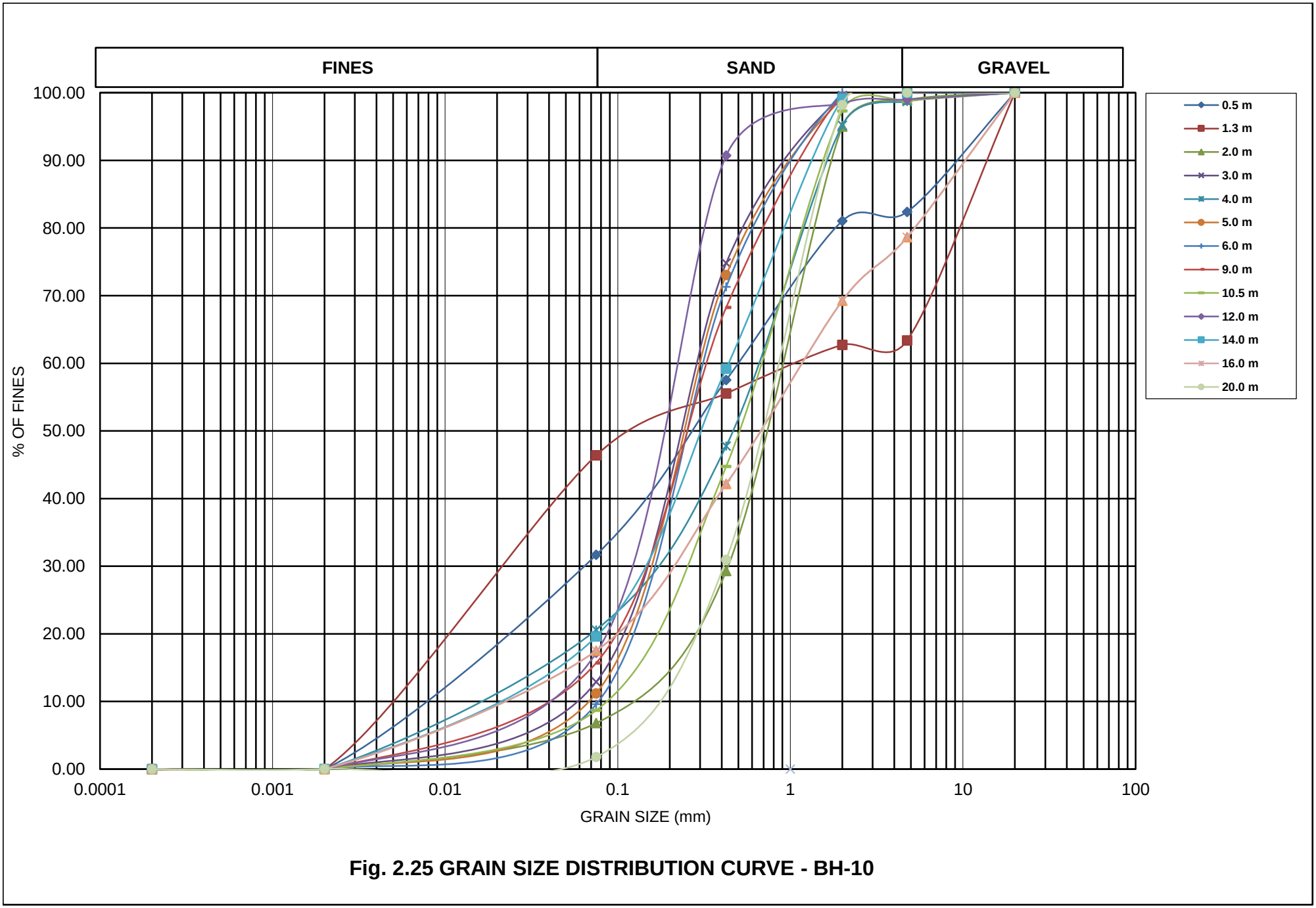


Fig. 2.25 GRAIN SIZE DISTRIBUTION CURVE - BH-10

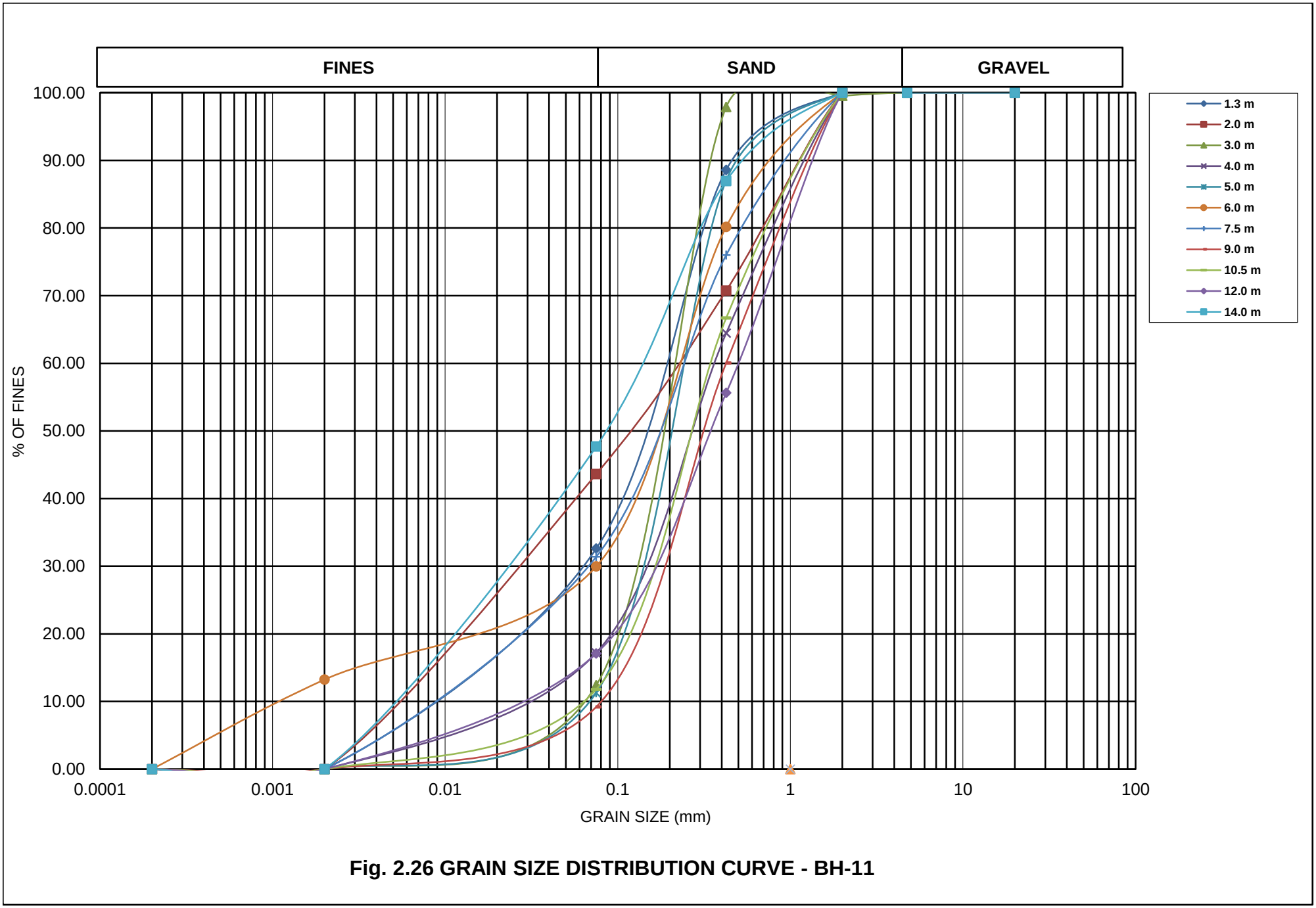


Fig. 2.26 GRAIN SIZE DISTRIBUTION CURVE - BH-11

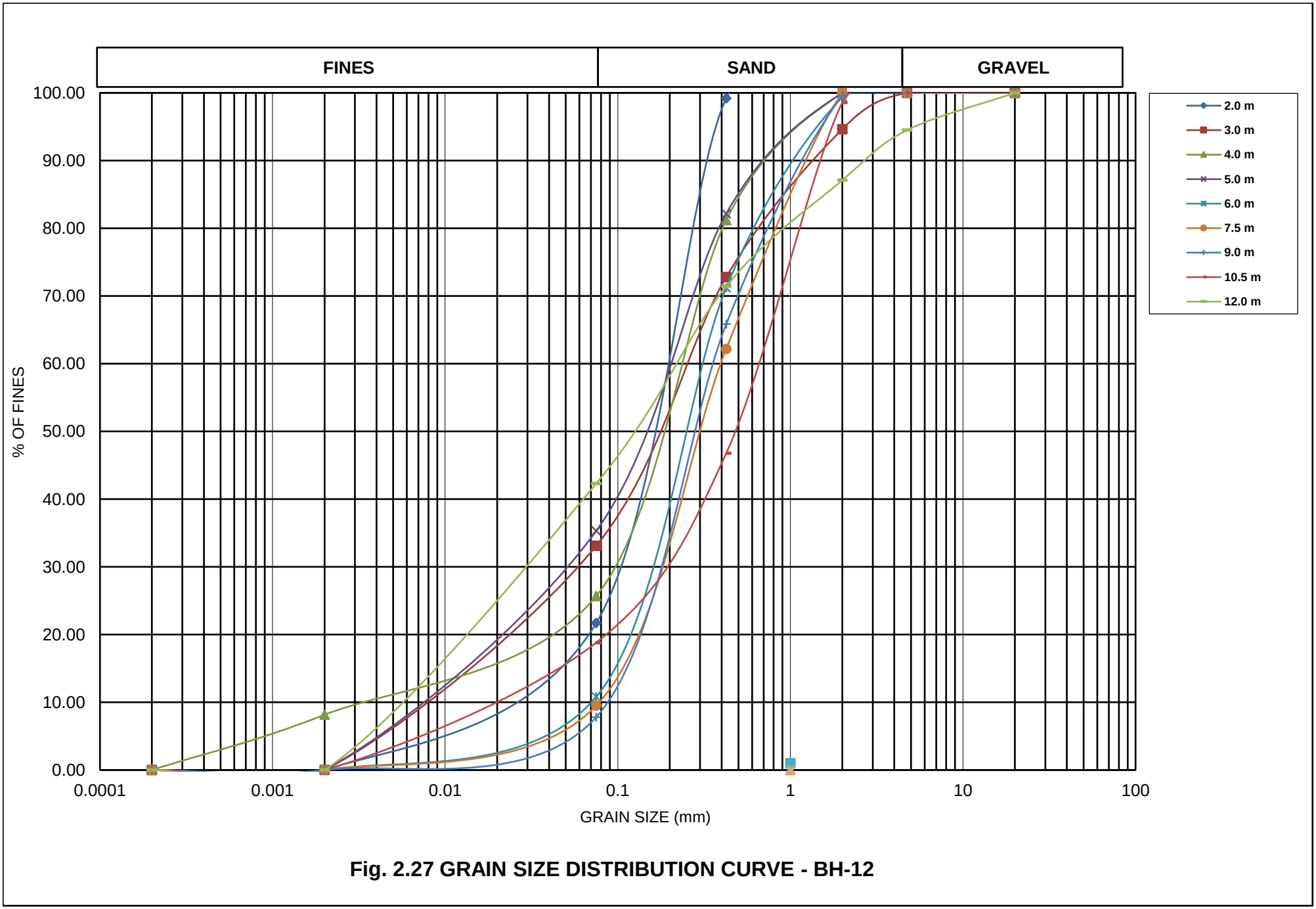


Fig. 2.27 GRAIN SIZE DISTRIBUTION CURVE - BH-12

HYDROMETER ANALYSIS CURVE

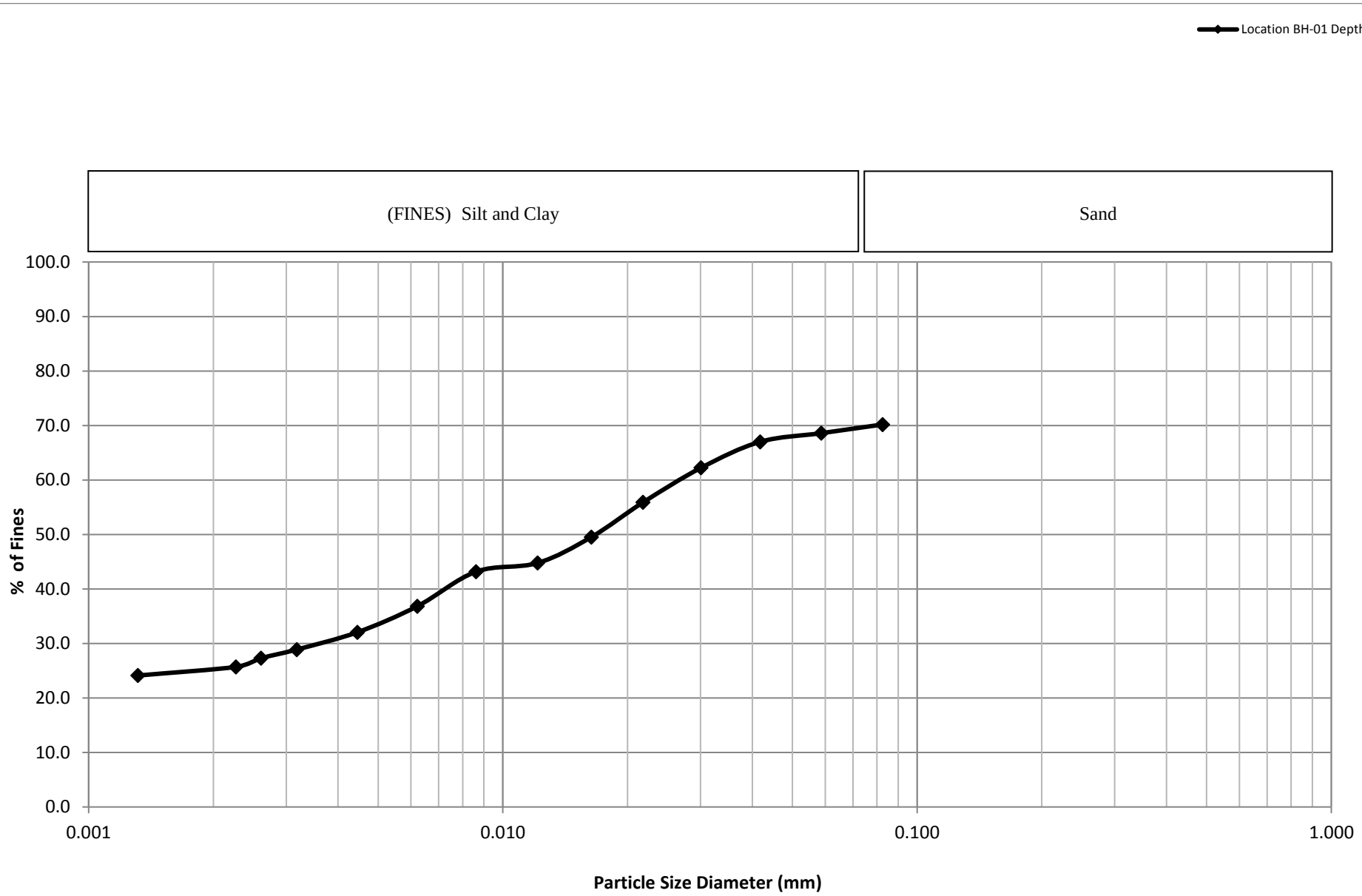


Fig 2.28 Hydrometer Analysis Master Curve

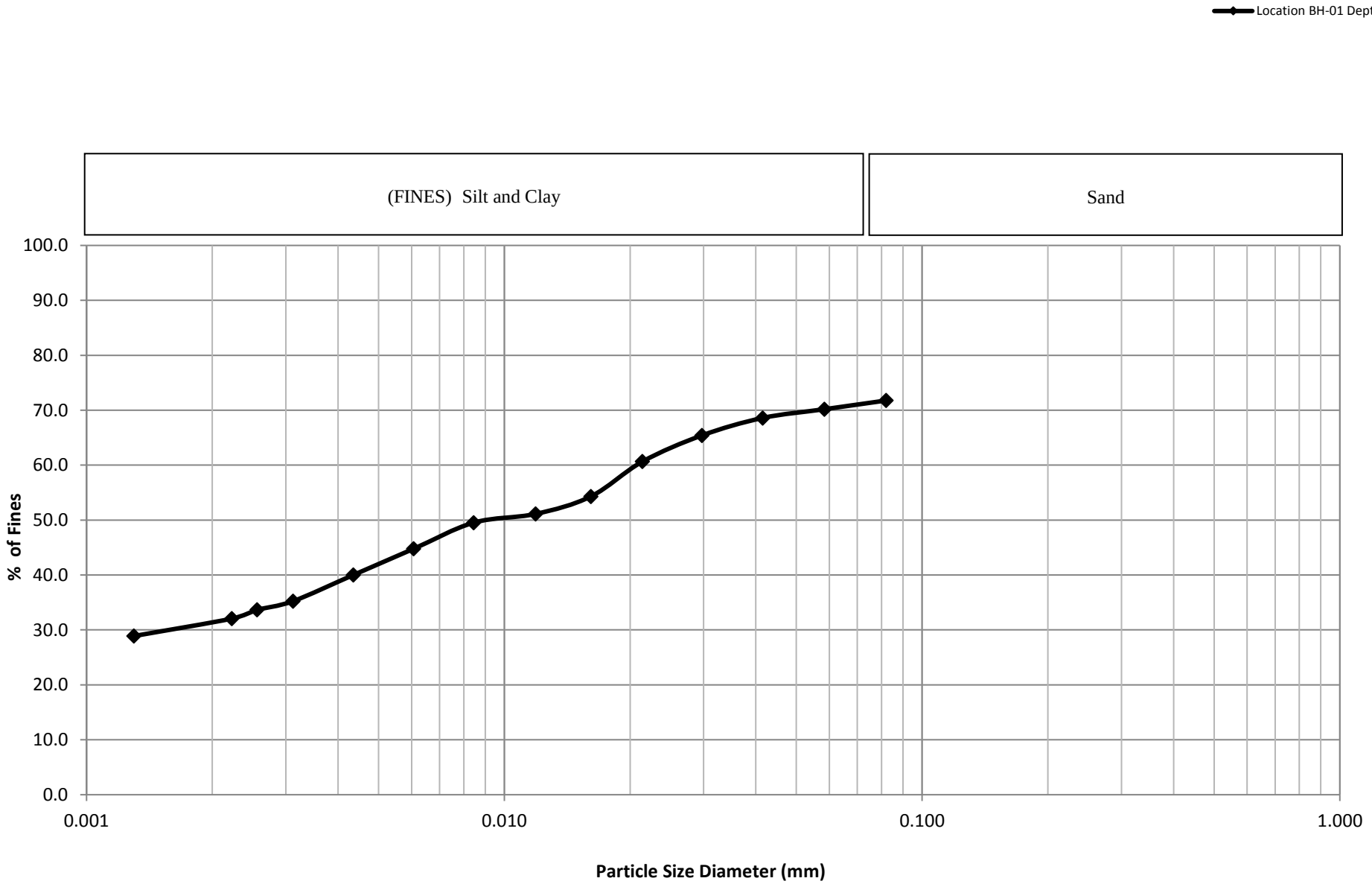


Fig 2.29 Hydrometer Analysis Master Curve

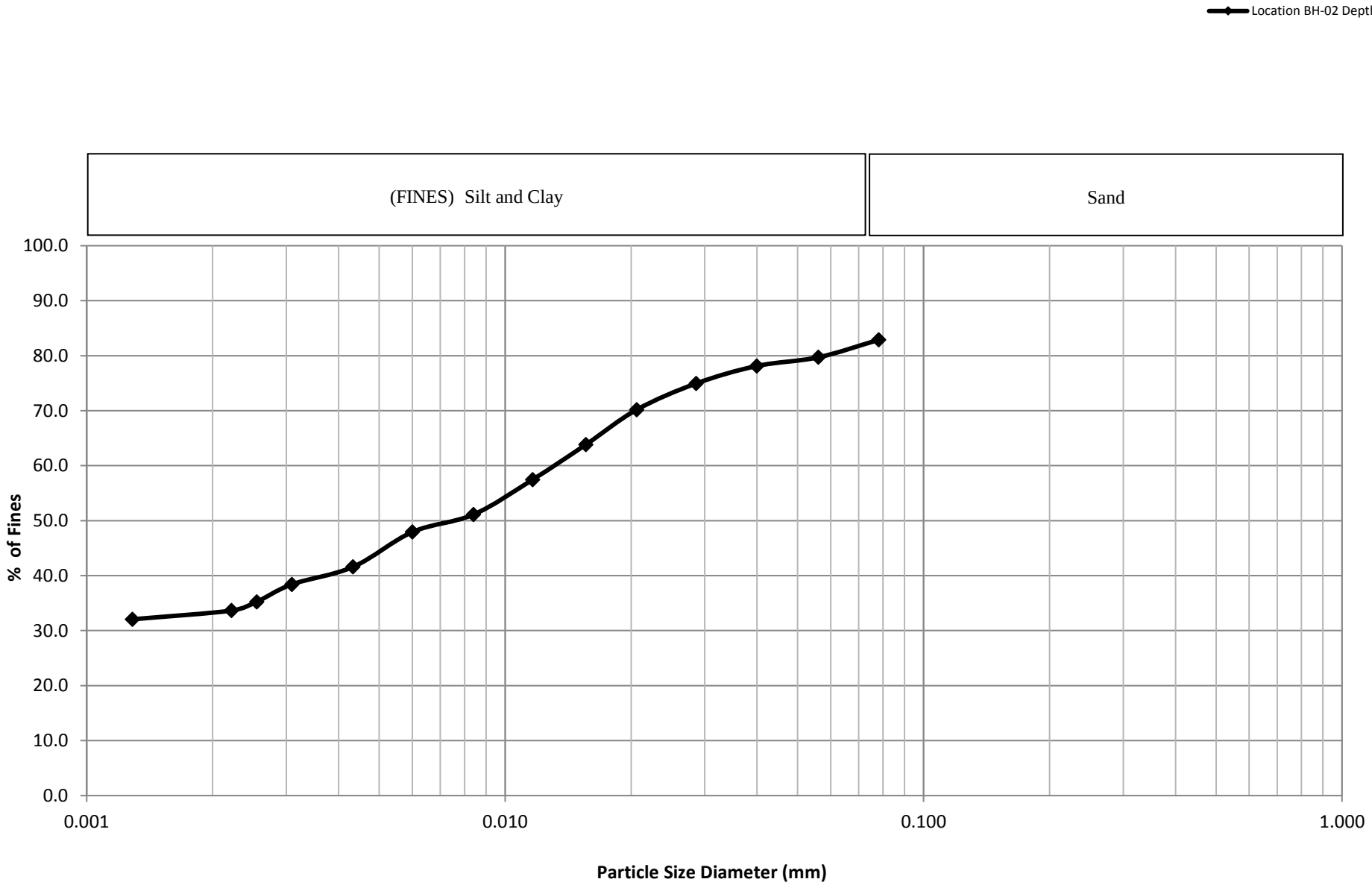


Fig 2.30 Hydrometer Analysis Master Curve

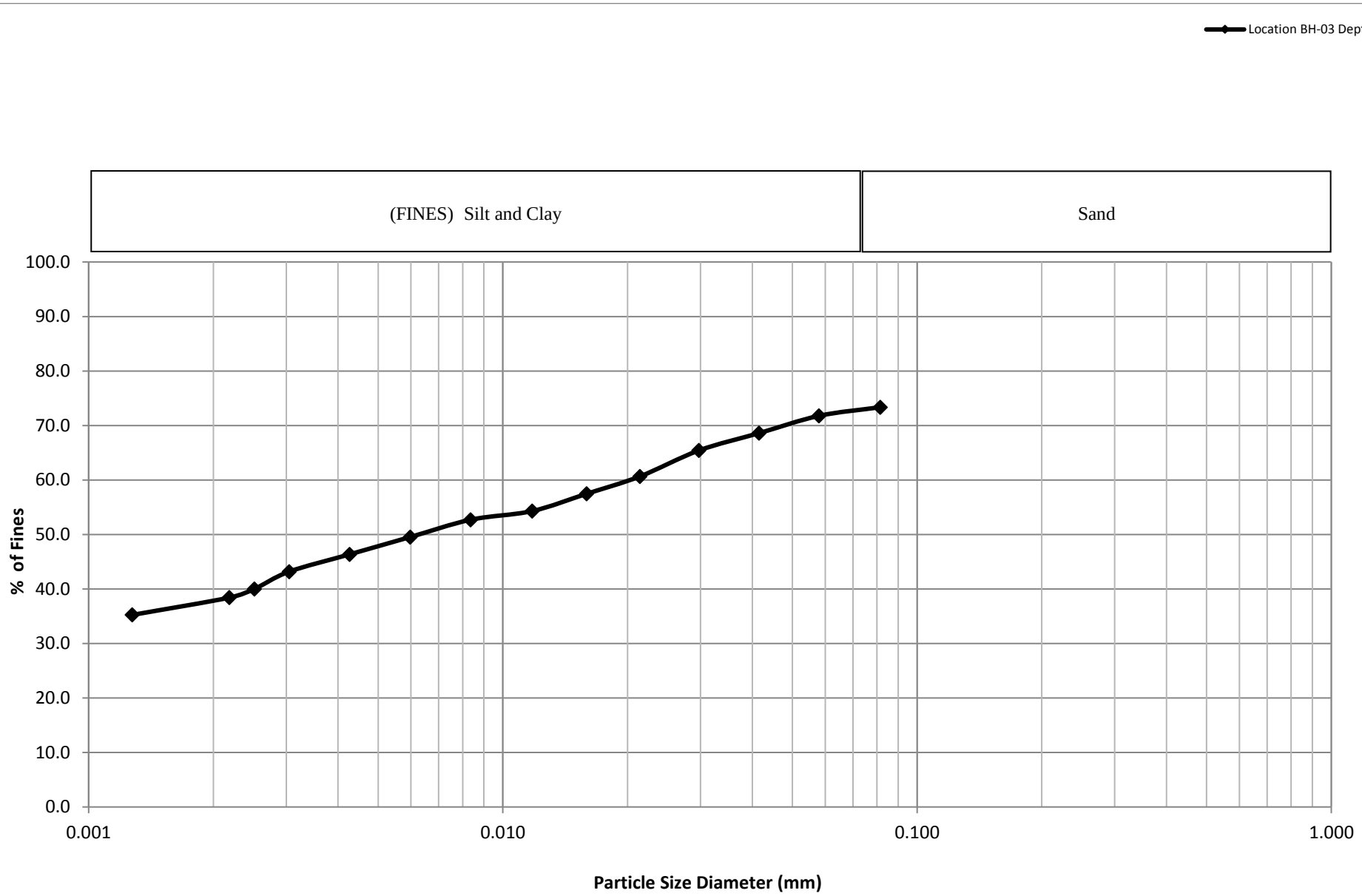


Fig 2.31 Hydrometer Analysis Master Curve

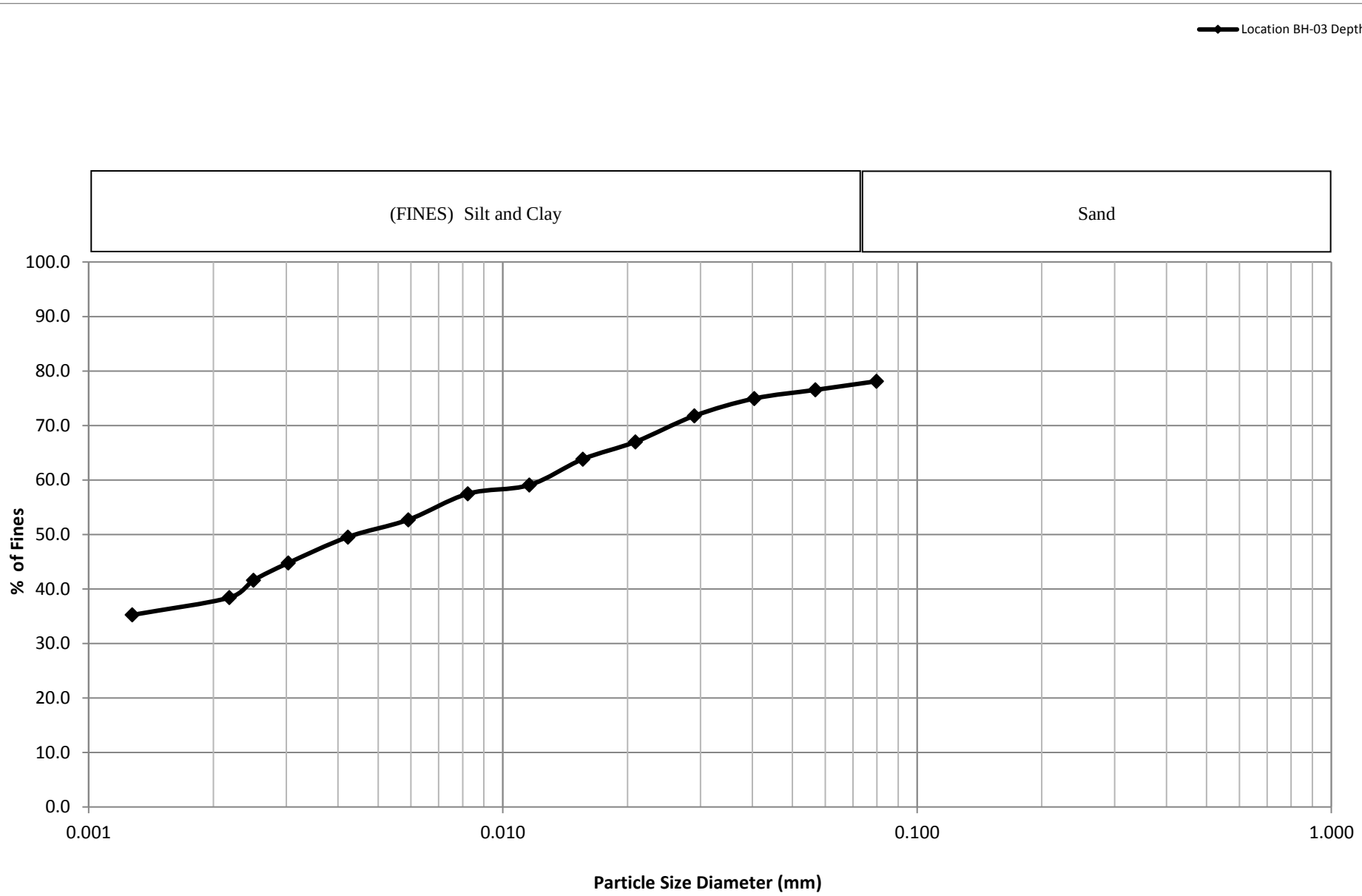


Fig 2.32 Hydrometer Analysis Master Curve

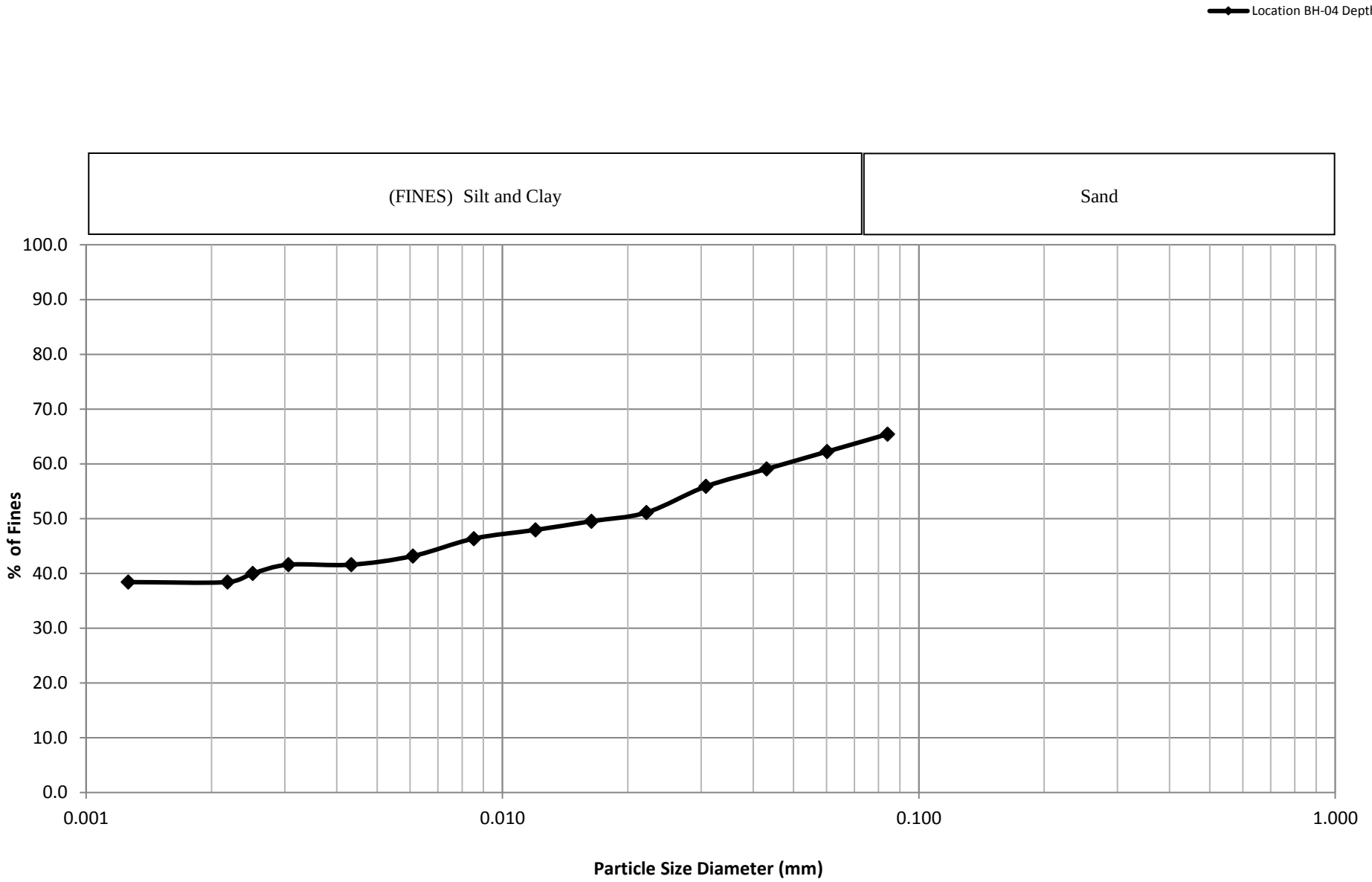


Fig 2.33 Hydrometer Analysis Master Curve

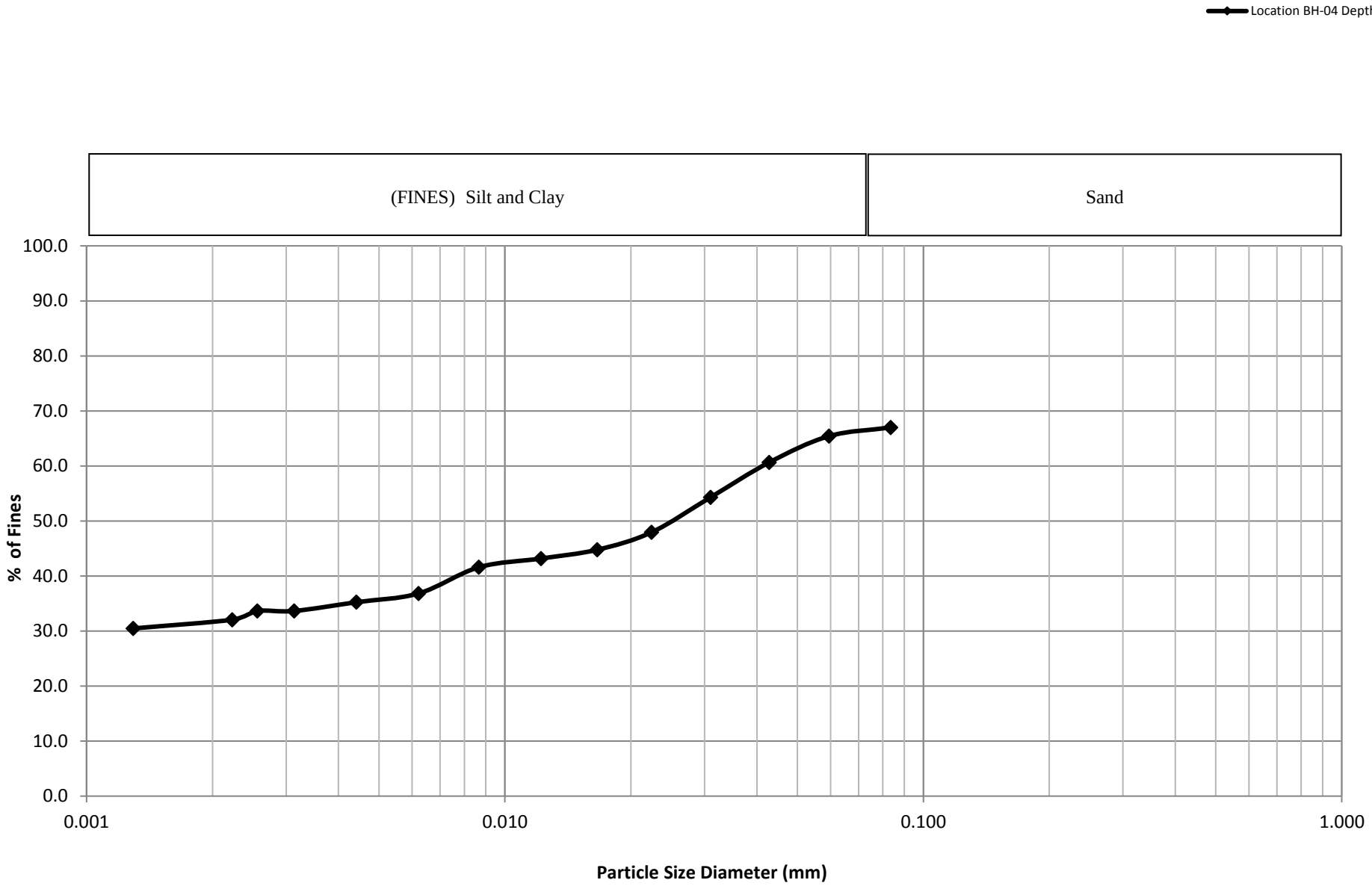


Fig 2.34 Hydrometer Analysis Master Curve

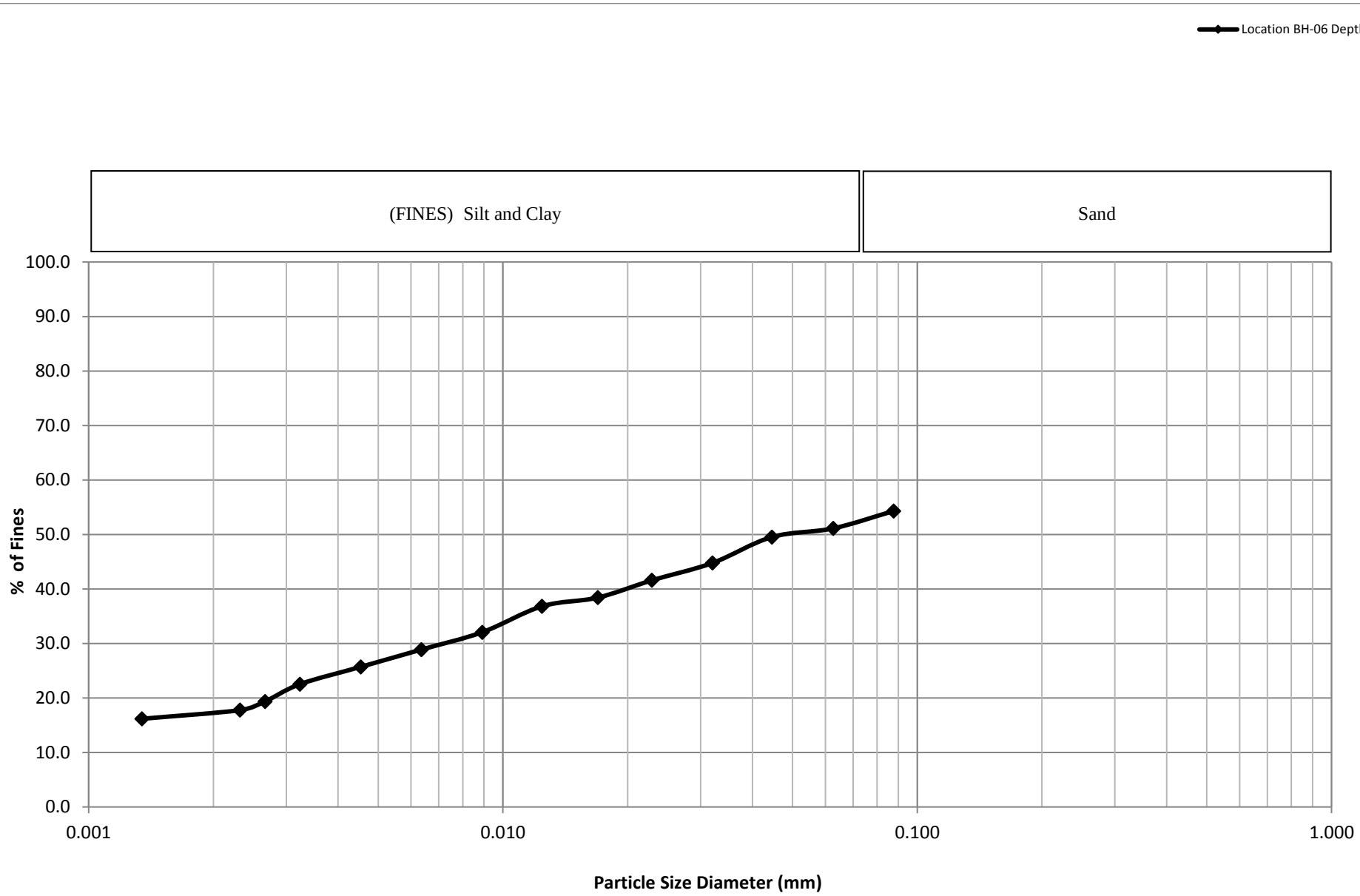


Fig 2.35 Hydrometer Analysis Master Curve

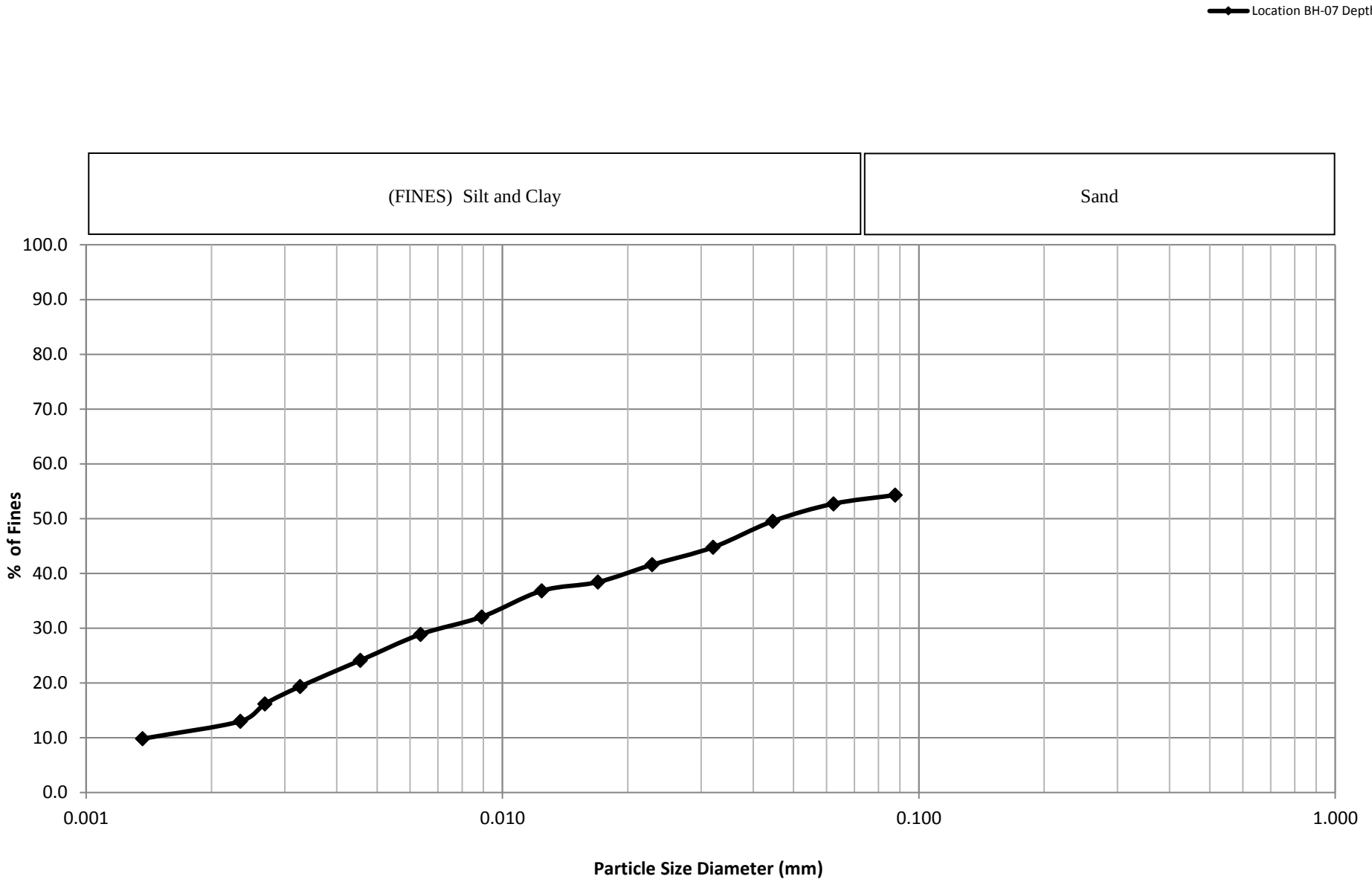


Fig 2.36 Hydrometer Analysis Master Curve

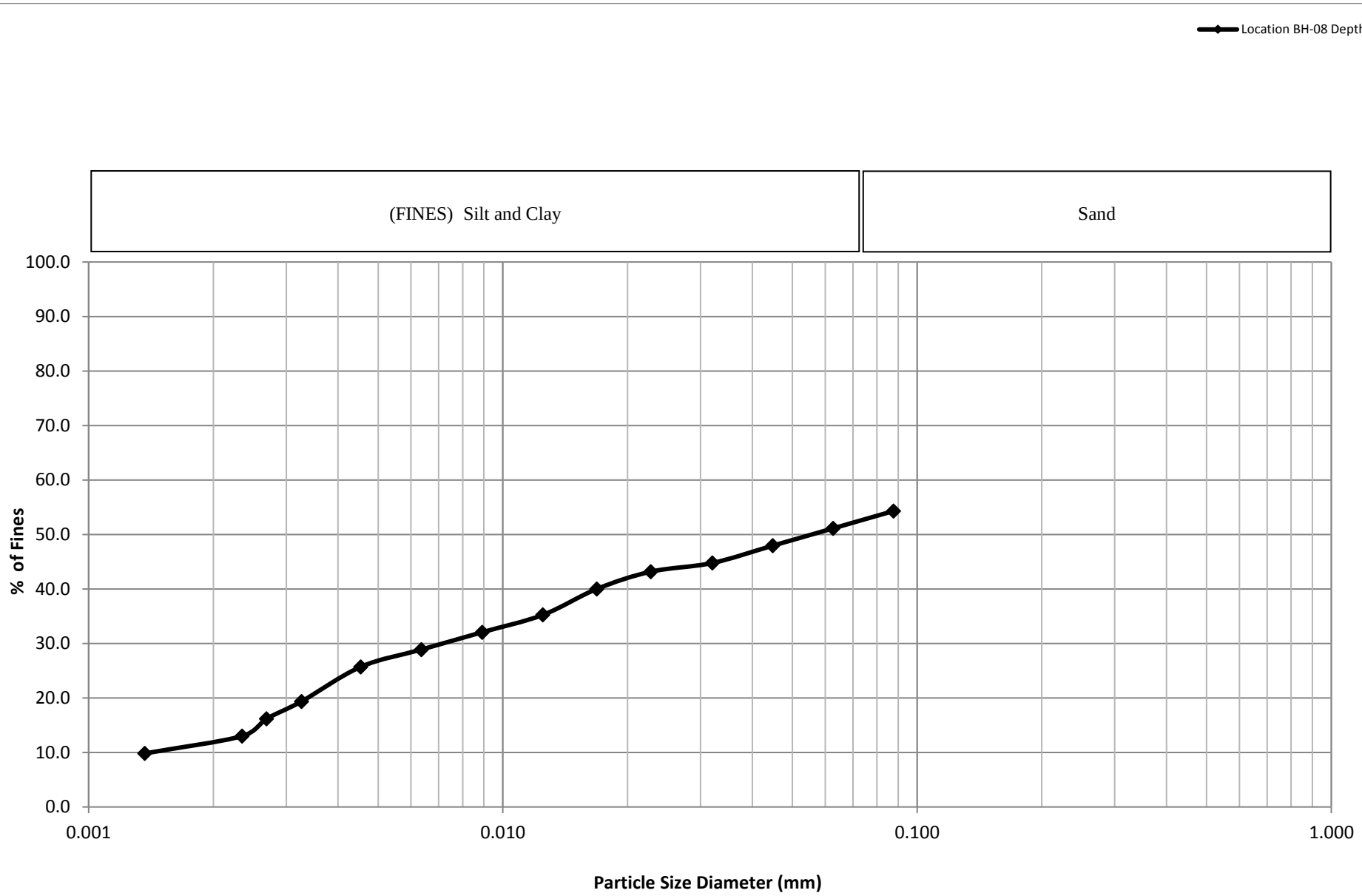


Fig 2.37 Hydrometer Analysis Master Curve

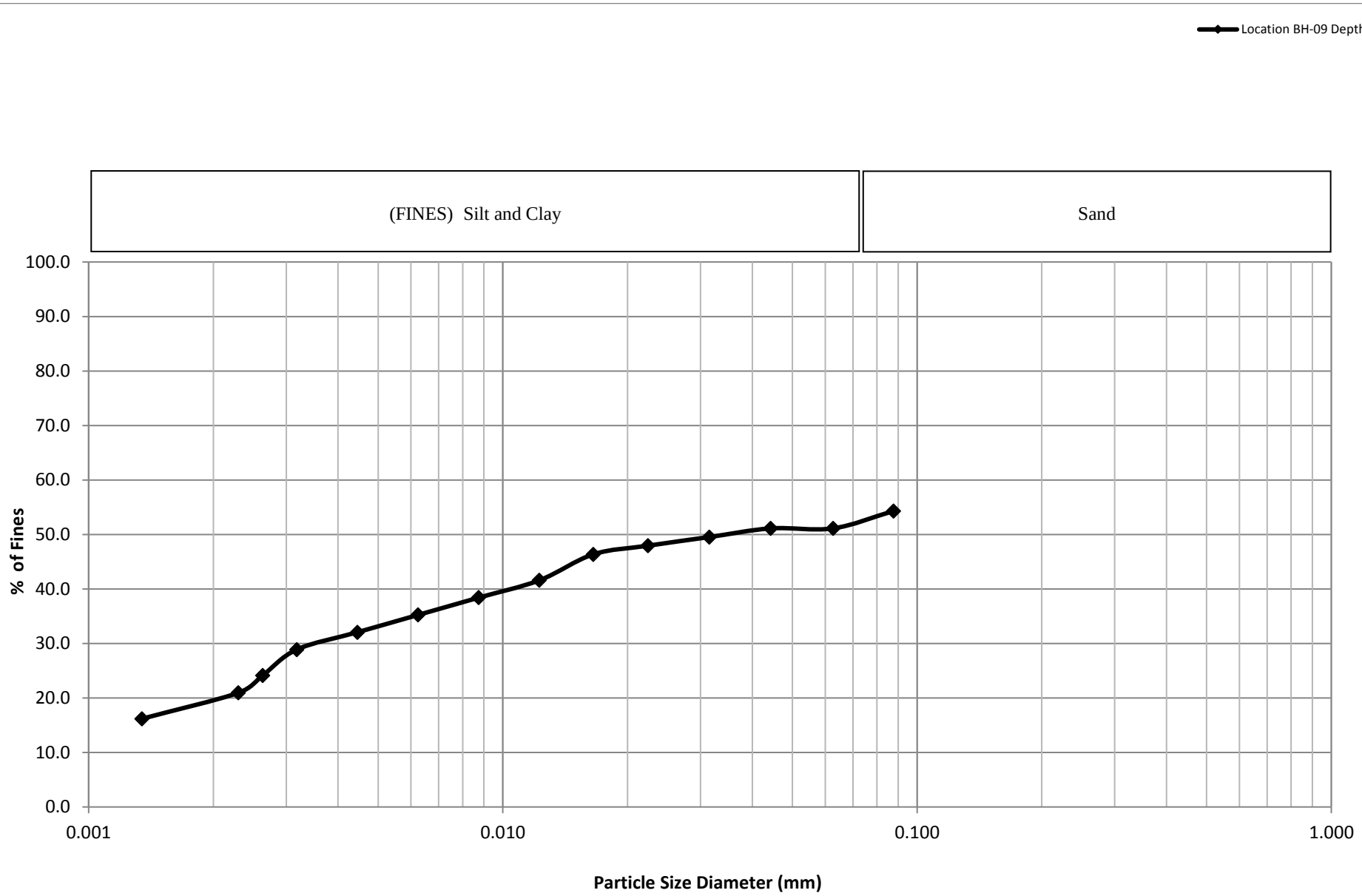


Fig 2.38 Hydrometer Analysis Master Curve

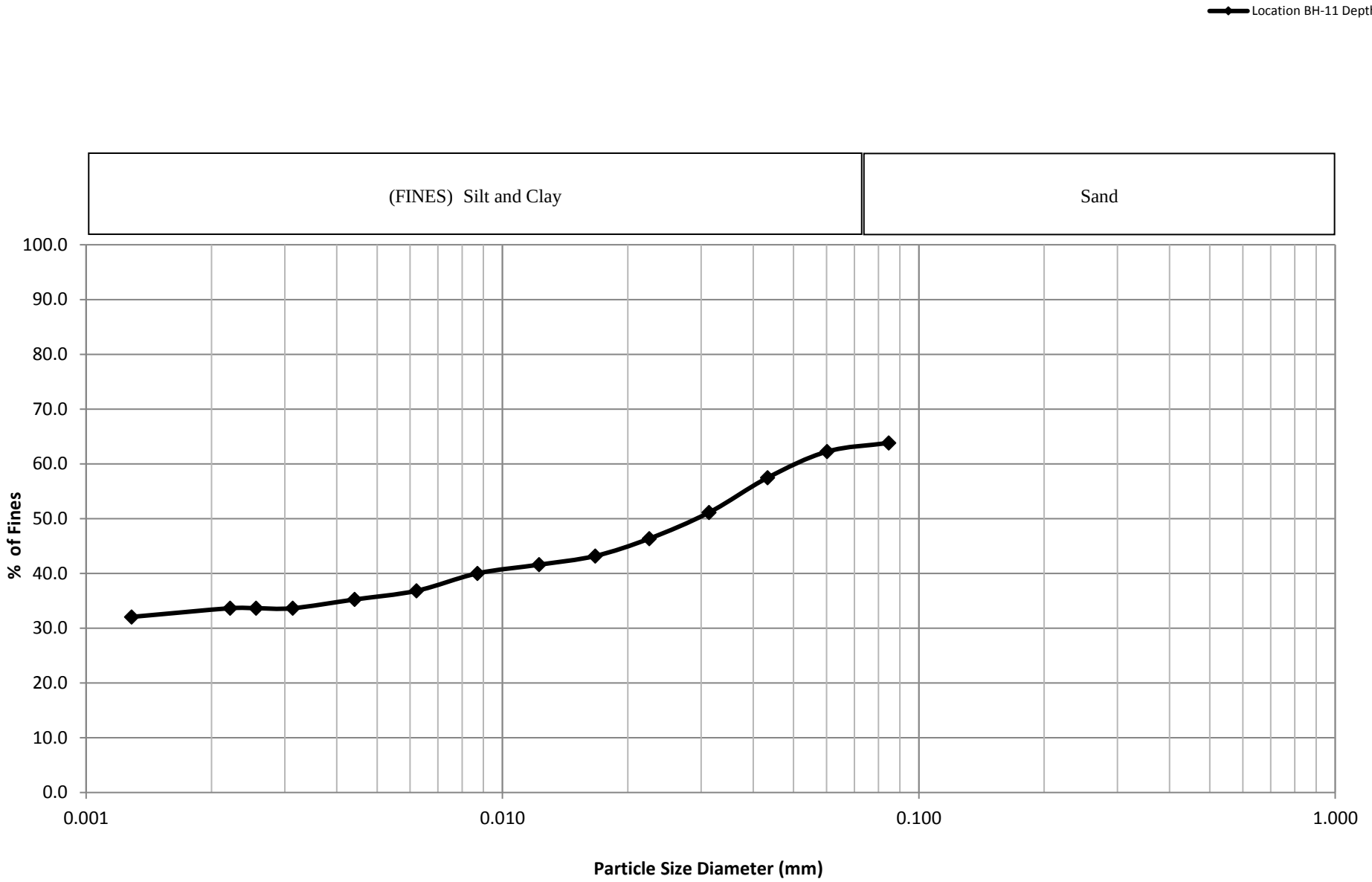


Fig 2.39 Hydrometer Analysis Master Curve

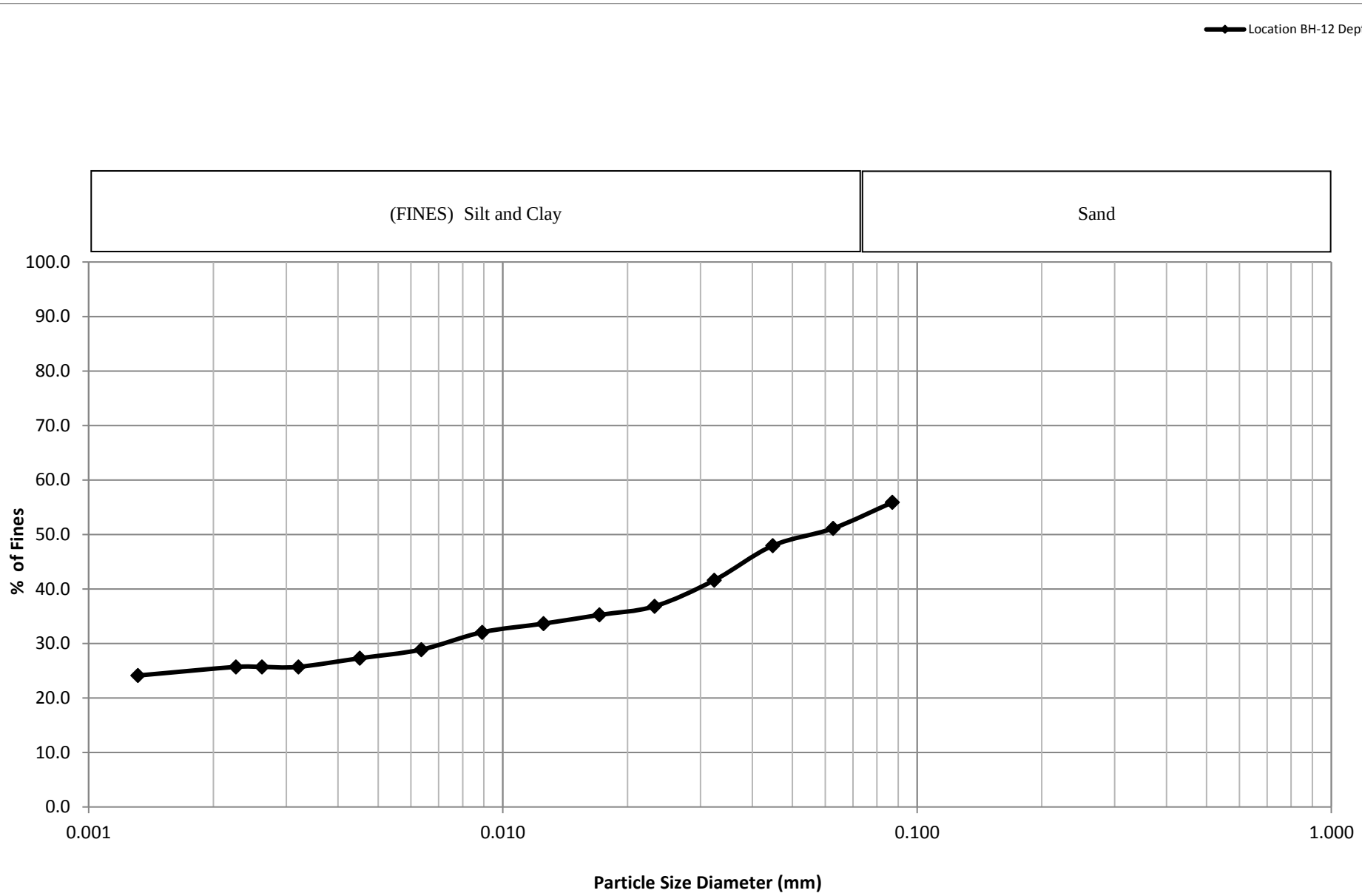


Fig 2.40 Hydrometer Analysis Master Curve

LABORATORY TEST RESULTS

GEOMARINE
THE SPIRIT OF ENGINEERING
Phone No.: 044-24481485, 044-24480305

LABORATORY TEST REPORT

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

Name & Address of the Customer	:	**M/s BRIGADE ENTERPRISES LTD.,**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	01/12/2022 to 08/12/2022
Source of Sample	:	Customer Supplied- Borehole No. BH-01	**Sample Identification Number**	:	SS/GMC/112022/566/BH01
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2473/BH-01
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	9/12/2022
Sample Receipt Date	:	30/11/2022	**Test Report Pages**	:	One Page

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

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Coarse Grained (CG)													
			Moisture Content (%) **AS PER IS 2720 (P-II) - 1973, RA-2015**	LIQUID LIMIT (%) **AS PER IS 2720 (P-V) - 1985, RA-2015**	PLASTIC LIMIT (%) **AS PER IS 2720 (P-V) - 1985, RA-2015**	**Plasticity Index (I_P= LL-PL)**	**Consistency Index (Ic=LL-NMC/I_p)**	SHRINKAGE LIMIT (%) **AS PER IS 2720 (P-VI) - 1972, RA-2011**	FREE SWELL INDEX (%) **AS PER IS 2720 (P-XL) - 1977, RA-2011**	**Consistancy**	**Position With Respect to A-Aline**	**IS:Notation**	SPECIFIC GRAVITY **AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010**	GRAIN SIZE ANALYSIS **AS PER IS 2720 (P-IV) - 1985, RA-2015**						D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$	**Relative Density**	**IS-Notation**	
													Gravel (%)	**Coarse (%)**	**Medium (%)**	**Fine (%)**	**Silt (%)**	**Clay (%)**							**Gravel**	**Sand**
1.25	18	SS	20.2	46.9	20.6	26.2	1.0	10.9	23.1	V.Stiff	Above	CI	-	0.0	0.2	5.8	12.9	60.1	21.0	-	-	-	-	-	FG>50%	FG>50%	FG>50%
2.0	30	SS	22.1	30.1	16.7	13.4	0.6	-	16.7	CG>50%	Above	-	-	0.1	0.8	17.3	35.9	45.9		-	-	-	-	-	M.Dense	<50%	SC
3.0	28	SS	20.0	-	-	-	-	-	-	CG>50%	-	-	2.60	0.0	0.2	11.5	52.2	36.2		-	-	-	-	-	M.Dense	<50%	SM
4.0	20	SS	18.4	-	-	-	-	-	-	CG>50%	-	-	-	2.1	2.6	56.5	28.6	10.3		-	-	-	-	-	M.Dense	<50%	SP-SM
5.0	32	SS	22.5	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	27.3	65.4	7.3		-	-	-	-	-	Dense	<50%	SP-SM
6.0	6	SS	32.2	46.4	22.5	23.9	0.6	12.1	6.3	M.Stiff	Above	CI	-	0.0	0.0	20.9	27.7	35.0	16.5	-	-	-	-	-	FG>50%	FG>50%	FG>50%
7.5	28	SS	19.4	-	-	-	-	-	-	CG>50%	-	-	-	0.0	3.4	30.9	53.4	12.3		-	-	-	-	-	M.Dense	<50%	SM
9.0	25	SS	19.2	-	-	-	-	-	-	CG>50%	-	-	2.62	0.0	0.2	31.3	59.0	9.6		-	-	-	-	-	M.Dense	<50%	SP-SM
10.5	32	SS	17.3	-	-	-	-	-	-	CG>50%	-	-	-	1.8	0.4	41.6	46.1	10.1		-	-	-	-	-	Dense	<50%	SP-SM
12.0	54	SS	18.6	-	-	-	-	-	-	CG>50%	-	-	-	4.0	3.0	40.0	44.2	8.8		-	-	-	-	-	V.Dense	<50%	SP-SM
14.0	86	SS	14.0	-	-	-	-	-	-	CG>50%	-	-	-	0.4	0.2	41.9	41.3	16.3		-	-	-	-	-	V.Dense	<50%	SM
16.0	48	SS	16.2	-	-	-	-	-	-	CG>50%	-	-	-	3.3	3.9	33.1	33.5	26.3		-	-	-	-	-	Dense	<50%	SM
18.0	>100	SS	14.4	-	-	-	-	-	-	CG>50%	-	-	-	18.3	13.6	36.6	21.9	9.7		-	-	-	-	-	V.Dense	<50%	SP-SM
19.0	>100	WS	No Penetration of SPT, Wash Sample Collected for Classification											0.2	12.0	71.6	15.6	0.5		-	-	-	-	-	V.Dense	-	

**** END OF REPORT****

Terms and Conditions

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

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

(3) Any correction in this reports invalidates the reports

Authorised Signatory

A. VINOTH

(Technical Manager)

GEOMARINE
THE SPIRIT OF ENGINEERING
Phone No.: 044-24481485, 044-24480305

LABORATORY TEST REPORT

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

Name & Address of the Customer	:	**M/s BRIGADE ENTERPRISES LTD.,**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	07/12/2022 to 09/12/2022
Source of Sample	:	Customer Supplied- Borehole No. BH-02	**Sample Identification Number**	:	SS/GMC/112022/566/BH02
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2473/BH-02
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	9/12/2022
Sample Receipt Date	:	06/12/2022	**Test Report Pages**	:	One Page

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

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Coarse Grained (CG)													
			Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_P= LL-PL)	Consistency Index (Ic=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistancy	Position With Respect to A-Aline	IS:Notation	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$	Relative Density	IS-Notation	
														Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)							Gravel	Sand
1.25	22	SS	13.0	Clay Binder						CG>50%	-	-	-	0.0	0.4	17.7	39.9	42.0		-	-	-	-	-	M.Dense	<50%	-
2.0	34	SS	7.4	-	-	-	-	-	-	CG>50%	-	-	-	0.6	0.8	33.4	50.5	14.8		-	-	-	-	-	Dense	<50%	SM
3.0	40	SS	11.0	-	-	-	-	-	-	CG>50%	-	-	-	0.0	3.2	54.9	32.2	9.7		-	-	-	-	-	Dense	<50%	SP-SM
4.0	30	SS	18.5	-	-	-	-	-	-	CG>50%	-	-	2.54	0.0	0.6	40.0	48.6	10.8		-	-	-	-	-	M.Dense	<50%	SP-SM
5.0	29	SS	20.1	-	-	-	-	-	-	CG>50%	-	-	-	0.0	1.4	21.5	70.0	7.1		-	-	-	-	-	M.Dense	<50%	SP-SM
6.0	9	SS	Sample Failed																							
7.5	4	SS	35.1	36.7	18.3	18.4	0.1	14.2	25.0	CG>50%	Above	-	-	0.0	0.0	8.9	50.8	28.5	11.8	-	-	-	-	-	V.Loose	<50%	SC
9.0	21	SS	20.4	-	-	-	-	-	-	CG>50%	-	-	2.58	1.4	0.3	18.3	68.6	11.5		-	-	-	-	-	M.Dense	<50%	SP-SM
10.5	36	SS	21.6	-	-	-	-	-	-	CG>50%	-	-	-	0.8	0.6	26.2	64.0	8.5		-	-	-	-	-	Dense	<50%	SP-SM
12.0	47	SS	15.7	-	-	-	-	-	-	CG>50%	-	-	-	2.5	2.9	31.6	54.5	8.5		-	-	-	-	-	Dense	<50%	SP-SM
14.0	37	SS	13.9	-	-	-	-	-	-	CG>50%	-	-	-	0.0	1.3	50.2	30.3	18.2		-	-	-	-	-	Dense	<50%	SM
16.0	47	SS	14.6	Clay Binder					18.2	CG>50%	-	-	-	32.9	6.0	21.5	20.8	18.8		-	-	-	-	-	Dense	<50%	SM
18.0	>100	WS	No SPT Penetration & No Core Recovery/ Wash Sample Collected for Physical Observation & Laboratory Test											8.9	26.0	46.7	18.0	0.3		-	-	-	-	-	V.Dense	-	

**** END OF REPORT****

Terms and Conditions

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

(3) Any correction in this reports invalidates the reports

Authorised Signatory

A. VINOTH
(Technical Manager)

GEOMARINE
THE SPIRIT OF ENGINEERING
Phone No.: 044-24481485, 044-24480305

LABORATORY TEST REPORT

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

Name & Address of the Customer	:	**M/s BRIGADE ENTERPRISES LTD.,**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	06/04/2023 to 10/04/2023
Source of Sample	:	Customer Supplied- Borehole No. BH-03	**Sample Identification Number**	:	SS/GMC/112022/566/BH03
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2473/BH-03
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	10/04/2023
Sample Receipt Date	:	05/04/2023	**Test Report Pages**	:	One Page

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

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Specific Gravity AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	Coarse Grained (CG)													
														Grain Size Analysis AS PER IS 2720 (P-IV) - 1985, RA-2015											Relative Density	IS-Notation	
			Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	Liquid Limit (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plastic Limit (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_P= LL-PL)	Consistency Index (Ic=LL-NMC/I_p)	Shrinkage Limit (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	Free Swell Index (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistancy	Position With Respect to A-Aline	IS:Notation		Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)	D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$		Gravel	Sand
1.25	30	SS	14.1	45.3	21.4	23.9	1.3	14.3	23.1	V.Stiff	Above	CI	-	0.0	0.0	4.5	21.9	73.6		-	-	-	-	-	FG>50%	FG>50%	FG>50%
2.0	32	SS	16.7	-	-	-	-	-	-	CG>50%	-	-	-	1.0	0.2	3.0	54.6	41.2		-	-	-	-	-	Dense	<50%	SM
3.0	29	SS	11.4	-	-	-	-	-	-	CG>50%	-	-	2.57	0.0	0.5	24.8	62.3	12.4		-	-	-	-	-	M.Dense	<50%	SM
4.0	30	SS	17.5	-	-	-	-	-	-	CG>50%	-	-	-	0.5	0.7	7.5	78.0	13.3		-	-	-	-	-	M.Dense	<50%	SM
5.0	33	SS	18.7	-	-	-	-	-	-	CG>50%	-	-	-	2.6	2.4	51.9	36.0	7.1		-	-	-	-	-	Dense	<50%	SP-SM
6.0	2	SS	37.0	33.8	16.1	17.7	-0.2	-	18.2	CG>50%	Above	-	-	0.0	0.0	9.5	46.4	27.2	17.0	-	-	-	-	-	V.Loose	<50%	SC
7.0	-	*UDS	UDS Failed																								
7.5	6	SS	29.0	55.1	19.2	35.9	0.7	12.5	50.0	M.Stiff	Above	CH	-	Lenses of Sand				61.6	38.4	-	-	-	-	-	FG>50%	FG>50%	FG>50%
9.0	32	SS	15.6	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.3	39.6	48.0	12.0		-	-	-	-	-	Dense	<50%	SP-SM
10.5	61	SS	15.3	-	-	-	-	-	-	CG>50%	-	-	2.69	0.6	0.5	46.6	44.6	7.6		-	-	-	-	-	V.Dense	<50%	SP-SM
12.0	55	SS	15.7	-	-	-	-	-	-	CG>50%	-	-	-	2.9	1.7	67.8	21.8	5.7		-	-	-	-	-	V.Dense	<50%	SP-SM
14.0	>100	SS	11.7	-	-	-	-	-	-	CG>50%	-	-	-	0.9	2.1	53.4	25.3	18.4		-	-	-	-	-	V.Dense	<50%	SM
16.0	>100	WS	No SPT Penetration & No Core Recovery/ Wash Sample Collected for Physical Observation & Laboratory Test											1.4	0.2	54.0	38.0	6.3		-	-	-	-	-	V.Dense	-	
18.0	>100	WS												0.8	0.5	44.5	41.4	12.8		-	-	-	-	-	V.Dense		

**** END OF REPORT****

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Authorised Signatory

A. VINOTH
(Technical Manager)

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

LABORATORY TEST REPORT

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

Name & Address of the Customer	:	**M/s BRIGADE ENTERPRISES LTD.,**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	03/04/2023 to 06/04/2023
Source of Sample	:	Customer Supplied- Borehole No. BH-04	**Sample Identification Number**	:	SS/GMC/112022/566/BH04
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2473/BH-04
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	10/04/2023
Sample Receipt Date	:	31/03/2023	**Test Report Pages**	:	One Page

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

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Coarse Grained (CG)													
			Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_P= LL-PL)	Consistency Index (Ic=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistancy	Position With Respect to A-Aline	IS:Notation	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$	Relative Density	IS-Notation	
													Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)							Gravel	Sand
1.25	28	SS	11.9	-	-	-	-	-	-	CG>50%	-	-	-	0.0	1.8	15.0	48.4	34.8		-	-	-	-	-	M.Dense	<50%	SM
2.0	30	SS	11.2	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	19.3	40.5	40.2		-	-	-	-	-	M.Dense	<50%	SM
3.0	21	SS	17.0	-	-	-	-	-	-	CG>50%	-	-	-	0.8	1.8	32.0	57.0	8.4		-	-	-	-	-	M.Dense	<50%	SP-SM
4.0	25	SS	18.5	-	-	-	-	-	-	CG>50%	-	-	2.64	0.0	0.7	53.9	35.1	10.4		-	-	-	-	-	M.Dense	<50%	SP-SM
5.0	5	SS	27.2	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	19.3	58.5	22.3		-	-	-	-	-	Loose	<50%	SM
6.0	2	SS	54.7	47.6	21.7	25.9	-0.3	16.7	36.4	CG>50%	Above	-	-	0.0	0.0	12.3	42.5	27.8	17.4	-	-	-	-	-	V.Loose	<50%	SC
7.5	36	SS	21.1	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	38.2	47.1	14.7		-	-	-	-	-	Dense	<50%	SM
9.0	41	SS	16.8	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	47.6	43.7	8.6		-	-	-	-	-	Dense	<50%	SP-SM
10.5	33	SS	18.2	-	-	-	-	-	-	CG>50%	-	-	2.64	0.0	1.3	48.7	42.3	7.7		-	-	-	-	-	Dense	<50%	SP-SM
12.0	23	SS	18.6	38.7	22.4	16.3	1.2	14.2	40.0	V.Stiff	Above	CI	-	0.0	4.9	23.7	18.7	35.8	16.9	-	-	-	-	-	FG>50%	FG>50%	FG>50%
14.0	38	SS	17.2	34.8	16.3	18.4	1.0	14.8	27.3	CG>50%	Above	-	-	0.0	0.0	25.4	36.7	37.8		-	-	-	-	-	Dense	<50%	SC
16.0	>100	SS	19.6	-	-	-	-	-	-	CG>50%	-	-	-	16.0	9.8	30.5	23.6	20.1		-	-	-	-	-	V.Dense	<50%	SM
17.5	>100	WS	No SPT Penetration & No Core Recovery/ Wash Sample Collected for Physical Observation & Laboratory Test											0.0	0.8	62.1	32.5	4.7		-	-	-	-	-	V.Dense	-	
19.0	>100	WS												0.0	0.6	64.0	31.9	3.5		-	-	-	-	-	V.Dense		

**** END OF REPORT****

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Authorised Signatory

A. VINOTH
(Technical Manager)

GEOMARINE
THE SPIRIT OF ENGINEERING
Phone No.: 044-24481485, 044-24480305

LABORATORY TEST REPORT

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

Name & Address of the Customer	:	**M/s BRIGADE ENTERPRISES LTD.,**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	03/04/2023 to 06/04/2023
Source of Sample	:	Customer Supplied- Borehole No. BH-05	**Sample Identification Number**	:	SS/GMC/112022/566/BH05
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2473/BH-05
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	10/04/2023
Sample Receipt Date	:	31/03/2023	**Test Report Pages**	:	One Page

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

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Coarse Grained (CG)												
			Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_P= LL-PL)	Consistency Index (Ic=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistancy	Position With Respect to A-Aline	IS:Notation	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$	Relative Density	IS-Notation	
														Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)							Gravel	Sand
2.0	21	SS	8.3	-	-	-	-	-	-	CG>50%	-	-	-	5.8	3.1	48.7	32.8	9.7		-	-	-	-	-	M.Dense	<50%	SP-SM
3.0	20	SS	12.1	-	-	-	-	-	-	CG>50%	-	-	-	4.4	3.7	57.3	25.0	9.6		-	-	-	-	-	M.Dense	<50%	SP-SM
4.0	23	SS	17.3	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.7	35.7	55.9	7.7		-	-	-	-	-	M.Dense	<50%	SP-SM
5.0	30	SS	16.1	-	-	-	-	-	-	CG>50%	-	-	-	0.0	2.4	62.0	28.5	7.1		-	-	-	-	-	M.Dense	<50%	SP-SM
6.0	17	SS	17.3	-	-	-	-	-	-	CG>50%	-	-	2.65	0.0	0.0	25.5	64.3	10.2		-	-	-	-	-	M.Dense	<50%	SP-SM
7.5	16	SS	16.9	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	30.6	59.6	9.8		-	-	-	-	-	M.Dense	<50%	SP-SM
9.0	29	SS	18.2	-	-	-	-	-	-	CG>50%	-	-	2.64	0.0	0.0	29.5	51.2	19.3		-	-	-	-	-	M.Dense	<50%	SM
10.5	28	SS	18.4	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	45.7	47.9	6.4		-	-	-	-	-	M.Dense	<50%	SP-SM
12.0	19	SS	2.7	-	-	-	-	-	-	CG>50%	-	-	-	0.8	0.6	48.8	15.3	34.7		-	-	-	-	-	M.Dense	<50%	SM
14.0	>100	SS	3.7	-	-	-	-	-	-	CG>50%	-	-	-	0.0	2.7	37.0	34.1	26.2		-	-	-	-	-	V.Dense	<50%	SM
16.0	>100	SS	16.9	-	-	-	-	-	-	CG>50%	-	-	-	10.9	11.7	34.0	26.6	16.9		-	-	-	-	-	V.Dense	<50%	SM
17.5	>100	WS	No Penetration & No Core Recovery/ Wash Sample Collected for Physical Observation											0.0	1.3	67.2	31.4	0.0		-	-	-	-	-	V.Dense	-	

**** END OF REPORT****

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Phone No.: 044-24481485, 044-24480305

LABORATORY TEST REPORT

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

Name & Address of the Customer	:	**M/s BRIGADE ENTERPRISES LTD.,**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	11/03/2023 to 16/03/2023
Source of Sample	:	Customer Supplied- Borehole No. BH-06	**Sample Identification Number**	:	SS/GMC/112022/566/BH-06
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2473/BH-06
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	17/03/2023
Sample Receipt Date	:	09/03/2023	**Test Report Pages**	:	One Page

Table-2.6 Laboratory Classification of Soil Samples from BH-06

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Coarse Grained (CG)													
			Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_P= LL-PL)	Consistency Index (Ic=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistancy	Position With Respect to A-Aline	IS:Notation	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$	Relative Density	IS-Notation	
													Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)							Gravel	Sand
0.5	5	SS	8.6	Clay Binder					9.1	CG>50%	-	-	-	0.0	2.0	18.5	39.3	40.3		-	-	-	-	-	Loose	<50%	SM
1.25	25	SS	15.8	25.8	16.4	9.5	1.1	-	0.0	CG>50%	Above	-	-	7.2	0.8	25.4	34.9	25.0	6.8	-	-	-	-	-	M.Dense	<50%	SC
2.0	33	SS	24.5	-	-	-	-	-	-	CG>50%	-	-	-	7.1	10.8	44.6	23.5	14.0		-	-	-	-	-	Dense	<50%	SM
3.0	20	SS	24.9	-	-	-	-	-	-	CG>50%	-	-	2.63	0.0	1.9	2.4	85.7	10.1		-	-	-	-	-	M.Dense	<50%	SP-SM
4.0	18	SS	47.6	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	34.1	59.4	6.5		-	-	-	-	-	M.Dense	<50%	SP-SM
5.0	15	SS	22.1	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	18.8	70.8	10.4		-	-	-	-	-	M.Dense	<50%	SP-SM
6.0	16	SS	20.2	-	-	-	-	-	-	CG>50%	-	-	2.62	0.0	0.0	23.5	64.3	12.2		-	-	-	-	-	M.Dense	<50%	SM
7.5	30	SS	18.4	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	33.4	59.0	7.7		-	-	-	-	-	M.Dense	<50%	SP-SM
9.0	26	SS	17.4	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	39.5	53.0	7.6		-	-	-	-	-	M.Dense	<50%	SP-SM
10.5	18	SS	18.3	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	40.4	51.3	8.3		-	-	-	-	-	M.Dense	<50%	SP-SM
12.0	25	SS	15.1	24.1	15.7	8.4	1.1	13.2	7.7	CG>50%	Above	-	-	0.0	0.0	43.4	34.8	21.8		-	-	-	-	-	M.Dense	<50%	SC
14.0	>100	SS	16.7	Clay Binder					16.7	CG>50%	-	-	-	0.0	10.1	38.3	29.5	22.1		-	-	-	-	-	V.Dense	<50%	SM
16.0	>100	SS	2.6	-	-	-	-	-	-	CG>50%	-	-	-	15.5	31.1	43.9	8.2	1.4		-	-	-	-	-	V.Dense	<50%	SP

**** END OF REPORT****

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LABORATORY TEST REPORT

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

Name & Address of the Customer	:	**M/s BRIGADE ENTERPRISES LTD.,**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	25/02/2023 to 01/03/2023
Source of Sample	:	Customer Supplied- Borehole No. BH-07	**Sample Identification Number**	:	SS/GMC/112022/566/BH-07
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2473/BH-07
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	17/03/2023
Sample Receipt Date	:	24/02/2023	**Test Report Pages**	:	One Page

Table-2.7 Laboratory Classification of Soil Samples from BH-07

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Coarse Grained (CG)													
			Moisture Content (%) **AS PER IS 2720 (P-II) - 1973, RA-2015**	LIQUID LIMIT (%) **AS PER IS 2720 (P-V) - 1985, RA-2015**	PLASTIC LIMIT (%) **AS PER IS 2720 (P-V) - 1985, RA-2015**	**Plasticity Index (I_P= LL-PL)**	**Consistency Index (Ic=LL-NMC/I_p)**	SHRINKAGE LIMIT (%) **AS PER IS 2720 (P-VI) - 1972, RA-2011**	FREE SWELL INDEX (%) **AS PER IS 2720 (P-XL) - 1977, RA-2011**	**Consistancy**	**Position With Respect to A-Aline**	**IS:Notation**	SPECIFIC GRAVITY **AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010**	GRAIN SIZE ANALYSIS **AS PER IS 2720 (P-IV) - 1985, RA-2015**						**D_{10} (mm)**	**D_{30}(mm)**	**D_{60} (mm)**	Uniformity Co-Efficient **$C_U=D_{60}/D_{10}$**	Co-Efficient of Curvature **$C_c=D_{30}^2/(D_{10}xD_{60})$**	**Relative Density**	**IS-Notation**	
													Gravel (%)	**Coarse (%)**	**Medium (%)**	**Fine (%)**	**Silt (%)**	**Clay (%)**							**Gravel**	**Sand**
0.5	10	SS	15.6	24.9	15.7	9.1	1.0	-	7.7	CG>50%	Above	-	-	8.3	6.4	24.7	31.0	25.8	3.9	-	-	-	-	-	Loose	<50%	SC
1.25	4	SS	Sample Failed																							
2.0	10	SS	10.6	-	-	-	-	-	-	CG>50%	-	-	-	0.9	1.8	54.6	30.4	12.3	-	-	-	-	-	Loose	<50%	SM
3.0	10	SS	25.3	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	1.8	90.0	8.2	-	-	-	-	-	Loose	<50%	SP-SM
4.0	22	SS	19.6	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.4	42.3	57.3	0.0	-	-	-	-	-	M.Dense	<50%	SP
5.0	14	SS	24.2	-	-	-	-	-	-	CG>50%	-	-	2.61	0.0	0.0	29.7	57.3	13.0	-	-	-	-	-	M.Dense	<50%	SM
6.0	10	SS	19.1	-	-	-	-	-	-	CG>50%	-	-	-	3.3	2.2	29.5	55.3	9.8	-	-	-	-	-	Loose	<50%	SP-SM
7.5	18	SS	Sample Failed																							
9.0	22	SS	18.4	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.7	32.1	57.3	9.9	-	-	-	-	-	M.Dense	<50%	SP-SM
10.5	8	SS	16.7	-	-	-	-	-	-	CG>50%	-	-	-	1.0	0.6	46.3	45.3	6.8	-	-	-	-	-	Loose	<50%	SP-SM
12.0	16	SS	30.9	-	-	-	-	-	-	CG>50%	-	-	-	0.0	3.0	32.7	30.9	33.5	-	-	-	-	-	M.Dense	<50%	SM
14.0	>100	SS	12.7	-	-	-	-	-	-	CG>50%	-	-	-	7.2	11.4	41.1	37.1	3.2	-	-	-	-	-	V.Dense	<50%	SP
15.5	>100	WS	No SPT Penetration & No Core Recovery/ Wash Sample Collected for Physical Observation & Laboratory Test											0.6	6.2	90.2	3.0	0.0	-	-	-	-	-	V.Dense	-	

**** END OF REPORT****

Terms and Conditions

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

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

(3) Any correction in this reports invalidates the reports

Authorised Signatory

A. VINOTH
(Technical Manager)

GEOMARINE
THE SPIRIT OF ENGINEERING
Phone No.: 044-24481485, 044-24480305

LABORATORY TEST REPORT

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

Name & Address of the Customer	:	**M/s BRIGADE ENTERPRISES LTD.,**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	25/02/2023 to 01/03/2023
Source of Sample	:	Customer Supplied- Borehole No. BH-08	**Sample Identification Number**	:	SS/GMC/112022/566/BH-08
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2473/BH-08
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	17/03/2023
Sample Receipt Date	:	24/02/2023	**Test Report Pages**	:	One Page

Table-2.8 Laboratory Classification of Soil Samples from BH-08

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Coarse Grained (CG)													
			Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_P= LL-PL)	Consistency Index (Ic=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistancy	Position With Respect to A-Aline	IS:Notation	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$	Relative Density	IS-Notation	
													Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)							Gravel	Sand
0.5	26	SS	Brick Pieces With Sand																							
1.25	16	SS	10.1	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	48.3	36.0	15.7		-	-	-	-	-	M.Dense	<50%	SM
2.0	18	SS	13.1	-	-	-	-	-	-	CG>50%	-	-	-	0.4	0.7	57.8	29.0	12.1		-	-	-	-	-	M.Dense	<50%	SM
3.0	10	SS	24.2	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	4.5	81.9	13.6		-	-	-	-	-	Loose	<50%	SM
4.0	18	SS	20.0	-	-	-	-	-	-	CG>50%	-	-	2.62	0.0	0.0	37.7	50.3	12.1		-	-	-	-	-	M.Dense	<50%	SM
5.0	4	SS	20.0	21.2	14.6	6.6	0.2	17.6	0.0	CG>50%	Above	-	-	0.0	0.0	11.2	69.4	19.4		-	-	-	-	-	V.Loose	<50%	SC
6.0	2	SS	23.4	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	8.8	67.1	24.1		-	-	-	-	-	V.Loose	<50%	SM
7.5	3	SS	19.1	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	26.0	60.4	13.7		-	-	-	-	-	V.Loose	<50%	SM
9.0	20	SS	16.9	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	28.4	60.9	10.7		-	-	-	-	-	M.Dense	<50%	SP-SM
10.5	18	SS	18.5	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	36.7	55.5	7.8		-	-	-	-	-	M.Dense	<50%	SP-SM
12.0	20	SS	25.7	32.4	15.0	17.4	0.4	14.7	-	CG>50%	Above	-	-	0.0	0.6	30.3	36.9	28.0	4.2	-	-	-	-	-	M.Dense	<50%	SC
14.0	>100	SS	14.1	Clay Binder						CG>50%	-	-	-	0.0	1.0	17.1	47.0	34.9		-	-	-	-	-	V.Dense	<50%	SM

**** END OF REPORT****

Terms and Conditions

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Authorised Signatory

A. VINOTH
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GEOMARINE
THE SPIRIT OF ENGINEERING
Phone No.: 044-24481485, 044-24480305

LABORATORY TEST REPORT

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

Name & Address of the Customer	:	**M/s BRIGADE ENTERPRISES LTD.,**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	25/02/2023 to 03/03/2023
Source of Sample	:	Customer Supplied- Borehole No. BH-09	**Sample Identification Number**	:	SS/GMC/112022/566/BH09
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2473/BH-09
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	17/03/2023
Sample Receipt Date	:	24/02/2023	**Test Report Pages**	:	One Page

Table-2.9 Laboratory Classification of Soil Samples from BH-09

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Coarse Grained (CG)													
			Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_P= LL-PL)	Consistency Index (Ic=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistancy	Position With Respect to A-Aline	IS:Notation	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$	Relative Density	IS-Notation	
													Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)							Gravel	Sand
1.25	14	SS	10.3	-	-	-	-	-	-	CG>50%	-	-	-	0.0	1.5	46.9	37.4	14.3		-	-	-	-	-	M.Dense	<50%	SM
2.0	18	SS	9.5	-	-	-	-	-	-	CG>50%	-	-	-	0.0	4.4	64.3	24.3	7.1		-	-	-	-	-	M.Dense	<50%	SP-SM
3.0	22	SS	23.8	-	-	-	-	-	-	CG>50%	-	-	-	24.3	4.2	6.4	46.5	18.6		-	-	-	-	-	M.Dense	<50%	SM
4.0	14	SS	16.7	-	-	-	-	-	-	CG>50%	-	-	-	0.0	1.2	64.7	28.9	5.3		-	-	-	-	-	M.Dense	<50%	SP-SM
5.0	16	SS	17.4	-	-	-	-	-	-	CG>50%	-	-	-	0.0	1.1	56.4	30.6	12.0		-	-	-	-	-	M.Dense	<50%	SP-SM
6.0	12	WS	Sample Failed/ Wash Sample Collected										-	0.0	1.8	93.0	5.2	0.0		-	-	-	-	-	M.Dense	<50%	SP
7.5	12	SS	19.2	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	29.5	60.2	10.3		-	-	-	-	-	M.Dense	<50%	SP-SM
9.0	14	SS	17.3	-	-	-	-	-	-	CG>50%	-	-	2.62	0.0	0.7	42.2	49.8	7.3		-	-	-	-	-	M.Dense	<50%	SP-SM
10.5	20	SS	17.2	-	-	-	-	-	-	CG>50%	-	-	-	0.0	2.1	38.4	46.6	12.9		-	-	-	-	-	M.Dense	<50%	SM
12.0	14	SS	44.7	32.7	13.2	19.5	-0.6	-	25.0	CG>50%	Above	-	-	0.0	0.0	22.9	51.0	20.6	5.5	-	-	-	-	-	M.Dense	<50%	SC
14.0	38	SS	15.1	23.7	16.0	7.7	1.1	12.9	9.1	CG>50%	Above	-	-	4.9	8.8	28.5	32.7	25.1		-	-	-	-	-	Dense	<50%	SC
16.0	>100	SS	11.0	-	-	-	-	-	-	CG>50%	-	-	-	0.0	15.8	30.4	30.5	23.4		-	-	-	-	-	V.Dense	<50%	SM
18.0	>100	WS	No SPT Penetration & No Core Recovery/ Wash Sample Collected for Physical Observation & Laboratory Test										-	0.0	1.5	52.8	42.5	3.2		-	-	-	-	-	V.Dense	-	

**** END OF REPORT****

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Authorised Signatory

A. VINOTH
(Technical Manager)

GEOMARINE
THE SPIRIT OF ENGINEERING
Phone No.: 044-24481485, 044-24480305

LABORATORY TEST REPORT

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

Name & Address of the Customer	:	**M/s BRIGADE ENTERPRISES LTD.,**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	18/02/2023 to 27/03/2023
Source of Sample	:	Customer Supplied- Borehole No. BH-10	**Sample Identification Number**	:	SS/GMC/112022/566/BH10
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2473/BH-10
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	17/03/2023
Sample Receipt Date	:	17/02/2023	**Test Report Pages**	:	One Page

Table-2.10 Laboratory Classification of Soil Samples from BH-10

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Coarse Grained (CG)													
													GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015											Relative Density	IS-Notation	
			Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_P= LL-PL)	Consistency Index (Ic=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistancy	Position With Respect to A-Aline	IS:Notation	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)	D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$		Gravel	Sand
0.5	5	SS	18.7	-	-	-	-	-	-	CG>50%	-	-	-	17.6	1.3	23.5	25.9	31.7		-	-	-	-	-	Loose	<50%	SM
1.25	4	SS	22.8	Clay Binder					9.1	CG>50%	-	-	-	36.6	0.7	7.2	9.2	46.4		-	-	-	-	-	V.Loose	GM	<50%
2.0	8	SS	13.5	-	-	-	-	-	-	CG>50%	-	-	-	1.1	3.9	65.7	22.5	6.8		-	-	-	-	-	Loose	<50%	SP-SM
3.0	28	SS	24.6	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.4	24.8	61.9	12.9		-	-	-	-	-	M.Dense	<50%	SM
4.0	20	SS	28.7	Clay Binder					8.3	CG>50%	-	-	-	1.3	3.5	47.4	27.2	20.6		-	-	-	-	-	M.Dense	<50%	SM
5.0	12	SS	23.2	-	-	-	-	-	-	CG>50%	-	-	2.62	0.0	0.8	26.1	61.8	11.2		-	-	-	-	-	M.Dense	<50%	SP-SM
6.0	20	WS	Sample Failed																								
7.5	10	SS	15.5	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	28.7	61.8	9.5		-	-	-	-	-	Loose	<50%	SP-SM
9.0	2	SS	19.1	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.2	31.5	52.6	15.7		-	-	-	-	-	V.Loose	<50%	SM
10.5	14	SS	17.1	-	-	-	-	-	-	CG>50%	-	-	-	1.2	1.5	52.5	36.1	8.7		-	-	-	-	-	M.Dense	<50%	SP-SM
12.0	6	SS	25.0	-	-	-	-	-	-	CG>50%	-	-	2.63	1.0	0.6	7.7	73.5	17.2		-	-	-	-	-	Loose	<50%	SM
14.0	60	SS	13.4	25.2	14.6	10.6	1.1	-	10.0	CG>50%	Above	-	-	0.0	0.9	39.9	39.6	19.6		-	-	-	-	-	V.Dense	<50%	SC
16.0	>100	SS	10.2	-	-	-	-	-	-	CG>50%	-	-	-	21.4	9.4	27.1	24.7	17.5		-	-	-	-	-	V.Dense	<50%	SM
17.0	>100	WS	No Penetration & No Core Recovery/ Wash Sample Collected for Physical Observation & Laboratory Test											0.0	1.8	67.2	29.2	1.8		-							
20.0	-	WS																									

**** END OF REPORT****

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Phone No.: 044-24481485, 044-24480305

LABORATORY TEST REPORT

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

Name & Address of the Customer	:	**M/s BRIGADE ENTERPRISES LTD.,**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	03/04/2023 to 06/04/2023
Source of Sample	:	Customer Supplied- Borehole No. BH-11	**Sample Identification Number**	:	SS/GMC/112022/566/BH11
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2473/BH-11
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	10/04/2023
Sample Receipt Date	:	31/03/2023	**Test Report Pages**	:	One Page

Table-2.11 Laboratory Classification of Soil Samples from BH-11

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Coarse Grained (CG)													
			Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_P= LL-PL)	Consistency Index (Ic=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistancy	Position With Respect to A-Aline	IS:Notation	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$	Relative Density	IS-Notation	
													Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)							Gravel	Sand
1.25	31	SS	12.9	29.2	16.8	12.4	1.3	15.7	9.1	CG>50%	Above	-	-	0.0	0.0	11.4	56.0	32.6		-	-	-	-	-	Dense	<50%	SC
2.0	31	SS	9.8	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	29.3	27.1	43.6		-	-	-	-	-	Dense	<50%	SM
3.0	25	SS	13.8	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.5	1.6	85.5	12.4		-	-	-	-	-	M.Dense	<50%	SM
4.0	46	SS	19.1	-	-	-	-	-	-	CG>50%	-	-	2.62	0.0	0.0	35.5	47.3	17.2		-	-	-	-	-	Dense	<50%	SM
5.0	28	SS	22.9	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	13.0	75.8	11.3		-	-	-	-	-	M.Dense	<50%	SP-SM
6.0	4	SS	40.6	36.5	17.1	19.4	-0.2	15.4	30.0	CG>50%	Above	-	-	0.0	0.0	19.8	40.9	26.0	13.2	-	-	-	-	-	V.Loose	<50%	SC
7.5	29	SS	27.0	Clay Binder					10.0	CG>50%	-	-	-	0.0	0.0	24.0	44.6	31.4		-	-	-	-	-	M.Dense	<50%	SM
9.0	37	SS	16.0	-	-	-	-	-	-	CG>50%	-	-	2.63	0.0	0.0	40.0	50.9	9.2		-	-	-	-	-	Dense	<50%	SP-SM
10.5	42	SS	18.0	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	33.3	54.9	11.8		-	-	-	-	-	Dense	<50%	SP-SM
12.0	38	SS	22.2	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	44.4	38.5	17.1		-	-	-	-	-	Dense	<50%	SM
14.0	40	SS	Clay Binder							CG>50%	-	-	-	0.0	0.0	13.0	39.3	47.7		-	-	-	-	-	Dense	<50%	-
16.0	>100	WS	No Penetration of SPT & No Core Recovery Wash Sample Collected for Physical Observation & Laboratory test											20.3	6.7	45.5	25.7	1.8		-	-	-	-	-	V.Dense	-	
18.0	>100	WS												0.0	1.5	52.5	37.0	9.0		-	-	-	-	-	V.Dense		
20.0	>100	WS												0.0	1.6	57.8	38.3	2.3		-	-	-	-	-	V.Dense		
21.0	>100	WS												0.96	1.73	52.41	38.17	6.7		-	-	-	-	-	V.Dense		

**** END OF REPORT****

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Authorised Signatory

A. VINOTH

(Technical Manager)

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Phone No.: 044-24481485, 044-24480305

LABORATORY TEST REPORT

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

Name & Address of the Customer	:	**M/s BRIGADE ENTERPRISES LTD.,**	**Customer Reference**	:	By Email
Sample Description	:	Soil Sample	**Period of Testing**	:	03/04/2023 to 06/04/2023
Source of Sample	:	Customer Supplied- Borehole No. BH-12	**Sample Identification Number**	:	SS/GMC/112022/566/BH12
Sample Condition	:	Satisfactory	**Test Report No.**	:	GT-2473/BH-12
Test Method	:	As per Bureau of Indian Standards	**Report Date**	:	10/04/2023
Sample Receipt Date	:	31/03/2023	**Test Report Pages**	:	One Page

Table-2.12 Laboratory Classification of Soil Samples from BH-12

Sample Depth (m)	SPT- "N" Value	Type of Sample	Fine Grained (FG)										Coarse Grained (CG)													
			Moisture Content (%) AS PER IS 2720 (P-II) - 1973, RA-2015	LIQUID LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	PLASTIC LIMIT (%) AS PER IS 2720 (P-V) - 1985, RA-2015	Plasticity Index (I_P= LL-PL)	Consistency Index (Ic=LL-NMC/I_p)	SHRINKAGE LIMIT (%) AS PER IS 2720 (P-VI) - 1972, RA-2011	FREE SWELL INDEX (%) AS PER IS 2720 (P-XL) - 1977, RA-2011	Consistancy	Position With Respect to A-Aline	IS:Notation	SPECIFIC GRAVITY AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010	GRAIN SIZE ANALYSIS AS PER IS 2720 (P-IV) - 1985, RA-2015						D_{10} (mm)	D_{30}(mm)	D_{60} (mm)	Uniformity Co-Efficient $C_U=D_{60}/D_{10}$	Co-Efficient of Curvature $C_c=D_{30}^2/(D_{10}xD_{60})$	Relative Density	IS-Notation	
													Gravel (%)	Coarse (%)	Medium (%)	Fine (%)	Silt (%)	Clay (%)							Gravel	Sand
1.25	13	SS	22.3	39.3	21.7	17.6	1.0	13.4	16.7	Stiff	Above	CI	-	0.0	0.0	7.6	40.9	51.5		-	-	-	-	-	FG>50%	FG>50%	FG>50%
2.0	9	SS	21.7	Clay Binder					-	CG>50%	-	-	-	0.0	0.0	0.8	77.5	21.7		-	-	-	-	-	Loose	<50%	SM
3.0	4	SS	20.1						10.0	CG>50%	-	-	-	0.0	5.4	21.8	39.7	33.1		-	-	-	-	-	V.Loose	<50%	SM
4.0	6	SS	39.1	25.4	16.4	8.9	-1.5	-	20.0	CG>50%	Above	-	-	0.0	0.0	18.8	49.4	23.6	8.2	-	-	-	-	-	Loose	<50%	SC
5.0	13	SS	28.0	28.4	17.5	10.9	0.0	-	18.2	CG>50%	Above	-	-	0.0	0.0	17.8	46.8	35.3		-	-	-	-	-	M.Dense	<50%	SC
6.0	31	SS	18.9	-	-	-	-	-	-	CG>50%	-	-	2.62	0.0	0.6	28.2	60.4	10.8		-	-	-	-	-	Dense	<50%	SP-SM
7.5	48	SS	15.9	-	-	-	-	-	-	CG>50%	-	-	-	0.0	0.0	37.8	52.7	9.5		-	-	-	-	-	Dense	<50%	SP-SM
9.0	33	SS	20.6	-	-	-	-	-	-	CG>50%	-	-	2.64	0.0	0.4	33.7	58.0	7.8		-	-	-	-	-	Dense	<50%	SP-SM
10.5	61	SS	10.8	-	-	-	-	-	-	CG>50%	-	-	-	0.0	1.4	51.8	28.0	18.8		-	-	-	-	-	V.Dense	<50%	SM
12.0	>100	SS	17.2	Clay Binder					0.0	CG>50%	-	-	-	5.5	7.4	15.7	29.1	42.3		-	-	-	-	-	V.Dense	<50%	SM
14.0	>100	WS	Sample Failed. No Penetration of SPT or Core Recovery Wash Sample Collected for Physical Observation																								
16.0	>100	WS																									
17.5	>100	WS																									

**** END OF REPORT****

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Authorised Signatory

A. VINOTH
(Technical Manager)

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

Table 2.13 Result of Chemical Test

Name of the Customer: **M/s BRIGADE ENTERPRISES LTD.,**

Sample Identification Number: GMC/112022/566 **Customer Reference:** By Email

Source of Sample: Customer Supplied **Period of Testing:** 07/12/2022 to 08/12/2022 & 07/04/2023

Sample Condition: Satisfactory **Report Date:** 10/04/2023

Sample Description: Water and Soil **Test Report No.:** GT-2473

Sample Receipt Date: 06/12/2022 & 05/04/2023 **Test Report Pages:** One Page

S No.	SAMPLE REFERENCE NO	Water				SOIL		
		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	DEPTH OF SAMPLE (m)	pH AS PER IS 2720 (P-XXVI) - 1987, RA-2021	SULPHATES (mg/kg) AS PER IS 2720 (P-XXVII) - 1977, RA-2020
1.0	BH-01	4.00	7.74	43.0	77.2	4.00	6.58	27.8
2.0	BH-02	4.10	7.64	32.4	72.8	1.25	6.73	30.7
3.0	BH-03	3.60	7.52	123.5	88.2	1.25	7.30	29.0
4.0	BH-04	3.50	7.48	136.2	81.5	1.25	7.46	30.2
5.0	BH-05	3.60	7.60	161.4	78.8	2.00	7.31	44.7
6.0	BH-06	3.80	7.58	35.7	65.8	1.25	7.58	32.5
7.0	BH-07	4.30	7.71	34.9	70.3	2.00	7.64	38.5
8.0	BH-08	5.00	7.63	38.5	31.6	3.00	7.83	36.0
9.0	BH-09	3.40	7.51	27.1	78.8	1.25	7.54	36.1
10.0	BH-10	3.60	7.76	25.9	88.2	2.00	7.51	33.1
11.0	BH-11	3.60	7.50	340.6	78.8	2.00	7.84	35.7
12.0	BH-12	2.50	7.65	216.9	92.9	2.00	7.98	36.8

**** END OF REPORT****

Authorised Signatory

A. VINOTH
(Technical Manager)

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Table-2.14 Results of Chemical Test for Chloride in Soil Sample

SL No.	Bore HoleNo.	Soil (2:1)	
		Depth of Sample (m)	Chlorides (mg/kg)
1.0	BH-01	4.00	33.6
2.0	BH-02	1.25	20.5
3.0	BH-03	1.25	3.3
4.0	BH-04	1.25	22.2
5.0	BH-05	2.00	64.6
6.0	BH-06	1.25	17.5
7.0	BH-07	2.00	26.9
8.0	BH-08	3.00	12.7
9.0	BH-09	1.25	26.9
10.0	BH-10	2.00	8.0
11.0	BH-11	2.00	8.0
12.0	BH-12	2.00	8.0

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Table 2.15 Result of Rock Test

Sample Identification Number	GMC/112022/566	**Customer Reference**	By Email
Source of Sample	Customer Supplied	**Period of Testing**	07/12/2022 to 08/12/2022 & 07/04/2023
Sample Condition	Satisfactory	**Report Date**	10/04/2023
Sample Description	Rock Sample	**Test Report No.**	GT-2473
Sample Receipt Date	06/12/2022 & 05/04/2023	**Test Report Pages**	One Page

S.No	SAMPLE REFERENCE	DEPTH (m)	UNCONFINED COMPRESSIVE STRENGTH,mPa AS PER IS 9143 - 1979, RA-2021	POINT LOAD STRENGTH INDEX, mPa AS PER IS 8764 - 1998, RA-2019	WATER CONTENT, % AS PER IS 13030 - 1991, RA-2021	SLAKE DURABILITY, % AS PER IS 10050 - 1981, RA-2021	TENSILE STRENGTH, mPa AS PER IS 10082 - 1981, RA-2021
1	BH - 01	24.00 to 25.00	89.4	3.18	0.15	98.24	4.71
2	BH - 01	25.00 to 26.00	99.17	3.53	0.12	97.35	4.95
3	BH - 02	24.00 to 25.00	-	-	0.19	96.41	-
4	BH - 03	19.50 to 21.00	-	2.32	0.31	96.31	4.52
5	BH - 03	21.00 to 22.50	97.82	3.56	0.11	98.12	12.29
6	BH - 04	19.00 to 20.50	-	1.78	0.31	96.54	-
7	BH - 04	20.50 to 22.00	-	0.36	0.43	96.24	0.93
8	BH - 05	19.00 to 20.5	-	2.14	0.55	96.88	2.26
9	BH - 05	20.50 to 22.00	-	0.71	0.80	94.69	3.44
10	BH - 06	21.00 to 22.00	-	9.98	0.46	98.21	5.50
11	BH - 06	23.00 to 24.00	85.07	6.38	0.24	98.82	8.61
12	BH - 07	21.50 to 23.00	-	10.87	0.22	98.31	7.86
13	BH - 07	23.00 to 24.00	24.71	3.24	0.29	97.85	6.18
14	BH - 08	17.50 to 19.00	17.34	13.19	0.14	98.26	6.68
15	BH - 08	20.50 to 22.00	35.21	5.81	0.18	98.13	8.54

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KOTTIVAKKAM, CHENNAI

Table 2.15 Result of Rock Test

Sample Identification Number	GMC/112022/566	**Customer Reference**	By Email
Source of Sample	Customer Supplied	**Period of Testing**	07/12/2022 to 08/12/2022 & 07/04/2023
Sample Condition	Satisfactory	**Report Date**	10/04/2023
Sample Description	Rock Sample	**Test Report No.**	GT-2473
Sample Receipt Date	06/12/2022 & 05/04/2023	**Test Report Pages**	One Page

S.No	SAMPLE REFERENCE	DEPTH (m)	UNCONFINED COMPRESSIVE STRENGTH,mPa AS PER IS 9143 - 1979, RA-2021	POINT LOAD STRENGTH INDEX, mPa AS PER IS 8764 - 1998, RA-2019	WATER CONTENT, % AS PER IS 13030 - 1991, RA-2021	SLAKE DURABILITY, % AS PER IS 10050 - 1981, RA-2021	TENSILE STRENGTH, mPa AS PER IS 10082 - 1981, RA-2021
16	BH - 09	19.00 to 20.50	58.21	10.31	0.16	98.52	13.29
17	BH - 09	20.50 to 22.00	67.26	16.57	0.22	97.21	17.69
18	BH - 10	23.00 to 24.50	54.35	10.67	0.17	98.24	12.27
19	BH - 10	24.50 to 26.00	79.47	5.17	0.30	98.07	7.96
20	BH - 11	21.00 to 22.50	-	1.07	0.34	96.45	2.95
21	BH - 12	17.50 to 19.00	-	2.34	0.28	96.81	3.93
22	BH - 12	19.00 to 20.50	-	1.43	0.41	97.13	8.85

**** END OF REPORT****

Authorised Signatory

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(Technical Manager)

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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.

3.4 GEOLOGICAL ORDER OF THE STUDY AREA:

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

Deposits of Recent Age

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

Archaean Basement Rock (Charnockite Rock / Hypersthene Granite)

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

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

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

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

REFERENCE BORE HOLE					BH-01	Ref R.L. of G.L. (m):			0.00	
Layer No.	Layer Thk. (m)			Type of Strata	Colour	Ave. Design SPT	Relative Density	Consistency	(γ) kN/m³	Shear Parameters
	Top BGL	Bottom BGL	Thickness							(Cu) kPa / (ϕ) Deg.
1.0	0.00	0.80	0.80	Filled Up	Sand With Building Debris					
2.0	0.80	2.30	1.50	Silty Clay	Brown	24	-	Very Stiff	20.5	160 / -
3.0	2.30	6.00	3.70	Silty Sand	Brown	27	Medium Dense	-	19	- / 35
4.0	6.00	7.50	1.50	Silty Clay	Brown	6	-	Medium Stiff	15.5	40 / -
5.0	7.50	12.00	4.50	Silty Sand	Grey	28	Medium Dense	-	19	- / 35
6.0	12.00	16.00	4.00	Silty Sand	Grey	70	Very Dense	-	21	- / 43
7.0	16.00	18.00	2.00	Silty Sand	Grey	48	Dense	-	20	- / 41
8.0	18.00	21.00	3.00	Completely Weathered Rock	Brown	>100	Very Dense	-	21	- / 43
9.0	21.00	22.50	1.50	Highly Weathered Rock	Grey Brown, Brown	CRR: 20% ; RQD: 0%				
10.0	22.50	25.00	2.50	Moderately Weathered Rock	Grey	CRR: 50% ; RQD: 35% to 36%				
11.0	25.00	26.00	1.00	Fresh Rock	Grey	CRR: 75% ; RQD: 75%				

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	0.80	0.80	Filled Up	Sand With Building Debris						
2.0	0.80	2.00	1.20	Silty Sand	Brown	22	Medium Dense	-	18.5	-	34
3.0	2.00	6.00	4.00	Silty Sand	Brown	33	Dense	-	19.5	-	37
4.0	6.00	9.00	3.00	Clayey Silty Sand	Grey	7	Loose	-	14.5	-	29
5.0	9.00	10.50	1.50	Silty Sand	Grey	21	Medium Dense	-	18.5	-	33
6.0	10.50	14.00	3.50	Silty Sand	Grey	42	Dense	-	20	-	39
7.0	14.00	18.00	4.00	Silty Sand	Green Grey	42	Dense	-	20	-	39
8.0	18.00	22.00	4.00	Completely Weathered Rock	Brown	>100	Very Dense	-	21	-	43
9.0	22.00	25.00	3.00	Moderately Weathered Rock	Brown	CRR: 25% to 35% ; RQD: 0%					

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/m^3	Shear Parameters	
	Top BGL	Bottom BGL	Thickness							(C_u) kPa	(ϕ) Deg.
1.0	0.00	2.00	2.00	Sandy Silty Clay	Brown	30	-	Very Stiff	20.5	200	-
2.0	2.00	6.00	4.00	Silty Sand	Brown	31	Dense	-	19.5	-	36
3.0	6.00	7.50	1.50	Clayey Silty Sand	Grey	2	Very Loose	-	13	-	20
4.0	7.50	9.00	1.50	Silty Clay	Grey, Black	6	-	Medium Stiff	15.5	40	-
5.0	9.00	10.50	1.50	Silty Sand	Grey	32	Dense	-	19.5	-	37
6.0	10.50	14.00	3.50	Silty Sand	Grey	58	Very Dense	-	20.5	-	42
7.0	14.00	16.00	2.00	Clayey Silty Sand/ Residual Soil	Grey,Brown Grey	>100	Very Dense	-	21	-	43
8.0	16.00	18.00	2.00	Completely Weathered Rock	-	>100	Very Dense	-	21	-	43
9.0	18.00	21.00	3.00	Moderately to Slightly Weathered Rock	Grey	CRR: 67% to 75% ; RQD: 0% to 10%					
10.0	21.00	22.50	1.50	Fresh Rock	Grey	CRR: 97% ; RQD: 97%					

REFERENCE BORE HOLE					BH-04	Ref R.L. of G.L. (m):			0.00	
Layer No.	Layer Thk. (m)			Type of Strata	Colour	Ave. Design SPT	Relative Density	Consistency	(γ) kN/m³	Shear Parameters
	Top BGL	Bottom BGL	Thickness							(Cu) kPa / (ϕ) Deg.
1.0	0.00	5.00	5.00	Silty Sand	Brown	26	Medium Dense	-	19	- / 35
2.0	5.00	7.50	2.50	Silty Sand	Grey	4	Very Loose	-	13.5	- / 20
3.0	7.50	12.00	4.50	Silty Sand	Grey	37	Dense	-	19.5	- / 38
4.0	12.00	14.00	2.00	Silty Clay	Grey	23	-	Very Stiff	20.5	153 / -
5.0	14.00	16.00	2.00	Clayey Silty Sand	Green Grey	38	Dense	-	19.5	- / 38
6.0	16.00	19.00	3.00	Completely Weathered Rock	Brown	>100	Very Dense	-	21	- / 43
7.0	19.00	22.00	3.00	Moderately to Slightly Weathered Rock	Grey	CRR: 54% to 57% ; RQD: 10% to 20%				

REFERENCE BORE HOLE					BH-05	Ref R.L. of G.L. (m):			0.00	
Layer No.	Layer Thk. (m)			Type of Strata	Colour	Ave. Design SPT	Relative Density	Consistency	(γ) kN/m³	Shear Parameters	
	Top BGL	Bottom BGL	Thickness							(C_u) kPa	(ϕ) Deg.
1.0	0.00	2.00	2.00	Filled Up soil	Sand With Building Debris						
2.0	2.00	14.00	12.00	Silty Sand	Brown	23	Medium Dense	-	18.5	-	34
3.0	14.00	16.00	2.00	Silty Sand	Green Grey	>100	Very Dense	-	21	-	43
4.0	16.00	19.00	3.00	Completely Weathered Rock	Grey Green	>100	Very Dense	-	21	-	43
5.0	19.00	22.00	3.00	Moderately to Slightly Weathered Rock	Grey	CRR: 67% to 69% ; RQD: 12% to 16%					

REFERENCE BORE HOLE					BH-06	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	Silty Sand	Brown	5	Loose	-	14	-	20
2.0	1.25	2.00	0.75	Clayey Silty Sand	Brown	25	Medium Dense	-	18.5	-	35
3.0	2.00	14.00	12.00	Silty Sand	Brown Grey	22	Medium Dense	-	18.5	-	34
4.0	14.00	16.00	2.00	Residual Soil to Completely Weathered Rock	Grey Green	112	Very Dense	-	21	-	43
5.0	16.00	18.00	2.00	Highly Weathered Rock	Grey Brown	>100	Very Dense	-	21	-	43
6.0	16.00	21.00	5.00	Moderately Weathered Rock	Grey	CRR: 27% ; RQD: 0%					
7.0	21.00	25.00	4.00	Slightly Weathered Rock	Grey	CRR: 80% to 95% ; RQD: 45% to 83%					

REFERENCE BORE HOLE					BH-07	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	2.00	2.00	Filled Up Soil	Clayey Sand With Building Debris						
2.0	2.00	4.00	2.00	Silty Sand	Brown	10	Loose	-	15	-	30
3.0	4.00	10.50	6.50	Silty Sand	Grey	17	Medium Dense	-	18	-	32
4.0	10.50	12.00	1.50	Silty Sand	Grey	8	Loose	-	14.5	-	30
5.0	12.00	14.00	2.00	Silty Sand	Grey	16	Medium Dense	-	18	-	32
6.0	12.00	17.00	5.00	Completely Weathered Rock	Brown	CRR: 10% ; RQD: 0%					
7.0	17.00	20.00	3.00	Moderately Weathered Rock	Grey	CRR: 18% to 60% ; RQD: 0%					
8.0	20.00	24.00	4.00	Moderately to Slightly Weathered Rock	Grey	CRR: 60% to 75% ; RQD: 7% to 67%					

REFERENCE BORE HOLE					BH-08	Ref R.L. of G.L. (m):			0.00		
Layer No.	Layer Thk. (m)			Type of Strata	Colour	Ave. Design SPT	Relative Density	Consistency	(γ) kN/m³	Shear Parameters	
	Top BGL	Bottom BGL	Thickness							(C_u) kPa	(ϕ) Deg.
1.0	0.00	1.30	1.30	Filled Up Soil	Sand With Building Debris						
2.0	1.30	5.00	3.70	Silty Sand	Yellow	16	Medium Dense	-	18	-	32
3.0	5.00	9.00	4.00	Clayey Silty Sand	Grey	3	Very Loose	-	13	-	20
4.0	9.00	12.00	3.00	Silty Sand	Grey	19	Medium Dense	-	18	-	33
5.0	12.00	14.00	2.00	Clayey Silty Sand	Grey	20	Medium Dense	-	18	-	33
5.0	14.00	15.00	1.00	Residual Soil	Green Yellow	>100	Very Dense	-	21	-	43
6.0	15.00	17.50	2.50	Highly Weathered Rock	Green Black	CRR: 8% to 9% ; RQD: 0%					
7.0	17.50	22.00	4.50	Slightly Weathered Rock	Grey	CRR: 87% ; RQD: 71%					

REFERENCE BORE HOLE					BH-09	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	1.30	1.30	Filled Up Soil	Sand With Building Debris						
2.0	1.30	14.00	12.70	Silty Sand	Grey	16	Medium Dense	-	18	-	32
3.0	14.00	16.00	2.00	Clayey Silty Sand	Green Grey	38	Dense	-	19.5	-	38
4.0	16.00	18.00	2.00	Residual Soil to Completely Weathered Rock	Grey	>100	Very Dense	-	21	-	43
5.0	18.00	22.50	4.50	Slightly Weathered Rock to Fresh Rock	Grey	CRR: 75% to 100% ; RQD: 20% to 75%					

REFERENCE BORE HOLE					BH-10	Ref R.L. of G.L. (m):			0.00	
Layer No.	Layer Thk. (m)			Type of Strata	Colour	Ave. Design SPT	Relative Density	Consistency	(γ) kN/m^3	Shear Parameters	
	Top BGL	Bottom BGL	Thickness							(C_u) kPa	(ϕ) Deg.
1.0	0.00	0.50	0.50	Filled Up Soil	Sand With Building Debris						
2.0	0.50	2.00	1.50	Silty Sand	Brown	5	Loose	-	14	-	20
3.0	2.00	3.00	1.00	Silty Sand	Brown	8	Loose	-	14.5	-	30
4.0	3.00	9.00	6.00	Silty Sand	Grey	18	Medium Dense	-	18	-	32
5.0	9.00	10.50	1.50	Silty Sand	Grey	2	Very Loose	-	13	-	20
6.0	10.50	14.00	3.50	Silty Sand	Grey	10	Loose	-	15	-	30
7.0	14.00	16.00	2.00	Clayey Silty Sand	Brown	60	Very Dense	-	20.5	-	43
8.0	16.00	17.00	1.00	Residual Soil to Completely Weathered Rock	Yellow Brown	>100	Very Dense	-	21	-	43
9.0	17.00	20.00	3.00	Highly Weathered Rock	Yellow Grey	CRR: 0% to 16% ; RQD: 0%					
10.0	20.00	23.00	3.00	Moderately Weathered Rock	Grey Brown	CRR: 40% to 43% ; RQD: 0%					
11.0	23.00	26.00	3.00	Slightly Weathered Rock	Grey	CRR: 91% to 95% ; RQD: 63% to 95%					

REFERENCE BORE HOLE					BH-11	Ref R.L. of G.L. (m):			0.00		
Layer No.	Layer Thk. (m)			Type of Strata	Colour	Ave. Design SPT	Relative Density	Consistency	(γ) kN/m³	Shear Parameters	
	Top BGL	Bottom BGL	Thickness							(C_u) kPa	(ϕ) Deg.
1.0	0.00	6.00	6.00	Clayey Silty Sand	Brown	32	Dense	-	19.5	-	37
2.0	6.00	7.50	1.50	Clayey Silty Sand	Grey	4	Very Loose	-	13.5	-	20
3.0	7.50	16.00	8.50	Silty Sand	Grey	37	Dense	-	19.5	-	38
4.0	16.00	21.00	5.00	Completely Weathered Rock	-	>100	Very Dense	-	21	-	43
5.0	21.00	24.00	3.00	Moderately Weathered Rock	Grey	CRR: 60% to 67% ; RQD: 7%					

REFERENCE BORE HOLE					BH-12	Ref R.L. of G.L. (m):			0.00		
Layer No.	Layer Thk. (m)			Type of Strata	Colour	Ave. Design SPT	Relative Density	Consistency	(γ) kN/m³	Shear Parameters	
	Top BGL	Bottom BGL	Thickness							(C_u) kPa	(ϕ) Deg.
1.0	0.00	2.00	2.00	Sandy Silty Clay	Brown	13	-	Stiff	19	87	-
2.0	2.00	5.00	3.00	Silty Sand	Brown	6	Loose	-	14.5	-	29
3.0	5.00	6.00	1.00	Clayey Silty Sand	Grey	13	Medium Dense	-	16.5	-	31
4.0	6.00	10.50	4.50	Silty Sand	Grey	37	Dense	-	19.5	-	38
5.0	10.50	12.00	1.50	Silty Sand	Green Grey	61	Very Dense	-	21	-	43
6.0	12.00	14.00	2.00	Clayey Silty Sand	Green Grey	>100	Very Dense	-	21	-	43
7.0	14.00	17.50	3.50	Completely Weathered Rock	-	>100	Very Dense	-	21	-	43
8.0	17.50	20.50	3.00	Moderately to Slightly Weathered Rock	Yellow Brown	CRR: 66% to 71% ; RQD: 7% to 38%					

CHAPTER-4

LIQUEFACTION EVALUATION

4.0 PHENOMENA:

Liquefaction has historically been used in conjunction with a variety of phenomena that involve soil deformations caused by monotonic, transient, or repeated disturbance of saturated cohesion-less soils under un-drained conditions. The generation of excess pore water pressure under un-drained loading conditions is a hallmark of all liquefaction phenomena. When saturated cohesion-less soils subjected to rapid loading resulting in undrained conditions undergo densification generates excess pore pressures and decreases effective stresses, eventually leading to excess deformation failures, commonly known as liquefaction. Liquefaction phenomena that result from this process is generally divided in two main groups: flow liquefaction and cyclic mobility**.** Both flow liquefaction and cyclic mobility are very important and any evaluation of liquefaction hazards should carefully consider both.

4.1 LIQUEFACTION SUSCEPTIBILITY:

Not all soils susceptible to liquefaction; consequently, the first step in a liquefaction hazard evaluation is the evaluation of liquefaction susceptibility. There are several criteria by which liquefaction susceptibility can be judged, and some are different for flow liquefaction and cyclic mobility. These include Historical, Geologic, Compositional, and State Criteria (Initial stress state before liquefaction).

Of the above four criteria, except the state criteria, the other three provide a qualitative evaluation of the liquefaction susceptibility of a deposit. The state criteria provide an analytical approach to quantify the liquefaction susceptibility with respect to the stress-strain response of the deposit against the environmental loading conditions.

The evaluation of liquefaction susceptibility based on state criteria is an independent and involved elaborate laboratory monotonic and cyclic loading testing programme and this is beyond the scope of present investigation. However, the liquefaction susceptibility pertinent to the present site sub surface characteristics are qualitatively outlined in the following sections. Further, based on the published correlation with respect to the corrected SPT-values, an attempt is made to provide a basic and guideline analysis on the liquefaction potential pertinent to ZONE-III earthquake coefficient.

4.2 QUALITATIVE APPROACH:

4.2.1 HISTORICAL CRITERIA:

Historically, the present site location never documented any post-earthquake generated soil flows or local liquefaction related effects.

4.2.2 GEOLOGIC CRITERIA:

Geologic process that sort soils into uniform grain size distribution and deposit them in loose states produce soil deposits with high liquefaction susceptibility. Similarly, the older geological formations are less susceptible to liquefaction compared to the recent deposits like Fluvial, Colluvium and Aeolian deposits.

FORMATION CHARACTERISTICS:

The geological succession of the project site with respect to the geotechnical investigation is classified based on the investigation boreholes and presented below:

Top 0.8m to 2.0m	Filled Up Soil (Sand with Building Debris)
0.8m to 6.0m	Medium Dense, Silty Sand/Clayey Sand & @ Location Loose, Relative Density
6.0m to 8.0m	Very Loose & Loose, Silty Sand/Clayey Sand & @ Location, Soft, Silty Clay with Lenses of Sand
8.0m to 16.0m/18.0m	Dense & Very Dense, Silty Sand/Clayey Sand & @ Location, Medium Dense, Clayey Sand is encountered
16.0m/18.0 to 18.0m/22.0m	Completely to Highly Weathered Rock
>18.0m to 22.0m	Moderately to Slightly Weathered Rock Followed by Fresh Rock Formation

4.2.3 COMPOSITION CRITERIA:

Since liquefaction requires the development of excess pore pressure, liquefaction susceptibility is influenced by the compositional characteristics that influence volume change behaviour. These characteristics include particle size, shape and gradation. No specific Indian Standards are available to arrive at the potential particle size that chiefly contributes to the liquefaction. Further, well graded soils are less susceptible to liquefaction than poorly graded soils. Similarly rounded particles are more susceptible than angular particles as they tend to density.

In general, the composition of particles that is susceptible to liquefaction is encountered in loose state of deposition in alluvial and fluvial environment. In the present case, the sub soil from the existing ground level being dense soil followed by rock formation of different degree of weathering which indicates the deposit is non-susceptible to liquefaction phenomena.

4.3 QUANTITATIVE APPROACH:

4.3.1 FLOW LIQUEFACTION:

Flow liquefaction can occur, when the shear stress required for static equilibrium of a soil mass (the static shear stress) is greater than the shear strength of the soil in its liquefied state. Flow liquefaction can occur either under monotonic or under cyclic loading conditions. In this failure, the cyclic stresses bring the soil to an unstable state at which its strength drops sufficiently to allow the static stresses to produce the flow. The flow liquefaction is characterised by sudden nature of occurrence and speed of occurrence.

The cyclic mobility can develop when the static shear stress is smaller than the steady-state shear strength and can occur in both loose and dense soils. A combination of static and cyclic loading generally produces cyclic mobility. However, no cyclic testing programme is carried out as it is beyond the scope of present investigation.

In the absence of cyclic testing programme a basic analysis based on the published data using in situ test results (SPT) is presented below to characterize the Liquefaction Resistance of the sub surface deposits encountered in the present site.

Further, as a first order of approximation and in the absence of rigours testing programme focusing on liquefaction steady, it is pressured that the clayey strata are non-susceptible to liquefaction and analysis is limited to sandy strata.

4.3.1.1 LIQUEFACTION RESISTANCE CHARACTERIZATION USING IN SITU TEST RESULTS:

(Ref."GEOTECHNCIAL EARTHQUAKE ENGINEERING" by Steven L. Kramer, University of Washington, Prentice-Hall International Series in Civil Engineering and Engineering Mechanic, 2005, Page77-381.

Seed et al (1975) developed a relationship between cyclic stress ratios (CSR) causing liquefaction and corrected SPT-values $(N_l)_{60}$ for silty sands in M=7.5 earthquakes. Further a magnitude correction factor for cyclic stress approach for different earthquake magnitudes is also developed.

The above relationships are reproduced in Figs.4.1 and Table-4.1. Based on this method, for the present site, the following approach is adopted to arrive at Liquefaction Resistance Characterization of the sub surface deposits encountered in the present site.

Step-I: Using the Zone Factor (Z), Importance Factor (I),Response reduction factor and Average response acceleration coefficient (S_a/g) pertinent to Zone-III, the design horizontal and vertical seismic coefficients are estimated as per IS:1893.

Step-2: Using the design seismic coefficient, compute the design seismic shear for corresponding to effective vertical stress (cyclic shear stress) due to overburden is computed.

Stet-3: Using the average corrected design SPT-value arrive at the design angle of shearing resistance compute the effective shear strength (static strength)

Step-4: Arrive at the CSR value of the deposit by dividing the cyclic shear stress with the effective shear strength.

Step-4: Based on the CSR-N_{l60} relation from Fig.4.1 and using the magnitude correction factor corresponding to Zone-III (M=6), the probable liquefaction/no-liquefaction characterization is arrived at and the details are given below:

Table 9-2 Magnitude Correction Factors for Cyclic Stress Approach

Magnitude, M	$CSR_M/CSR_{M=7.5}$
$5\frac{1}{4}$	1.50
6	1.32
$6\frac{3}{4}$	1.13
$7\frac{1}{2}$	1.00
$8\frac{1}{5}$	0.89

TABLE-4.1 MAGNITUDE CORRECTION FACTORS FOR CYCLIC STRESS APPROACH

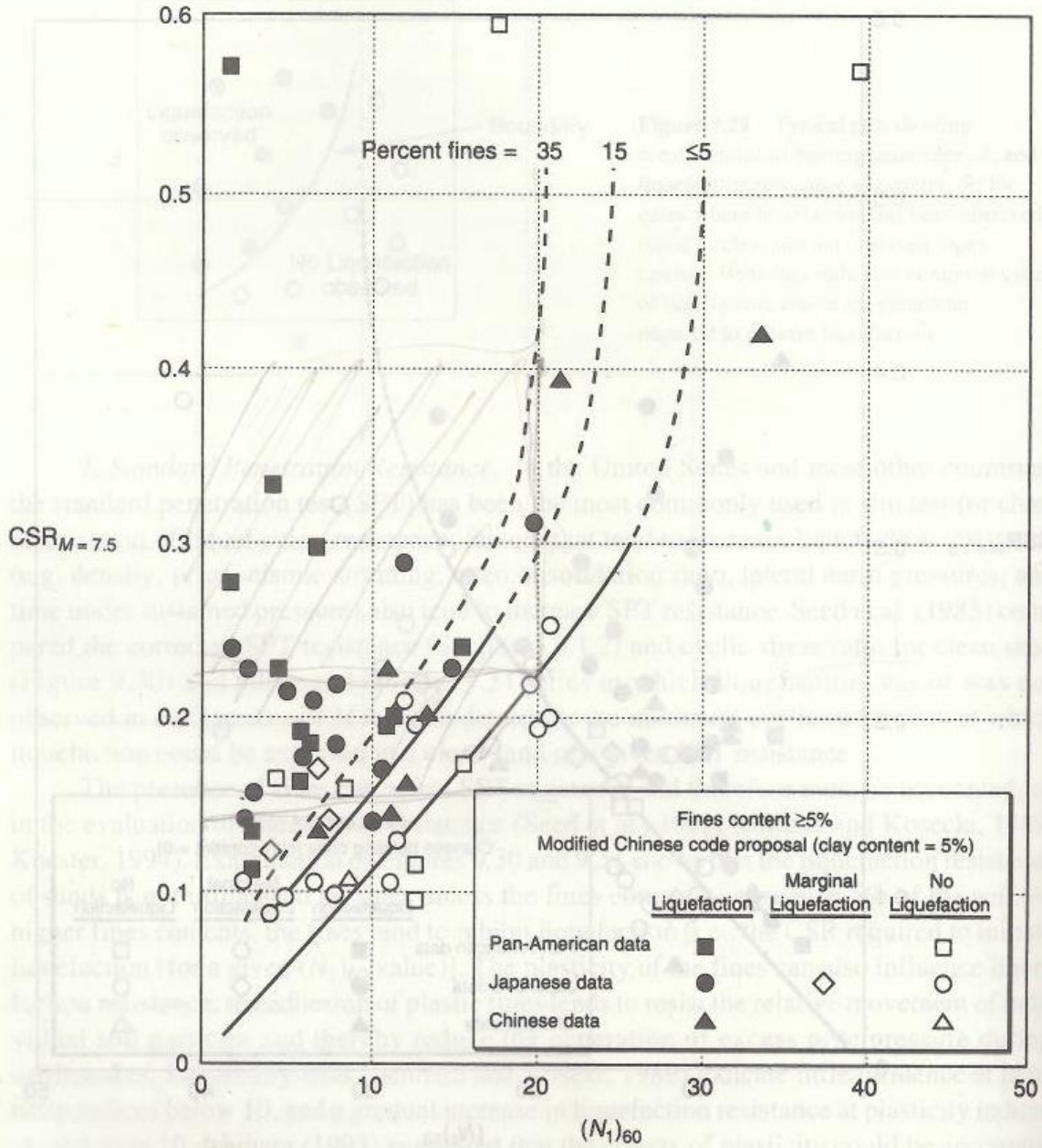


Figure 9.31 Relationship between cyclic stress ratios causing liquefaction and $(N_1)_{60}$ values for silty sands in $M = 7.5$ earthquakes. (After Seed et al. (1975). Influence of SPT procedures in soil liquefaction resistance evaluations, *Journal of Geotechnical Engineering*, Vol. 111, No. 12. Reprinted by permission of ASCE.)

FIG 4.1: RELATIONSHIP BETWEEN CYCLIC STRESS RATIOS OF LIQUEFACTION

4.4 SUSCEPTIBILITY TO LIQUEFACTION:

Liquefaction is a phenomenon occurs in sand and silts having relative density loose to very loose formation. Further the phenomenon can occurs in soft to very soft, clays of low plastic nature. The low plastic nature indirectly infers the predominant percentage of silt size particle which are highly susceptible to liquefaction.

In the project site no silt and sand with relative density having neither very loose nor very soft to soft low plastic clay strata exits within the investigation depth.

- ***The present project site falls in Seismic Zone-III, as per IS 1893 (Part-I).***
- ***In the project site, the sub soil formation encountered being medium dense to very dense formation from the existing ground level the formation is not susceptible to liquefaction as per Zone-III seismic intensity*.**
- ***The liquefaction analysis is presented in Annexure*-I**

FOUNDATION SYSTEM

CHAPTER-5

FOUNDATION SYSTEM

5.0 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.

5.1 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 three basement floors and forty-five upper floors, and is meant for residential occupancy. For this kind of structure, the column loads could vary between 1000kN to 13000 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.

5.2 SUB SURFACE CHARACTERISTICS:

The geological succession of the project site with respect to the geotechnical investigation is classified based on the investigation boreholes and presented below:

Top 0.8m to 2.0m	Filled Up Soil (Sand with Building Debris)
0.8m to 6.0m	Medium Dense, Silty Sand/Clayey Sand & @ Location Loose, Relative Density
6.0m to 8.0m	Very Loose & Loose, Silty Sand/Clayey Sand & @ Location, Soft, Silty Clay with Lenses of Sand
8.0m to 16.0m/18.0m	Dense & Very Dense, Silty Sand/Clayey Sand & @ Location, Medium Dense, Clayey Sand is encountered
16.0m/18.0 to 18.0m/22.0m	Completely to Highly Weathered Rock
>18.0m to 22.0m	Moderately to Slightly Weathered Rock Followed by Fresh Rock Formation

5.3 FOUNDATION SYSTEM:

The proposed structure is high rise building with 45 upper floors and three basement floors. For the proposed three basement floor, the lower basement floor including foundation thickness could be placed at a depth of 14.0m (As per client information). Hence, adopt raft foundation that is located in Dense to Very Dense, Clayey to Silty Sand at the depth of 14.0m below the existing ground level.

The recommended allowable net safe bearing pressure for the design of raft is 1200 kPa and typical computation is presented in the Annexure-I.

For the design of raft, the recommended modulus of sub grade reaction of the bearing strata (k_s) is 75,000 kN/m^3

5.4 GROUND WATER LOWERING/DEWATERING:

In the present site, the ground water table during the period of investigation is about 2.5m to 5.0m from the existing ground level. Lowering of such high ground water table has the following challenges:

- ❖ Containing the subsidence effect on the neighbourhood foundation or structures or roads
- ❖ Effective disposal that ensures non circulation of the same into the project zone.

5.4.1 CONTROL OF SUBSIDENCE:

It is possible to control the subsidence with the adoption of cut-off walls around the excavation and carry out ground water lowering operation within the cut-off walls. Hence to contain the effect of subsidence on neighbourhood adopt the cut-off walls Cut-Off walls is a vertical barrier installed from ground level to the underlying rock formation. The vertical barrier could be diaphragm wall/ contiguous piles/ secant piles.

In the present case, the cut-off wall shall have a minimum socket depth of 1.0m into the underlying rock formation. ***For effective cut-off adopt diaphragm walls.***

CAUTION NOTE:

Apart from dewatering borehole provide ground water monitoring borehole of 4Nos at corners of the excavation (outside the excavation/diaphragm wall).

Due to dewatering continuous monitoring of ground elevation outside the shoring system is mandatory and in case of any settlement observations, stop dewatering/ground water lowering. Resume dewatering after carrying out the study by the geotechnical consultants.

5.5 EXCAVATION SHORING:

For shoring, it is ideal to adopt diaphragm wall from basement water proofing considerations.

Since the scope of work does not cover the design of shoring system the same is not presented in this report.

5.6 LOWER BASEMENT SLAB UPLIFT:

Since there is possibility of leakage of ground water from the tip of the diaphragm wall, check the lower basement slab/raft for uplift considering ground water table at existing ground level.

RECOMMENDATIONS

CHAPTER-6

RECOMMENDATIONS

6.1 RECOMMENDATION FOR THREE BASEMENT FLOOR:

- For the kind of sub soil conditions and the proposed construction with three basement floors R.C.C Raft can be provided as foundation system.
- The raft can be located at a depth of 14.0m below the existing ground level and shall be designed for an allowable safe net bearing pressure of 1200 kPa.
- Since the formation at the founding level is dense to very dense formation and beyond being rock formation, the settlement will be of immediate in nature and the estimated settlement for the corresponding safe bearing pressure is within the permissible limit as per IS 1904.
- The present project site falls in seismic zone-III as per IS 1893-P-I
- The recommended modulus of subgrade modulus ks is 75,000 kN/m3

6.2 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 reinforcement is required for the construction.
- Corresponding to the sulphate content in 2:1 Water-Soil extract and ground water use Table 4.0 of IS 456 Clause 1.0 for minimum cement content and maximum water cement ratio. Hence ordinary Portland cement can be used.
- *Before excavation is started a workshop shall be conducted including the Owner, Architect, Structural Engineer, Geotechnical Engineer and Execution agency to ensure the proposal given by the contractor is workable and safe.*
- *Before construction activities are initiated, a scientific due-diligence of the condition of the neighbouring structures shall be carried out and authenticated. This is required to ensure that no undue claims or interpretations are made by the neighbourhood that the construction activities cause damages to their structures*

AUTHORISED SIGNATORY

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ANNEXURE-I

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TYPICAL BEARING CAPACITY COMPUTATIONS FOR SHALLOW FOUNDATION

1.0 COMPUTATION OF BEARING CAPACITY AS PER IS:6403

1.1 Geometrical Data :

Shape of the Foundation	Raft	
Depth of Embedment below the lowest basement floor "D_e"(m):	2.0	
Depth of lowest basement floor below E.G.L "D_b"(m):	12.0	
Depth of Foundation Below E.G.L "Df" (m):	14.0	
Breadth of Footing "B" (m):	10.0	
Length of Footing "L" (m):	10.0	
B/L	1.00	
Inclination of Vertical Load with the Vertical (a)	0.00	

1.2 Soil Data :

Type of Effective Bearing Strata :	Sand	
Type of Shear Failure:	General	
Average SPT "N" of the Bearing Strata :	37	
Angle of Shearing Resistance	37.93	

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 (q)	16.00	kN/m^2
Bearing Capacity Factors:		
N_c =	N/A	
N_q =	51.38	
N_g =	83.94	
Shape Factors:		
S_c =	-	
S_q =	1.20	
S_g =	0.60	
Depth Factors :		
D_c =	-	
D_q =	1.02	
D_g =	1.02	
Inclination Factor:		
I_c =	1.00	
I_q =	1.00	
I_g =	1.00	

1.4 Ultimate Bearing Capacity (Qu) :

Qu=q*(Nq-1)*Sq*Dq*Iq + 0.5*B*g*Ng*Sg*Dg*Ig*w' (g should be read as gama)	3289.72	kPa

1.5 Safe Bearing Capacity (Qsafe) :

Factor of Safety (F.S.) :	2.50	
Qsafe :	1315.89	kPa
Say Q_{safe}	**1200**	**kPa**

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

Layer-I (Medium Dense Sand)

The immediate elastic settlement (S_i)=	$qB(1-m^2)*I/E_s$	
q= bearing pressure	1200.00	kPa
Poission's Ratio (μ)	0.30	
Modulus of Elasticity (E_s)(Ref. Joseph E Bowels,1996,page316,Table5.6, Japanese design standards)		
Average Modulus of Elasticity (E_s)	96200	
Size of footing considered for maximum settlement(m)	10.00	
Influence factor	1.00	
Rigidity Factor	0.80	
Depth Factor	0.76	
Elastic Settlement (DH_i)	69.02	mm
	<75	mm

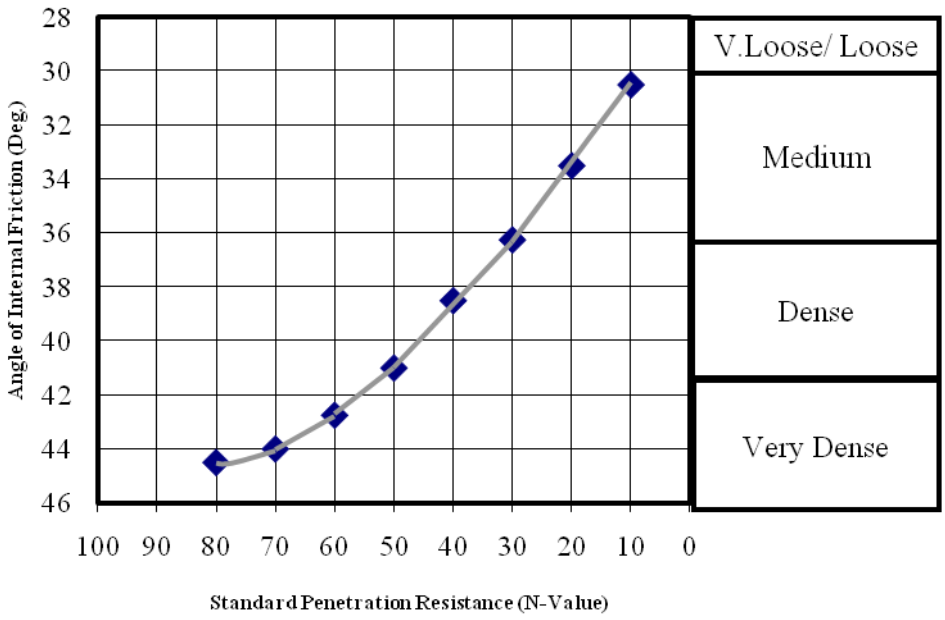


FIG. A1 Relation Ship between Angle of Internal Friction & N-value (Reproduced from IS:6403-1981)

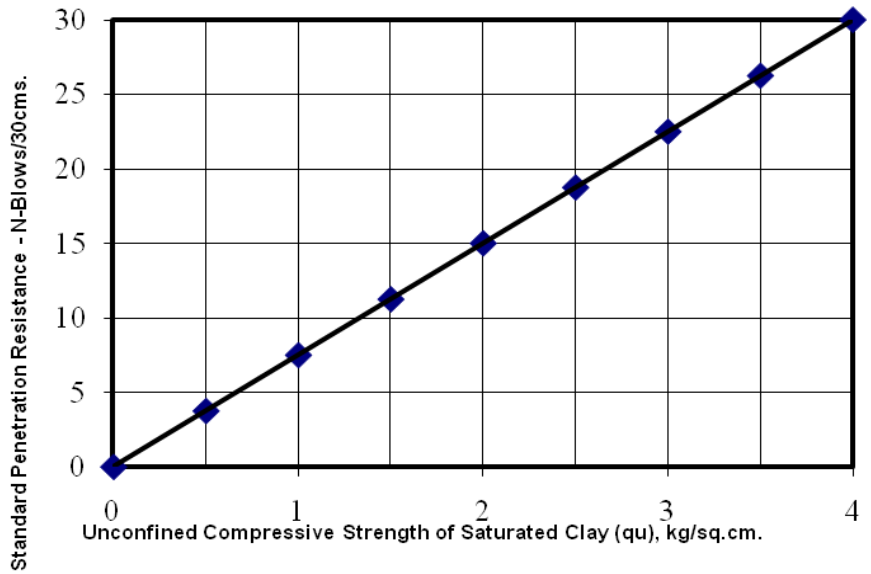


FIG. A2 : Relationship between UCC & SPT-Value (N) of Saturated Clay (AfterTerzhagi & Peck, 1948)

ANNEXURE-II

GEOMARINE
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SITE INVESTIGATION RECORD

BORE HOLE No. 01
PAGE No. 01
DIA OF BORE HOLE 150mm ✓ / 100mm
BORE START DATE 25/11/2022
BORE END DATE 28/11/2022
TOTAL DRILLING DAYS

PROJECT NAME: BRIGADE - WHITES ROAD, ROYAPETTAH - CHENNAI
LOCATION
STRUCTURE
JOB CODE
MACHINE No.
DRILLING METHOD: Rotary
FLUSHING MEDIUM: Bentonite
CHAINAGE (m)
CO-ORDINATES: N, E

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	Layer Data: Depth (m)	Geotechnical Description
0											0.75			0.75	Filled up soil (Concrete Floor
1		14 00					4	7	11	18	1.25	1	SPT SAMPLE	1.25	Brownish Hard clay
		14 02													
2		14 20					11	15	15	30	2.0	2		2.0	-do-
		14 22												2.30	
3		14 45					8	10	18	28	3.0	3		3.0	Brownish Medium Dense Silty Sand
		14 47													
4		15 10					10	10	10	20	4.0	4		4.6	Brownish Medium Dense Sand
		15 12													
5	25/11/2022	15 27		WASH BORING			11	14	18	32	5.0	5		5.0	Brownish Dense Sand
		15 29													
6		16 00					4	3	3	6	6.0	6		6.0	Brown, Gray Sandy Clay
		16 02													
7															
		16 30					8	12	16	28	7.50	7		7.5	Grayish Silty Sand
8		16 32													
9	26/11/2022	9 00					8	12	13	25	9.0	8		9.0	-do-
		9 03													
0															

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: S. DEEPAK DAS
SIGNATURE
DATE: 26/11/2022
CLIENT IN-CHARGE

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

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	01
PAGE No.	02
DIA OF BORE HOLE	150mm / 100mm
BORE START DATE	25/11/2022
BORE END DATE	28/11/2022
TOTAL DRILLING DAYS	

PROJECT NAME	BRIGADE – WHEELERS ROAD, ROYAPETTAH – CHENNAI				
LOCATION		MACHINE No.		CHAINAGE (m)	
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N
JOB CODE		FLUSHING MEDIUM	Bentonite		E

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Layer Data: Geotechnical Description
0	25/11/2022	9	30	WASH BORING			10	12	20	32	10.50	9	DISTURBED SAMPLE	10.50	Greyish dense silty fine sand
		9	32												
1		10	00												
		10	05				10	27	27	54	12.00	10		12.0	Greyish Silty sand rock clay bindup
2															
3															
4		10	35				26	40	46	86	14.0	11		14.0	Greyish very dense Silty sand
		10	40												
5															
6	26/11/2022	11	20				26	23	25	48	16.0	12		16.0	Greyish dense Cemented sand
		11	25												
7															
8		12	00				75/28	NV	NV		18.0	13		18.0	Brownish Soft Rock
		12	10												
9		12	30				Hammer Refusal				19.0			19.0	ROCK
		13	00				N 7/10								
0															

				PROJECT SITE DETAILS	
CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	S. STEPHENRAJ	GROUND LEVEL (m)	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		WATER TABLE (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	26/11/2022	CASING DEPTH (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE			

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	01
PAGE No.	03
DIA OF BORE HOLE	150mm ✓ / 100mm
BORE START DATE	25/11/2022
BORE END DATE	28/11/2022
TOTAL DRILLING DAYS	

PROJECT NAME	BRIGADE – WHITES ROAD, ROYAPETTAH – CH:14				
LOCATION		MACHINE No.		CHAINAGE (m)	
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N
JOB CODE		FLUSHING MEDIUM	Bentonite		E

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
0	25/11/2022	13	30	DB			Hammer Refusal N>100				21.0		W.S.	21.0	Brownish Weathered Rock.
1		14	30												
2	26/11/2022	15	00	DB	20	0					22.5		CS	23.5	Greyish to Black Hard Rock
3		16	45												
4	27/11/2022	9	00	DB	50	35					24.0		CS	24.0	Greyish to Black Hard Rock
5		10	30								25.0		CS.	25.0	Greyish to Black Hard Rock
6		11	00	DB	50	36					26.6		CS	26.6	— DO —
7		12	15												
8	28/11/2022	13	30	DB	75	75									Bore Hole Terminated at 26.0m Below Ground Level
9		15	00												
0															

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	S. STEPHENRAJ
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	28/11/2022
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE	

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

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	02
PAGE No.	01
DIA OF BORE HOLE	150mm ✓ / 100mm
BORE START DATE	01/12/2022
BORE END DATE	
TOTAL DRILLING DAYS	

PROJECT NAME	BRIGADE – WHITES ROAD – CHENNAI – 6						
LOCATION		MACHINE No.		CHAINAGE (m)			
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	'N		
JOB CODE		FLUSHING MEDIUM	Bentonite		E		

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Layer Data: Geotechnical Description
1	1/12/2022	14	00	SOIL CUTTER			8	10	12	22	1.25	1	WASH BORING		OLD FOUNDATION
		14	04											1.5	Brownish Sandy clay
2		14	30				10	17	17	34	2.0	2		2.0	Brownish dense Sand
		14	32												
3		14	50				13	19	21	40	3.0	3		3.0	-do-
		14	52												
4		15	20				10	13	17	30	4.0	4		4.0	-do-
		15	22												
5		15	40				13	15	14	29	5.0	5		5.0	Brownish Medium dense Sand
		15	42												
6		16	00				5	4	5	9	6.0	6		6.0	Sample failed
		16	02												
7		-													
		16	20				2	2	2	4	7.50	7		7.5	Greyish sandy clay
		16	22												
8															
9		17	40				7	10	11	21	9.0	8		9.0	Greyish silty Sand
		17	42												
10		15	20				12	16	20	36	10.50	9		10.5	Greyish dense silty Sand
		15	22												

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	S. STEPHEN RAJ	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	01/12/2022	WATER TABLE (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	02
PAGE No.	02
DIA OF BORE HOLE	150mm ✓ / 100mm
BORE START DATE	01/12/2022
BORE END DATE	
TOTAL DRILLING DAYS	

PROJECT NAME	BRIGADE - WHITES ROAD. - CHENNAI-14					
LOCATION		MACHINE No.		CHAINAGE (m)		
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N	
JOB CODE		FLUSHING MEDIUM	Bentonite		E	

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	Blows/cm. 15-30	Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	Layer Data: Depth (m)	Geotechnical Description
1															
2		9	00				14	19	28	47	1.00		SS	1.20	Greyish dense Sand with Shells
		9	04												
3															
4		9	30												
		9	34				17	18	19	37	3.40		SS	4.40	Greyish to Greenish Dense Cemented Sand
5															
6		9	50												
		9	55				12	17	30	47	6.00		SS	6.80	Greenish Dense Cemented Sand
7															
8		10	35				Hammer Reba						SS	8.80	Weathered ROCK
		10	59				N 7 00								
9															
0		14	00	DB			Hammer Reba						WS	20.0	— Bo —
		15	30												

DRILLED UPTO 20.0 M

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	S. STEPHENRAJ	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	02/12/2022	WATER TABLE (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	02
PAGE No.	03
DIA OF BORE HOLE	150mm ✓ / 100mm
BORE START DATE	01/12/2022
BORE END DATE	03/12/2022
TOTAL DRILLING DAYS	

PROJECT NAME	Brigade - Whites Road - Chennai - 14						
LOCATION		MACHINE No.		CHAINAGE (m)			
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	'N		
JOB CODE		FLUSHING MEDIUM	Bentonite		E		

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
1															
2		9	00				Hammer Refusal				2.20		WS	2.20	Weathered Rock
		10	30	DB											
3		10	45								2.30		C.S.	2.30	Grayish Hard Rock
		11	30	DB	25	0									
4		11	45								2.40		C.S	2.40	-do-
		12	45	DB	27	0									
5		14	00								2.50		C.S	2.50	-do-
		15	00	DB	35	0									
															Bore Hole Terminated at 2.5.0m (Below the Ground Level)
7															
8															
9															
0															

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	S. STEPHEN RAJ	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	03/12/2022	WATER TABLE (m)	-1.0
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	03
PAGE No.	01
DIA OF BORE HOLE	150mm ✓ / 100mm
BORE START DATE	01/04/2023
BORE END DATE	04/04/2023
TOTAL DRILLING DAYS	

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

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Layer Data: Geotechnical Description
1	01/04/23	14	00	SC			5	13	17	30	1.25	1	SPLIT SPOON SAMPLE	1.25	Brownish sandy clay
		14	02												
2		14	10				10	12	20	32	2.0	2		2.0	Brownish silty sand
		14	12												
3		14	40				9	12	17	29	3.0	3		3.0	Brownish silty sand
		14	42												
4		15	05				10	13	17	30	4.0	4		4.0	Brownish grey silty sand
		15	07												
5		15	30				9	13	20	33	5.0	5		5.0	-DO-
		15	32												
6		16	00	SOIL CUTTER			1	1	1	2	6.0	6		6.0	Blackish sand mixed clay
		16	01												
7		15	25				UDS failed				7.0			7.0	-DO-
		16	26												
8		16	00				2	3	3	6	7.50	7		7.50	Blackish clay with sand
		16	02												
9		16	40				2	15	17	32	9.0	8		9.0	Greyish dense sand
		16	42												
0															

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	S. STEPHENRAJ
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	01/04/2023
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE	

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

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No. 03
PAGE No. 02
DIA OF BORE HOLE 150mm ✓ / 100mm
BORE START DATE 01/04/2023
BORE END DATE 04/04/2023
TOTAL DRILLING DAYS

PROJECT NAME: BRIDGE - TVS MOUNT ROAD
LOCATION
STRUCTURE
JOB CODE
MACHINE No.
DRILLING METHOD: Rotary
FLUSHING MEDIUM: Bentonite
CHAINAGE (m)
CO-ORDINATES: N, E

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	Layer Data: Depth (m)	Geotechnical Description
0		9	00	SC			15	25	36	61	10.50	9	S.S	10.50	Greyish Very Dense Sand
1		9	10												
2		9	40	SC			18	25	30	55	12.00	10	S.S.	12.0	-DO-
3		9	42												
4		10	05	SC			18	5cm	Hammer		14.00	11	S.S	14.0	Greyish ~~weathered~~ Very Dense to Dense Cemented Sand
5		10	12					35 Blows							
6		10	10	TC			Hammer Released					12	W.S.	16.0	Weathered ROCK
7		10	20				No Penetration								
8		10	40	TC			Hammer Released					13	W.S.	18.0	-DO-
		11	50				N > 100								
9		12	10	DB	75	0						14	C.S.	18.00	19.50 - HARD ROCK
		13	15												

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: S. STEPHENRAJ
SIGNATURE
DATE
CLIENT IN-CHARGE

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

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	03
PAGE No.	03
DIA OF BORE HOLE	150mm ✓ / 100mm
BORE START DATE	01/04/2023
BORE END DATE	04/04/2023
TOTAL DRILLING DAYS	

PROJECT NAME	BRIGADE – TVS – MOUNT ROAD						
LOCATION		MACHINE No.		CHAINAGE (m)			
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N		
JOB CODE		FLUSHING MEDIUM	Bentonite		E		

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Layer Data: Geotechnical Description
0	04/04/2023	9	00	DB	67	10							C.S	19.50	Greyish Hard Rock
1		11	20											TO 21.0	
2		12	00		97	97								21.0	— DO —
		13	00	DB									C.S	22.50	
		14	00												
3		14	45												
4	Bore Hole Terminated at 22.50 m @ the Ground Level														
5															
6															
7															
8															
9															
0															

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	S. STEPHEN RAJ
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	04/04/2023
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE	

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

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No. 04
PAGE No. 01
DIA OF BORE HOLE 150mm ✓ / 100mm

PROJECT NAME: BRIDGE - TVS - Mount Road

LOCATION:
STRUCTURE:
JOB CODE:
MACHINE No.:
DRILLING METHOD: Rotary
FLUSHING MEDIUM: Bentonite
CHAINAGE (m):
CO-ORDINATES: N / E
BORE START DATE: 23/03/2023
BORE END DATE: 24/03/2023
TOTAL DRILLING DAYS:

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	Layer Data: Depth (m)	Geotechnical Description
1	20/03/2023	11	30				8	11	17	28	1.25	1	S.S.	1.25	Brownish fine Sand
		11	32												
2		11	50				8	15	15	30	2.0	2	S.S.	2.0	Brownish dense fine Sand
		11	52												
3		12	20				8	12	9	21	3.0	3	S.S.	3.0	Brownish fine Sand
		12	22												
4		13	00				7	10	15	27	4.0	4	S.S.	4.0	- DO -
		13	02												
5		14	00				7	3	2	5	5.0	5	S.S.	5.0	Greyish clayie Sand
		14	02												
6	21/03/2023	14	20				1	1	1	2	6.0	6	S.S.	6.0	Blackish soft clay
		14	22												
7															
8		15	35				17	16	20	36	7.50	7	S.S	7.50	Greyish dense Sand
		15	38												
9		16	50				14	20	21	41	9.0	8	S.S.	9.0	- DO -
		16	53												
0															

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

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

SUPERVISOR NAME: S. STEPHEN RAJ
SIGNATURE:
DATE: 23/03/2023
CLIENT IN-CHARGE:

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

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No. 04
PAGE No. 1
DIA OF BORE HOLE 150mm ✓ / 100mm
BORE START DATE 23/03/2023
BORE END DATE 24/03/2023
TOTAL DRILLING DAYS

PROJECT NAME: BRIGADE – TVS – Mount Road
LOCATION
STRUCTURE
JOB CODE
MACHINE No.
DRILLING METHOD: Rotary
FLUSHING MEDIUM: Bentonite
CHAINAGE (m)
CO-ORDINATES: N, E

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	Layer Data: Depth (m)	Geotechnical Description
0		9	00												
1		9	03				11	16	17	33	10.50	09	S.S.	10.50	Greyish very dense sand
2		9	30	SC			3	5	18	23	12.0	10	S.S.		Greyish clay with sand pockets
		9	33	USTE											
3															
4	24/03/2023	10	05	85 DIA			14	16	22	38	14.0	11	S.S.	17.0	Greenish dense cemented sand
5		10	10												
6		11	00				15cm								
		11	16				50/4"	Brownish Soft Rock			16.0	12	S.S.	16.0	Brownish Soft Rock
7															
		11	30	DIAMOND BIT			Hammering Rebound				17.50	13	W.S	17.50	Grey, Brown weathered Rock
8		12	00				No Penetration								
							W.O.D								
9		14	00				Hammering Rebound				19.0	14	W.S	19.0	BOT.
		14	40				No Penetration								
0															

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: STEPHENRAJ
SIGNATURE
DATE: 24/03/2023
CLIENT IN-CHARGE

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

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	04
PAGE No.	03
DIA OF BORE HOLE	150mm ✓ / 100mm
BORE START DATE	23/03/2023
BORE END DATE	24/03/2023
TOTAL DRILLING DAYS	

PROJECT NAME	BRIGADE – TVS – MOUNT ROAD					
LOCATION		MACHINE No.		CHAINAGE (m)		
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	'N	
JOB CODE		FLUSHING MEDIUM	Bentonite		E	

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
1		12	50	DB	54	10					19.0 TO 20.50			20.50	Greyish Hard Rock
		16	10												
2		16	20	DB	57	20					22.0			22.0	-DO-
		17	35												
3															Bore hole Terminated at 22.0 m Below Ground Level
4															
5															
6															
7															
8															
9															
0															

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

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

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No. - 05
PAGE No. 01

PROJECT NAME: BRIDGE - TVS - Mount Road
DIA OF BORE HOLE: 150mm ✓ / 100mm
LOCATION:
MACHINE No.:
CHAINAGE (m):
BORE START DATE: 20/03/2023
STRUCTURE:
DRILLING METHOD: Rotary
CO-ORDINATES: 'N / E
BORE END DATE: 22/03/2023
JOB CODE:
FLUSHING MEDIUM: Bentonite
TOTAL DRILLING DAYS:

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
1	20/03/2023														Filled up Soil with sand upto 2.0 m
2							8	10	11	21	2.0	1	S.S.	2.0	Brownish Fine Sand
3		9	00				11	10	10	20	3.0	2	S.S.	3.0	Brownish Medium dense Fine Sand
		9	02												
4		9	20				11	11	12	23	4.0	3	S.S.	4.0	Brownish Medium dense Fine Sand
		9	22												
5		10	00				13	15	15	30	5.0	4	S.S.	5.0	Brownish dense Fine Sand
		10	02												
6	21/03/2023	10	30				6	7	10	17	6.0	5	S.S.	6.0	Brownish Medium Fine Sand
		10	32												
7		11	00				7	7	9	18	7.50	6	S.S.	7.50	Brownish Medium dense Fine Sand
		11	03												
8															
9		11	30				10	14	15	29	9.0	7	S.S.	9.0	— Do —
		11	32												
0															

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: S. STEPHENRAJ
SIGNATURE:
DATE: 22/03/2023
CLIENT IN-CHARGE:

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

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH 05
PAGE No.	02
DIA OF BORE HOLE	150mm ✓ / 100mm
BORE START DATE	20/03/2023
BORE END DATE	22/03/2023
TOTAL DRILLING DAYS	

PROJECT NAME	BRIGADE – TVS – Mount Road						
LOCATION		MACHINE No.		CHAINAGE (m)			
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	'N		
JOB CODE		FLUSHING MEDIUM	Bentonite		E		

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	Blows/cm. 15-30	Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	Layer Data: Depth (m)	Geotechnical Description
1		12	00	SC			11	14	14	28	10.50	8	S.S	10.5	Brownish Dense fine sand
		12	03												
2		12	30	SC			11	8	11	19	12.0	9	S.S	12.0	Brownish Medium dense Sand
		12	32												
3															
4		14	00	SC			17	27	50/4cm			10	S.S	14.0	Green Grey very dense cemented sand
		14	30				Hammer Rebound								
5															
6		15	00	SC			50/4cm					R1	S.S	18.0	Grey, Green very dense Weathered Rock
		15	35				50/5cm Hammer Rebound N=100								
7															
8		16	00	DB			Hammer Rebound Not Penetrated					12	W.S.	17.5	Grey, Brown weathered Rock
		16	30												
9															-to-
10	22/03/2023	9	00	DB			Hammer Rebound					13	W.S.	19.0	
		9	40				N=100								

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	S. STEPHEN RAJ	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	22/03/2023	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.	05
PAGE No.	03
DIA OF BORE HOLE	150mm / 100mm
BORE START DATE	20/03/2023
BORE END DATE	22/03/2023
TOTAL DRILLING DAYS	

PROJECT NAME	BRQ QAD E MOUT ROAD TVS -				
LOCATION		MACHINE No.		CHAINAGE (m)	
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N
JOB CODE		FLUSHING MEDIUM	Bentonite		E

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
1	22/03/2023	10	30	DB	67	12					19.0 TO 20.50				Greyish Hard Rock
2		11	15								TO 20.50				-DO-
		12	00								22.0				
3		13	45	DB	69	16									
4															Borehole Terminated at 22.0 m Below the Road Level
5															
6															
7															
8															
9															
0															

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

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

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No. 06
PAGE No. 1

PROJECT NAME: BRIHADE TNS
DIA OF BORE HOLE: 150mm / 100mm

LOCATION: Mount Road | MACHINE No. | CHAINAGE (m) | BORE START DATE: 7/FEBRUARY/2023
STRUCTURE | DRILLING METHOD: Rotary | CO-ORDINATES N | BORE END DATE: 9/March/2023
JOB CODE | FLUSHING MEDIUM: Bentonite | E | TOTAL DRILLING DAYS

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	Layer Data: Depth (m)	Geotechnical Description
0	7/03/2023	4	00												Brown, compact, SANDY CLAY with Brick.
		4	02				3	2	3	5	.50				
1		4	15												Brown, compact, fine-medium grain. CLAYEY SAND.
		4	17				2	5	20	25	1.25				
2		4	40												Dense, Brown, fine-medium grain. CLAYEY SAND.
		4	44				5	18	15	33	2				
		4	59												M. Dense, Brown-Greyish (Mix) fine-medium grain. SILTY SAND.
3		5	02				8	10	10	20	3				
		5	20												M. Dense, Brownish-Greyish (Mix) fine-medium grain. SILTY SAND.
		5	23				5	9	9	18	4				
4		9	00												M. Dense, Grey, fine-medium grain. SILTY SAND
		9	04				3	7	8	15	5				
5		9	25												
		9	28												SILTY SAND
6							4	8	8	16	6				
	8/03/2023	9	55												
7		9	58												Dense, Grey, fine-medium grain. SILTY SAND.
							10	13	17	30	7.5				
8		10	17												
		10	22												M. Dense, Grey, fine-medium grain. SILTY SAND.
9							10	12	14	26	9				
		10	45												
10		10	47												M. Dense, Grey, fine-medium grain. SILTY SAND
							4	8	10	18	10.50				

CS - Core Sample | DS - Disturbed Sample
SS - Split Spoon Sample | SC - Soil Cutter
UDS - Undisturbed Sample | TCB - Tungsten Carbide Bit
WS - Wash Sample | DB - Diamond Bit

SUPERVISOR NAME: Arunshankaran
SIGNATURE
DATE: 8/3/2023
CLIENT IN-CHARGE

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

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No. 06
PAGE No. 2

PROJECT NAME: IIM CHADE TVS.

DIA OF BORE HOLE: 150mm / 100mm

LOCATION	Mount Road	MACHINE No.		CHAINAGE (m)		BORE START DATE	7/MARCH/2023
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N	BORE END DATE	9/MARCH/2023
JOB CODE		FLUSHING MEDIUM	Bentonite		E	TOTAL DRILLING DAYS	

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
1		11	15												
		11	20												M Dense, Grey, Fine-medium grain CLAYEY SILTY SAND.
2				SC			3	8	17	25	12				
3		12	01												
		12	05												
4				SC			22	52	60	112	14				V. Dense, Grey-Greenish (Mix) Fine-medium grain Compact CLAYEY RESIDUAL SOIL
5	8/03/2023	12	35												
		12	48												
6				SC			HAMMERED 56 / 5cm (>100)				16				V. NEAR, Grey-Brown (Mix) medium Coarser grain. COMPLETELY WEATHERED ROCK
7		2	00												
		2	20												
		2	46												
8		3	00	DB	91.0%						18				V. NEAR Grey-Brown (Mix) medium Coarser grain. HIGHLY WEATHERED FRACTURED ROCK
		4	09												CORE = 9%. RQD = 0%
9		5	00	DB	27%	0%					19				NEAR-moderate HIGHLY WEATHERED FRACTURE ROCK ~~MODERATELY WEATHERED ROCK~~
											19.50	CS			CORE = 27%. RQD = 0%
	9/3/2023	9	25												
10		10	45								20				
		AM			27%	0%					21	CC			NEAR, Brown-Grey (Mix) medium coarser grain. MODERATELY WEATHERED ROCK CORE = 27% RQD = 0%

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. Sivashankaran
SIGNATURE:
DATE: 9/3/2023
CLIENT IN-CHARGE:

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

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No. 06
PAGE No. 3

PROJECT NAME: BRIGADE TVS
DIA OF BORE HOLE: 150mm / 100mm

LOCATION: Mountroad | MACHINE No. | CHAINAGE (m) | BORE START DATE: 7/MAY/2023
STRUCTURE | DRILLING METHOD: Rotary | CO-ORDINATES N | BORE END DATE: 9/March/2023
JOB CODE | FLUSHING MEDIUM: Bentonite | E | TOTAL DRILLING DAYS

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	Layer Data: Depth (m)	Geotechnical Description
0		11	15												
1		12	40		95%	45%					22		CS		strong, Brown-Grey (mix) medium-coarser grains MODERATELY WEATHERED ROCK
		2	00												
2		3	05												
		3	20		95%	81%					23		CS		strong, Grey, medium-coarser grained SLIGHTLY WEATHERED ROCK CRR: 95%. RQD = 81%. II
3		4	20												
		4	40		83%	83%					24		CS		Grey strong, medium-coarser grains. SLIGHTLY WEATHERED ROCK (Grade II) CRR: 83%. RQD: 83%.
		5	40												
4		9m			80%	80%					25		CS		SLIGHTLY WEATHERED ROCK CRR: 80%. RQD: 80%.
5															
6															
7															
8															
9															
0															

Bore hole Terminated at 25.00mts depth

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

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

SUPERVISOR NAME: K. Sivasankaran
SIGNATURE
DATE: 9/3/2023
CLIENT IN-CHARGE

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

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No. 07
PAGE No. 1

PROJECT NAME: BRIGADE - TVS - MOUNT ROAD
DIA OF BORE HOLE: 150mm ✓ / 100mm
LOCATION:
MACHINE No.: ATV
CHAINAGE (m):
BORE START DATE: 21/02/23
STRUCTURE:
DRILLING METHOD: Rotary
CO-ORDINATES: N
BORE END DATE: 4/03/23
JOB CODE:
FLUSHING MEDIUM: Bentonite
E
TOTAL DRILLING DAYS: 3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	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	21/02/2023	14	45	SOIL CUTTER			6	6	4	10	0.5	1	SS	0.5	Filled up Soil
		14	47												
1		15	00				2	2	2	4	1.25	-	SS	1.25	— Sample Failed —
		15	03												
2		15	15				2	4	6	10	2	2	SS	2.0	Brownish Loose Sand
		15	16												
3		15	30				6	4	6	10	3	3	SS	3.0	Brownish Loose Silty fine sand
		15	31												
4		15	39				6	8	14	22	4	4	SS	4.0	Brownish Medium Dense sand
		15	41												
5		16	04				4	6	8	14	5	5	SS	5.0	Brownish Medium Dense sand
		16	05												
6		16	15				4	4	6	10	6	6	SS	6.0	Greyish Loose Fine Sand
		16	16												
7		16	45				8	8	10	18	7.50	-	SS	7.50	— Sample Failed —
		16	47												
8															
9		17	15				8	8	14	22	9.0	7	SS	9.0	Greyish Medium Dense Sand
		17	17												

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: S. STEPHENRAJ
SIGNATURE:
DATE: 21-02-2023
CLIENT IN-CHARGE:

PROJECT SITE DETAILS
GROUND LEVEL (m):
WATER TABLE (m): 4.30
CASING DEPTH (m):

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	07
PAGE No.	2
DIA OF BORE HOLE	150mm ✓ / 100mm ✓
BORE START DATE	21/02/23
BORE END DATE	4/2/23
TOTAL DRILLING DAYS	3

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

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
0	22/02/2023	9	00												
		9	02	SC			4	4	4	8	10.5	8	SS	10.50	Greyish Loose Sand
1															
		9	50												
2		9	52	SC			6	6	10	16	12.0	9	SS	12.0	Blackish Clay mixed with Medium Dense Sand
3															
		10	20				10CM / 75 blow	Hammer Rebound							
4		10	23	SC							14.0	10	SS	14.0	yellow, Grey weathered rock
		10	50				Hammer Rebound	>100							
5		11	05	DB							15.50	-	WS	15.5	Greyish weathered rock
6															
		11	40												
7		12	10	DB	10	0	-	-	-	-	17.	11	CS	17	Greyish weathered rock
8															
		13	30												
		14	30	DB	18	0	-	-	-	-	18.50	12	CS	18.50	Greyish weathered rock
9															
		15	30												
0		16	40	DB	60	0	-	-	-	-	20	13	CS	20.0	Greyish hard rock

CS - Core Sample	DS - Disturbed Sample.	SUPERVISOR NAME	S. STEPHEN RAJ	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	22-02-2023	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. 07
PAGE No. 3

PROJECT NAME: BRIGADE – TVS – MOUNT ROAD

DIA OF BORE HOLE: 150mm; 100mm ✓

LOCATION		MACHINE No.		CHAINAGE (m)		BORE START DATE	21/02/2023
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N	BORE END DATE	4/3/23
JOB CODE		FLUSHING MEDIUM	Bentonite		E	TOTAL DRILLING DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	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	4/03/2023	09	05	DB	75	7	–	–	–	–	21.50	14	CS	21.50	Strong Brown-Greyish(Mix) Medium Coarsed grain Moderately weather rock CRR-75%. RQD-7/.
		10	25												
2		10	56												
		11	45	DD	60	14	–	–	–	–	23.0	15	CS	23.0	Strong Brow-Grey, Mde fraction Index CRR: 60%. RQD: 14%. Moderately weather rock
3		12	15												
		13	00												
		14	15	DB	75	67	–	–	–	–	24.0	16	CS	24.0	Strong, Greyish, Medium Coarser grain, Moderately to slightly weather Rock CRR: 75%. RQD: 67-/.
4		16	05												
5															
6															
7															
8															
9															Borehole terminate @ 24.00 Mts
0															

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	S. STEPHEN RAJ	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	4/03/2023	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.	08
PAGE No.	01

PROJECT NAME	BRIGADE - TVS , CHENNAI					DIA OF BORE HOLE	150mm / 100mm
LOCATION	MOUNT-ROAD	MACHINE No.		CHAINAGE (m)		BORE START DATE	17/02/23
STRUCTURE	3B+4S+3F	DRILLING METHOD	Rotary	CO-ORDINATES	N	BORE END DATE	21/02/23
JOB CODE		FLUSHING MEDIUM	Bentonite		E	TOTAL DRILLING DAYS	

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Layer Data: Geotechnical Description
0	17/02/23	10	38												
		10	39	SC			46	20	6	26	0.50	1	SS		M. Dense, Brownish Red, Sand with Brick piece.
1		10	49												
		10	50	SC			8	8	8	16	1.25	2	SS		M. Dense, Pale Yellowish brown, Sand
2		11	02												
		11	03	SC			6	8	10	18	2.00	3	SS		M. Dense, Brownish pale yellow, Sand.
3		11	14												
		11	15	SC			4	4	6	10	3.00	4	SS		M. Dense, Greyish brown fine Silty Sand.
4		11	26												
		11	27	SC			8	8	10	18	4.00	5	SS		M. Dense, Greyish brown Silty Sand.
5		11	38												
		11	39	SC			2	4	0	4	5.00	6	SS		Very Loose, Grey, ~~Sand~~ fine Silty Sand mix clay.
6		11	53												
		11	54	SC			2	1	1	2	6.00	7	SS		Very Loose, Grey, fine Silty Sand mix clay.
7		12	15												
		12	16	SC			2	1	2	3	7.50	8	SS		Very Loose, Grey, Silty Sand.
8															
		12	39												
9		12	40	SC			8	10	10	20	9.00	9	SS		M. dense, Grey, Sand.
10															

CS - Core Sample	DS - Disturbed Sample.	SUPERVISOR NAME	R. Kannalakannan	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	R. Kannalakannan	GROUND LEVEL (m)	
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	17/02/23	WATER TABLE (m)	5.0
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No. 08
PAGE No. 02

PROJECT NAME: BRIGADE - TVS , CHENNAI
DIA OF BORE HOLE: 150mm / 100mm

LOCATION: MOUNT ROAD | MACHINE No. | CHAINAGE (m) | BORE START DATE: 17/02/23
STRUCTURE | DRILLING METHOD: Rotary | CO-ORDINATES: N | BORE END DATE: 01/02/23
JOB CODE | FLUSHING MEDIUM: Bentonite | E | TOTAL DRILLING DAYS

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
1	17/02/23	14	23												
		14	24	SC			8	10	8	18	10.50	10	SS		M. Dense, Grey, Silty Sand.
2		14	49												
		14	50	SC			4	6	14	20	12.00	11	SS		M. Dense, Grey, Silty Sand mix clay.
3															
4		15	18				11 cm / 50/6		H.R	N/A	14.00	12	SS		V. dense, Greenish pale yellow brown, Silty Sand (or) Residual soil.
		15	20	SC											
5		16	05				SPT Hammer Rebound			N/100	15.00	13	WS		— Sample Nil — [Washed Sample Collected]
		16	13	SC											
6	18/02/23	10	48												
		10	56	DB	8	0	–	–	–	–	16.00	14	CS		Weak, Green mix Blackish whitish brownish pale yellow, Highly weathered Rock.
7															
		11	20												
		11	38	DB	9	0	–	–	–	–	17.50	15	CS		Weak, Blackish brownish pale yellow Highly weathered Rock.
8															
		12	39												
9		13	09	DB	89	51	–	–	–	–	19.00	16	CS		Moderate, brown mix Blackish pale yellowish Green. Moderately weathered Rock.
		Spoil													
		14	27												
		14	42												
0															

CS - Core Sample	DS - Disturbed Sample.	SUPERVISOR NAME	R. Kamalakannan	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	R. Kamal.	GROUND LEVEL (m)	
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	17/02/23	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.	08
PAGE No.	03

PROJECT NAME	BRIGADE - TVS - MOUNT ROAD					DIA OF BORE HOLE	150mm / 100mm
LOCATION	MOUNT ROAD	MACHINE No.		CHAINAGE (m)		BORE START DATE	17/02/23
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N	BORE END DATE	21/02/23
JOB CODE		FLUSHING MEDIUM	Bentonite		E	TOTAL DRILLING DAYS	03

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
1															
2		14	00												
		15	30	DB	87	71	–	–	–	–	22.00	17	CS		Weak To Strong, Greyish brown + Yellowish Grey, slightly Weathered Rock,
3															
4															BOREHOLE TERMINATE AT 22.00 Mts depth.
5															
6															
7															
8															
9															
0															

CS - Core Sample	DS - Disturbed Sample.	SUPERVISOR NAME	S. Stephen Raj	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	21/02/23	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. 09
PAGE No. 1

PROJECT NAME: BRIGADE - TVS - MOUNT ROAD
DIA OF BORE HOLE: 150mm ✓ / 100mm

LOCATION		MACHINE No.	ATV	CHAINAGE (m)		BORE START DATE	17/2/23
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N	BORE END DATE	20/2/23
JOB CODE		FLUSHING MEDIUM	Bentonite		E	TOTAL DRILLING DAYS	3

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC/TCB/DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	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	17/02/2023	15	20	SOIL CUTTER			2	4	4	8	0.50	1	SS	0.50	Brownish Loose Fine to Medium course Sand
		15	21												
		15	31				4	6	8	14	1.25	2	SS	1.25	Brownish Medium Dense course to Fine Sand
2		15	32												
		15	43				6	8	10	18	2.0	3	SS	2.0	Brownish Medium Dense Silty fine Sand
		15	44												
3		15	57				6	10	12	22	3.0	4	SS	3.0	Brownish Medium Dense Silty fine sand.
		15	58												
		16	14				6	6	8	14	4.0	5	SS	4.0	Brownish Medium Dense fine to Medium Course Sand
4		16	15												
		16	26				6	8	8	16	5.0	6	SS	5.0	Brownish Medium Dense Fine to medium coarse Sand
5		16	27												
		09	20				6	6	6	12	6.0	—	SS/WS	6.0	— Sample Failed —
6		09	22												
		09	42												
7	18/02/2023	09	44				4	4	8	12	7.50	7	SS	7.50	Brown, Grey Medium Dense Sand
8		10	30												
		10	32				6	4	10	14	9.0	8	SS	9.0	Greyish Medium Dense Sand.
9															
0															

CS - Core Sample	DS - Disturbed Sample.	SUPERVISOR NAME	S. STEPHEN RAJ	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	
UDS - Undisturbed Sample	TCB - Tungstan Carbide Bit	DATE	18-02-2023	WATER TABLE (m)	3.4
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH 9
PAGE No.	02
DIA OF BORE HOLE	150mm ✓ / 100mm ✓
BORE START DATE	17/02/23
BORE END DATE	20/02/23
TOTAL DRILLING DAYS	3

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

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
0	18/02/2023	10	52	SC			6	8	12	20	1.050	9	SS	10.50	Greyish Medium Dense Sand
		10	54												
1		11	10	SC			16	6	8	14	1.20	10	SS	2.0	Greyish Medium Dense Sand with clay Pockets
		11	12												
2															
3		11	41	SC			16	18	20	38	1.40	11	SS	14.0	Greenish Cemented Sand
		11	44												
4															
5		12	12	SC			70	80	96	176	1.60	12	SS	16.0	Grey. Brownish Weathered rock
		12	16												
6															
7		14	00	DB			SPT Hammer Rebound			>100	18.0	—	WS	18.0	Grey Brownish Weathered rock
		14	45												
8															
9		16	00	DB	75	20	—	—	—	—	20	13	CS	20	Greyish Hard rock
		17	00												
0															

CS - Core Sample	DS - Disturbed Sample.	SUPERVISOR NAME	S. STEPHEN RAJ	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	18-02-2023	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.	09
PAGE No.	3
DIA OF BORE HOLE	150mm / 100mm ✓
BORE START DATE	17/02/23
BORE END DATE	20/02/23
TOTAL DRILLING DAYS	3

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

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
0	20/02/2023	10	16	DB	89	73	-	-	-	-	20.5	14	CS	20.5	Greyish very Strong Slightly weathered rock (Hard rock)
1		11	37												
		14	15												
2		15	40	DB	100	75									Greyish very Strong fresh Rock (Hard rock)
							-	-	-	-	22.5	15	CS	22.5	
3															
	Borehole terminate @ 22.5M Depth below in EGL														
4															
5															
6															
7															
8															
9															
0															

CS - Core Sample	DS - Disturbed Sample.	SUPERVISOR NAME	S. STEPHENRAJ	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	20-02-2023	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.	10
PAGE No.	01
DIA OF BORE HOLE	150mm ✓ / 100mm
BORE START DATE	14/02/23
BORE END DATE	17/02/23
TOTAL DRILLING DAYS	3

PROJECT NAME	BRIGADE - TVS, CHENNAI						
LOCATION	MOUNT ROAD	MACHINE No.		CHAINAGE (m)			
STRUCTURE	3B+4S+13F	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
		15	25											0.5	Filled up Soil.
	14/02/23	15	26	SC			2	2	3	5	0.50	1	SS		Brownish Loose clayey Sand.
1		15	36												
		15	37	SC			2	2	2	4	1.25	2	SS		Brownish Loose clayey Sand.
2		15	51												
		15	52	SC			3	3	5	8	2.00	3	SS		Brownish Loose fine to Medium Coarse Sand.
3		16	01												
		16	02	SC			17	16	12	28	3.00	4	SS		Brownish Meadium Dense Silty fine Sand.
4		16	16												
		16	17	SC			4	6	14	20	4.00	5	SS		Greyish brown Medium Dense, Silty fine Sand with clay Packet
5		16	23												
		16	34	SC			3	5	7	12	5.00	6	SS		Greyish Medium dense Silty fine Sand with Shell.
6		16	54												
		16	55	SC			6	9	11	20	6.00	7	WS		—— Sample Nil ——
7	15/02/23	15	50												
		15	51	SC			4	4	6	10	7.50	8	SS		Greyish Loose fine Sand with Sea Shell
8															
		16	38												
9		16	39	SC			2	0	2	2	9.00	9	SS		Greyish Very Loose Silty fine Sand.
0															

CS - Core Sample	DS - Disturbed Sample.	SUPERVISOR NAME	K. Loganathan	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	K. Logi	GROUND LEVEL (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	15/02/23	WATER TABLE (m)	3.60 m
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No. 10
PAGE No. 02

PROJECT NAME: BRIGADE - TVS, CHENNAI

DIA OF BORE HOLE: 150mm ✓ / 100mm

LOCATION		MACHINE No.		CHAINAGE (m)		BORE START DATE	14/02/23
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N	BORE END DATE	17/02/23
JOB CODE		FLUSHING MEDIUM	Bentonite		E	TOTAL DRILLING DAYS	03

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	16/02/2023	16	55												
		16	56	SC			6	6	8	14	10.50	10	SS		Greyish Meadium dense fine Sand.
1															
		10	02												
2		10	03	SC			2	2	4	6	12.00	11	SS		Greyish Loose fine Sand with clay Packets.
3															
		10	20												
4		10	22	SC			18	26	34	60	14.00	12	SS		Brownish Grey Very dense Cemented Sand.
5															
		10	45				9am								
6		10	49	SC			7pm	H.R		N>100	16.00	13	SS		Yellowish brown Very weak Completly Weathered Rock.
		11	26												
7		11	37	DB			Hammer Rebound			N/100	17.00	14	WS		——— Do ———
8															
		12	06												
		12	46	DB	16	0					18.50	15	CS		Yellowish Greyish brown Highly Weathered Rock
9															
		14	10												
0		14	46	DB	0	0					20.00	16	WS		Greyish brown Very weak, Completly Weathered Rock.

CS - Core Sample	DS - Disturbed Sample.	SUPERVISOR NAME	K. Loganathan	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	
UDS - Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	16/02/23	WATER TABLE (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	10
PAGE No.	03

PROJECT NAME	BRIGADE - TVS, CHENNAI					DIA OF BORE HOLE	150mm ✓ / 100mm
LOCATION		MACHINE No.		CHAINAGE (m)		BORE START DATE	14/02/23
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N	BORE END DATE	17/02/23
JOB CODE		FLUSHING MEDIUM	Bentonite		E	TOTAL DRILLING DAYS	03

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	16/02/23	15	05												
		15	49	DB	40	0					21.50	17	CS		Greyish brown weak Moderatly weathered Rock.
2		16	15												
		16	45												
		10	18												
3	17/02/23	10	43	DB	43	0					23.00	18	CS		Greyish brown Weak Moderatly Weathered Rock
4		11	08												
		11	51	DB	91	63					24.50	19	CS		Brownish Grey Strong slightly weathered Rock.
5															
		12	18												
6		13	10	DB	95	95					26.00	20	CS		Pinkish Grey Very Strong Fresh Rock (Hard Rock)
7															
8															
															BORE HOLE TERMINATED AT 26.00 mts depth
9															
0															

CS - Core Sample	DS - Disturbed Sample.	SUPERVISOR NAME	K. Loganathan	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	17/02/23	WATER TABLE (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE		CASING DEPTH (m)	

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No. 11
PAGE No. 01
DIA OF BORE HOLE 150mm ✓ / 100mm
BORE START DATE 25/03/2023
BORE END DATE
TOTAL DRILLING DAYS

PROJECT NAME: BRIGADE – TVS – MOUNT ROAD
LOCATION
STRUCTURE
JOB CODE
MACHINE No.
DRILLING METHOD: Rotary
FLUSHING MEDIUM: Bentonite
CHAINAGE (m)
CO-ORDINATES: N, E

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	Layer Data: Depth (m)	Geotechnical Description
1	25/03/2023	14	00	SC			7	12	19	31	1.25	1	S.S	1.25	Brownish Medium dense silty sand
		14	08												
2		14	25				9	14	17	31	2.0	2	S.S.	2.0	-do-
		14	27												
3		15	08				6	11	14	25	3.0	3	S.S	3.0	Brownish Sand
		15	02												
4	26/03/2023	16	00				7	15	31	46	4.0	4	S.S.	4.0	Brownish dense Sand
		16	03												-do-
5		17	02				7	19	9	20	5.0	5	S.S	5.0	
		17	04												
6		9	00	V.T.C.W			0	2	2	4	6.0	6	S.S.	6.0	Greyish Sandy clay
		9	05												
7	27/03/2023	9	25				3	12	17	29	7.5	7	S.S.	7.50	Greyish clay with pockets
		9	28												
8															
9		10	00	SOIL			12	17	20	37	9.0	8	S.S.	9.0	Greyish Sand
		10	03												
0															

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: S. STEPHEN RAJ
SIGNATURE
DATE: 27/03/2023
CLIENT IN-CHARGE

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

GEOMARINE
THE SPIRIT OF ENGINEERING

SITE INVESTIGATION RECORD

BORE HOLE No.	BH 11
PAGE No.	02
DIA OF BORE HOLE	150mm ✓ / 100mm
BORE START DATE	25/03/2023
BORE END DATE	27/03/2023
TOTAL DRILLING DAYS	

PROJECT NAME: BRIGADE - TVS - MOUNT ROAD

LOCATION | MACHINE No. | CHAINAGE (m) | CO-ORDINATES N | E

STRUCTURE | DRILLING METHOD: Rotary

JOB CODE | FLUSHING MEDIUM: Bentonite

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	Layer Data: Depth (m)	Geotechnical Description
1		10	30	SC			11	18	24	42	10.50	9	S.S	10.50	Greyish Pera Sand
		10	32												
2		10	55	SC			11	18	20	38	12.00	10	S.S	12.00	-DO-
		10	58												
3															
4		11	20	SC			10	20	20	40	14.00	11	S.S	14.00	-DO-
		11	22												
5															
6		11	40	TC			Hammer Refusal				16.00	12	W.S	16.00	Weathered Rock
		12	00				N>100								
7															-DO-
8		14	00	DB			Hammer Refusal				18.00	13	W.S	18.00	
		14	25				N>100								
9															-DO-
							Hammer Refusal				20.00	14	W.S	20.00	
0		15	30	DB											
		17	30												

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	S. STEPHENRAJ	PROJECT SITE DETAILS	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		GROUND LEVEL (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	27/03/2023	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.	11
PAGE No.	03
DIA OF BORE HOLE	150mm ✓ / 100mm
BORE START DATE	25/03/2022
BORE END DATE	28/03/2022
TOTAL DRILLING DAYS	

PROJECT NAME	BRIDGE – TVS MOUNT ROAD				
LOCATION		MACHINE No.		CHAINAGE (m)	
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N
JOB CODE		FLUSHING MEDIUM	Bentonite		E

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Geotechnical Description
0		17	35												
		18	15				Hammer Reboun								
1		9	00								21		WS	21.0	Hard Rock
		10	30		60	07								TO	
											22.5		CS	22.50	
2															
3														22.80	Hard Rock
		11	00		67	07							CS	TO	
		12	30								24.0			24.0	
4															One Boulder Encountered
5	Bore hole Terminated at 24.0														
6															
7															
8															
9															
0															

CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	S. STEPHEN RAJ
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	28/03/2022
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE	

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

GEOMARINE
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SITE INVESTIGATION RECORD

BORE HOLE No. 12
PAGE No. 01
DIA OF BORE HOLE 150mm ✓ / 100mm
BORE START DATE 29/03/2023
BORE END DATE 30/03/2023
TOTAL DRILLING DAYS

PROJECT NAME: BRIGADE – TVS – MOUNT ROAD
LOCATION
STRUCTURE
JOB CODE
MACHINE No.
DRILLING METHOD: Rotary
FLUSHING MEDIUM: Bentonite
CHAINAGE (m)
CO-ORDINATES: N, E

Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	15-30	30-45	SPT 'N' Value	Sample Details: Depth	No.	Type	Layer Data: Depth (m)	Geotechnical Description
1	29.03.2023	12	00	DB			5	6	7	13	1.25	1	SPT	1.25	Brownish silty Sandy clay
		12	01												
2		12	23				2	4	5	9	2.0	2		2.0	Brownish Fine Sand
		12	25												
3		12	41				3	2	2	4	3.0	3		3.0	Brownish loose Sand
		12	43												
4		12	45				2	3	3	6	4.0	4		4.0	-DO-
		12	46												
5		14	30				4	6	7	13	5.0	5		5.0	Greyish Sand with Clay binds
		14	32												
6	30.03.2023	14	30				14	14	17	41	6.0	6		6.0	Greyish Dense silty Sand
		14	32												
7															
8		14	40				18	23	25	48	7.50	7		7.5	-DO-
		14	43												
9		15	10				13	16	17	33	9.0	8		9.0	Greyish dense silty Fine Sand
		15	12												
0															

SOIL WET SAMPLE

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: SIGTRISHENRAJ
SIGNATURE
DATE: 29/03/2023
CLIENT IN-CHARGE

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

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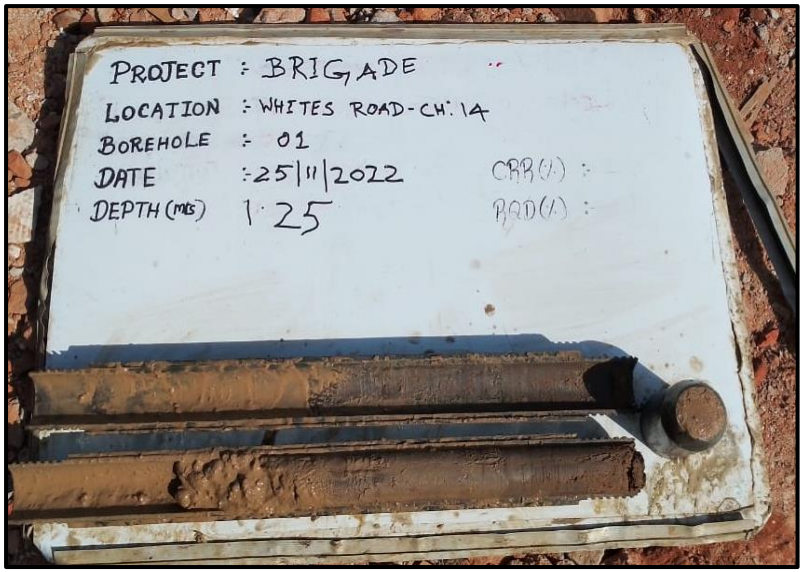
SITE INVESTIGATION RECORD

BORE HOLE No.	12
PAGE No.	02
DIA OF BORE HOLE	150mm ✓ / 100mm
BORE START DATE	29/03/2023
BORE END DATE	30/03/2023
TOTAL DRILLING DAYS	

PROJECT NAME	BRIGADE — TVS - MOUNT ROAD						
LOCATION		MACHINE No.		CHAINAGE (m)			
STRUCTURE		DRILLING METHOD	Rotary	CO-ORDINATES	N		
JOB CODE		FLUSHING MEDIUM	Bentonite		E		

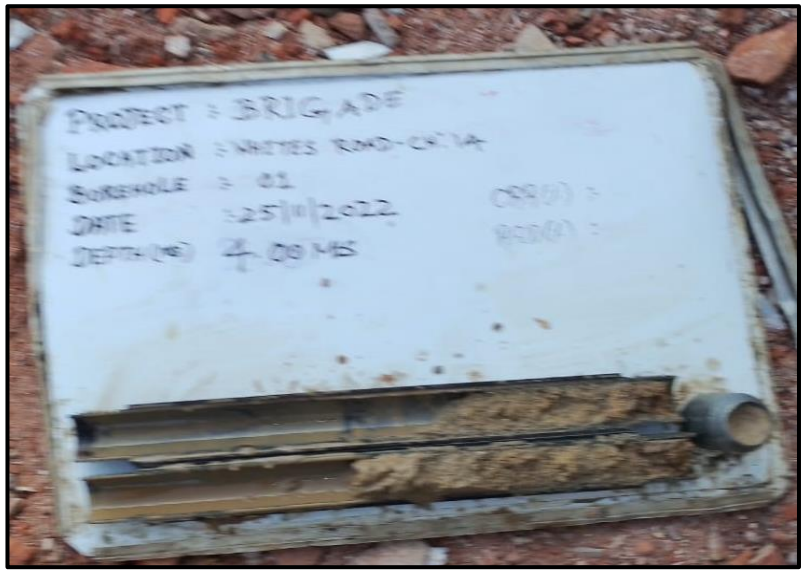
Depth below E.G.L. (m)	Drilling progress per metre: Date	Time: Hr.	Time: Min	Type of Drill Bit (SC / TCB / DB)	Core Details: Total Core Recovery %	Core Details: R.Q.D %	SPT Details: Blows/cm. 0-15	SPT Details: Blows/cm. 15-30	SPT Details: Blows/cm. 30-45	SPT 'N' Value	Sample Details: Depth	Sample Details: No.	Sample Details: Type	Layer Data: Depth (m)	Layer Data: Geotechnical Description
0		15	35	SC			14	26	35	61	10.50	9	S.S.	10.50	Grayish Very Dense Cemented Sand
1		15	38												
2		16	10	SC			63	48	Hammer Refusal N>100		12.00	10	SS	12.00	Greenish Soft Rock
3		16	13												
4		16	35	SC			Hammer Refusal N>100				14.0	11	W.S.	14.0	Gray, Brown weathered Rock
5		17	00												
6		9	00	SC			Hammer Refusal N>100				16.0	12	W.S.	16.0	-DO-
7		10	00												
8		10	25	DB			Hammer Refusal N>100				17.50	13	W.S.	17.50	-DO-
9		10	15												
10		10	30	DB							17.50 19.0			20.0	Greyish Hard Rock
11		13	00												
12		14	00	DB							19.0 20.50			20.50	-DO-
13		15	45												
14		Bore Hole Terminated at 10.50													Below the Ground level

				PROJECT SITE DETAILS	
CS - Core Sample	DS - Disturbed Sample	SUPERVISOR NAME	S. STEPHEN RAJ	GROUND LEVEL (m)	
SS - Split Spoon Sample	SC - Soil Cutter	SIGNATURE		WATER TABLE (m)	
UDS-Undisturbed Sample	TCB - Tungsten Carbide Bit	DATE	30/03/2023	CASING DEPTH (m)	
WS - Wash Sample	DB - Diamond Bit	CLIENT IN-CHARGE			

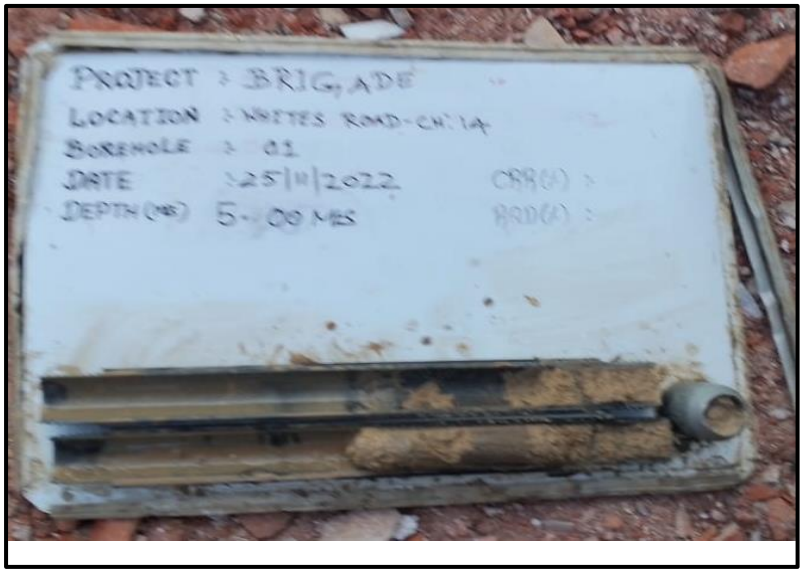

PROJECT : BRIGADE
LOCATION : WHITES ROAD-CH: 14
BOREHOLE : 01
DATE :25/11/2022
DEPTH (mts) 1.25
CBR(%) :
BRD(%) :


PROJECT : BRIGADE
LOCATION : WHITES ROAD-CH: 14
BOREHOLE : 01
DATE :25/11/2022
DEPTH (mts) 2.0
CBR(%) :
BRD(%) :


PROJECT : BRIGADE
LOCATION : WHITES ROAD-CH: 14
BOREHOLE : 01
DATE :25/11/2022
DEPTH (mts)
3.0
CBR(%) :
BRD(%) :


PROJECT : BRIGADE
LOCATION : WHITES ROAD-CH: 14
BOREHOLE : 01
DATE :25/11/2022

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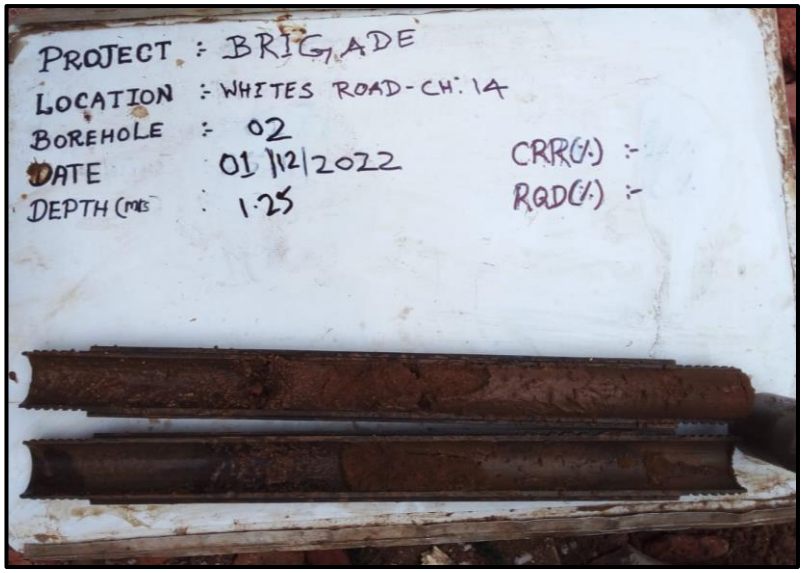


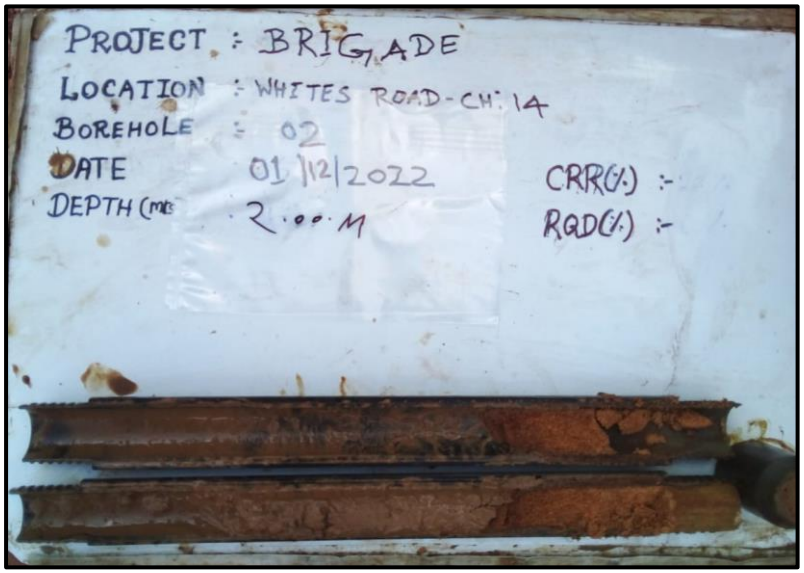




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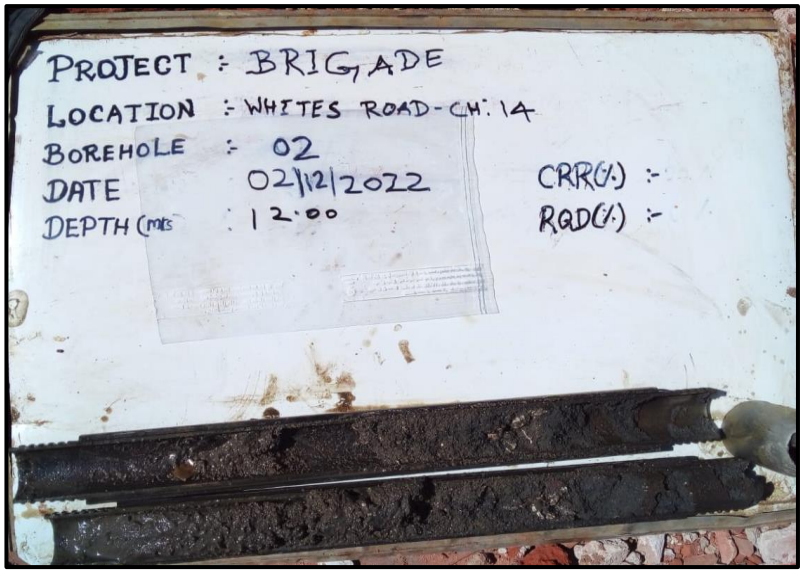




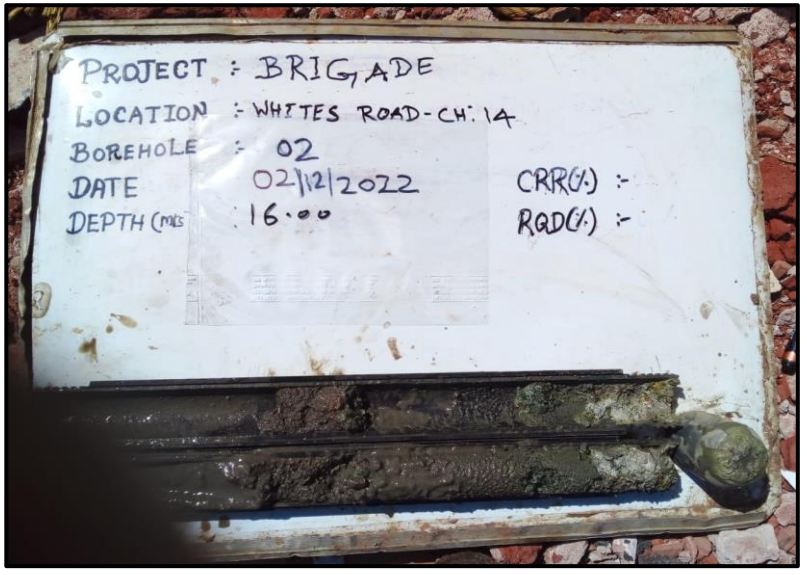


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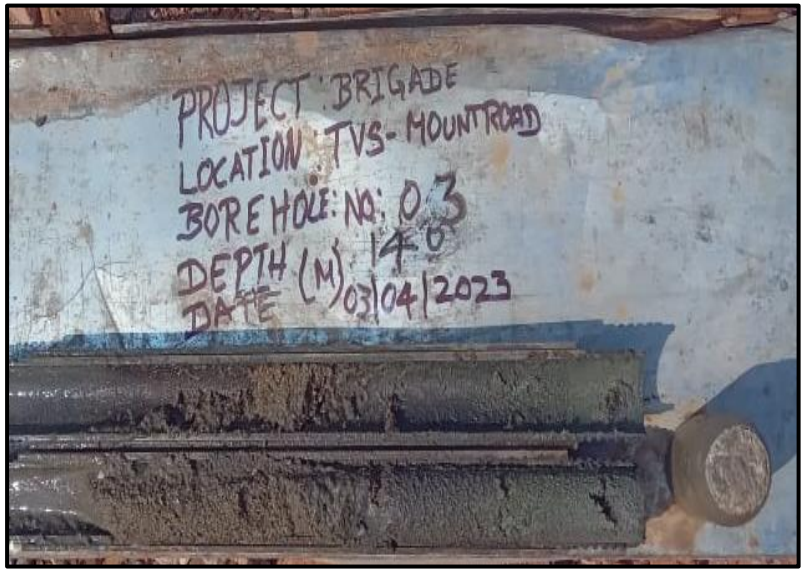




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PROJECT : TVSI - BRIGADE
LOCATION : MOUNT ROAD
BORE NO : 04
DATE : 23-03-2023
DEPTH : (M) 2.0


PROJECT : TVSI - BRIGADE
LOCATION : MOUNT ROAD
BORE NO : 04
DATE : 23-03-2023
DEPTH : (M) 3.0


PROJECT : TVSI - BRIGADE
LOCATION : MOUNT ROAD
BORE NO : 04
DATE : 23-03-2023
DEPTH : (M) 4.0


PROJECT : TVSI - BRIGADE
LOCATION : MOUNT ROAD
BORE NO : 04
DATE : 23-03-2023
DEPTH : (M) 5.0

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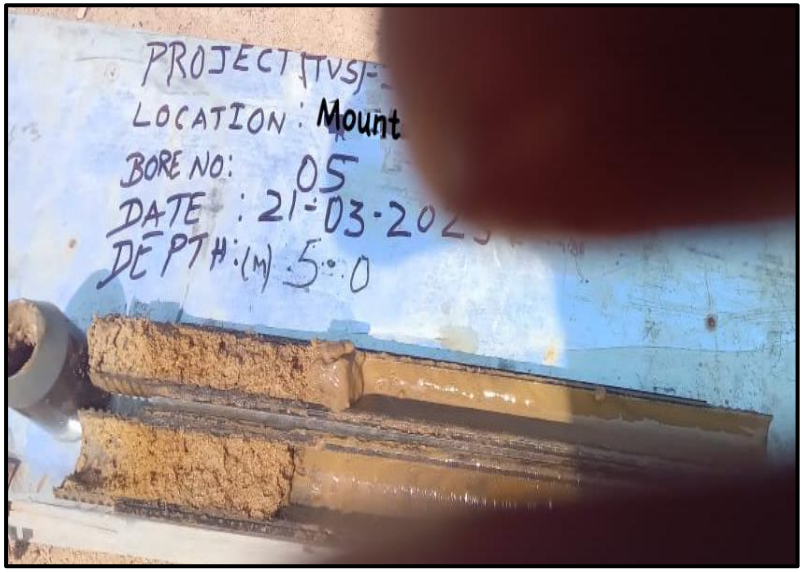







PROJECT (TVS)-3RL GADE
LOCATION : Mount road
BORE NO: 05
DATE : 21-03-2023
DEPTH:(M) 3.0


PROJECT (TVS)-3RL GADE
LOCATION : Mount road
BORE NO: 05
DATE : 21-03-2023
DEPTH:(M) 4.0


LOCATION : Mount
BORE NO: 05
DEPTH:(M) 5.0


PROJECT (TVS)-3RL GADE
LOCATION : Mount road
BORE NO: 05
DATE : 21-03-2023
DEPTH:(M) 7.50

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BRIMADE
MOUTROAD
BH: 6
DEPTH-(m) .50M

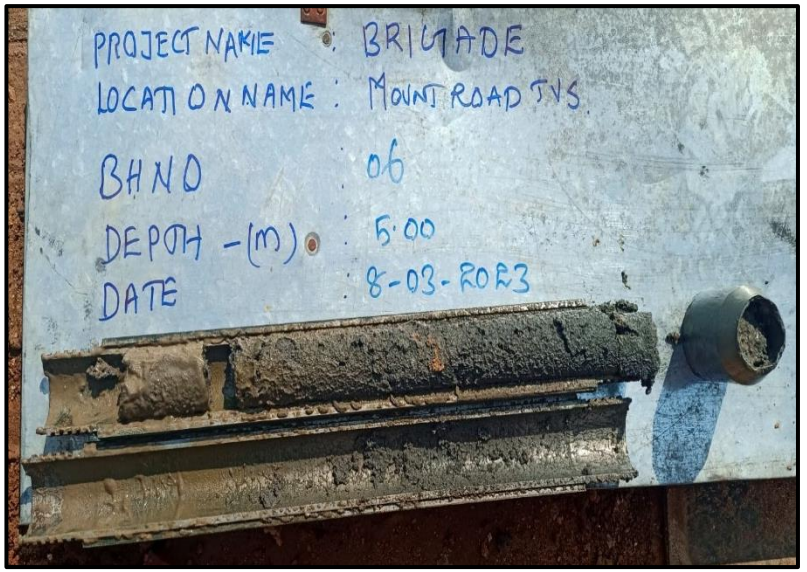

BRIMADE
MOUTROAD
BH: 6
DEPTH-(m) 1.25 M

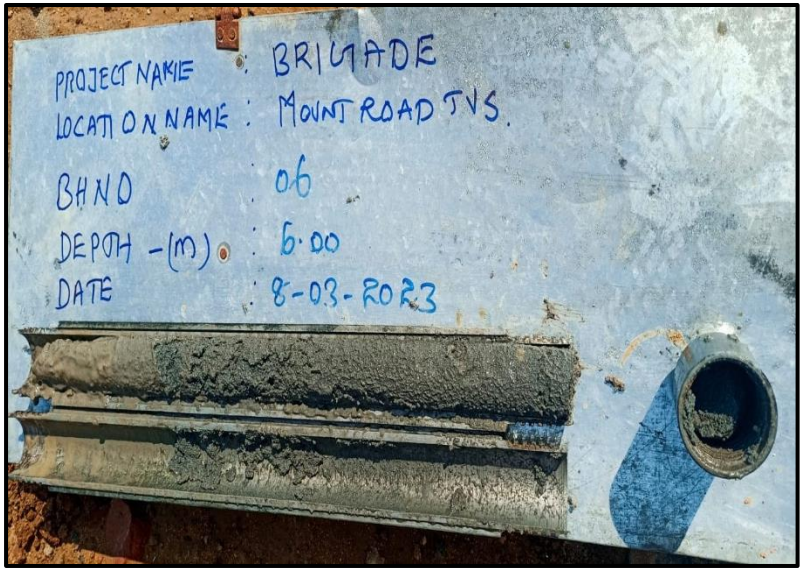

BRIMADE
MOUTROAD
BH: 6
DEPTH-(m) 2.50M


BRIMADE
MOUTROAD
BH: 6
DEPTH-(m) 3.50M

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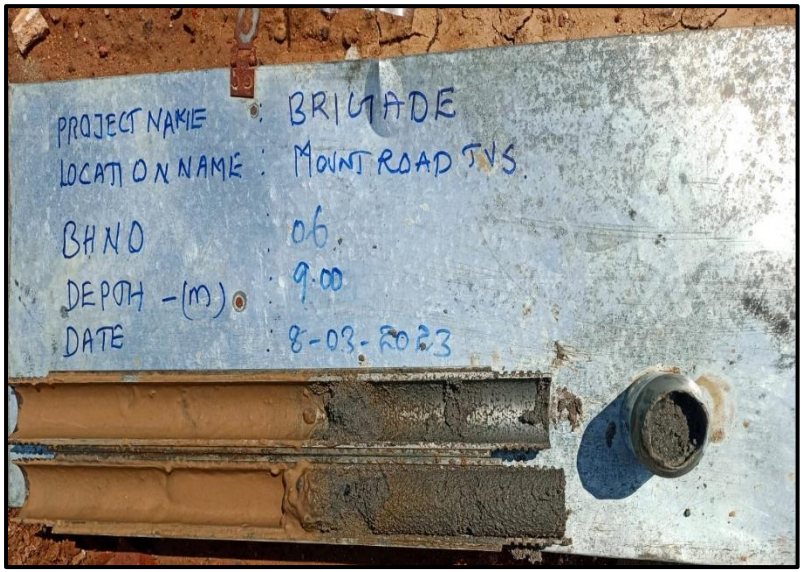








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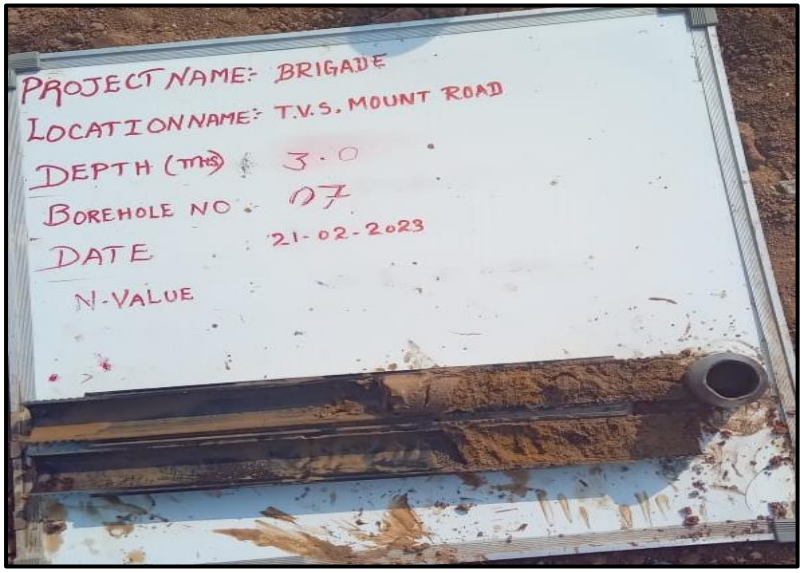




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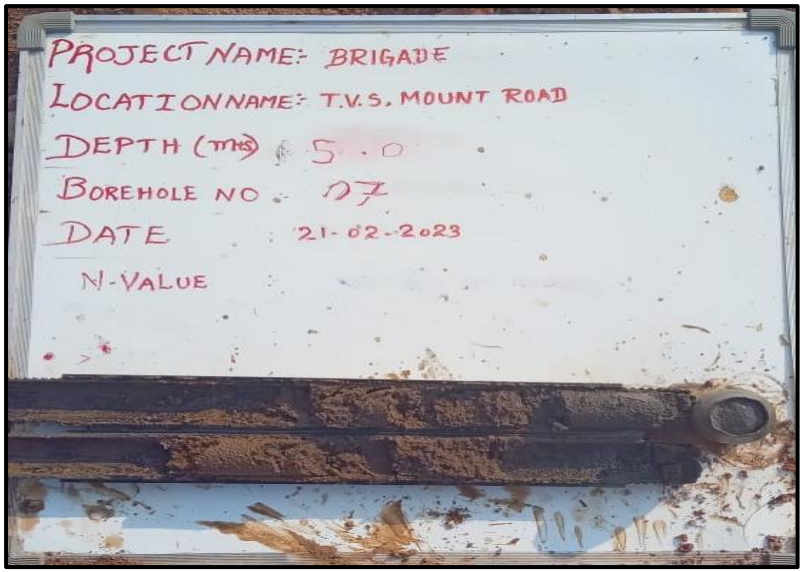


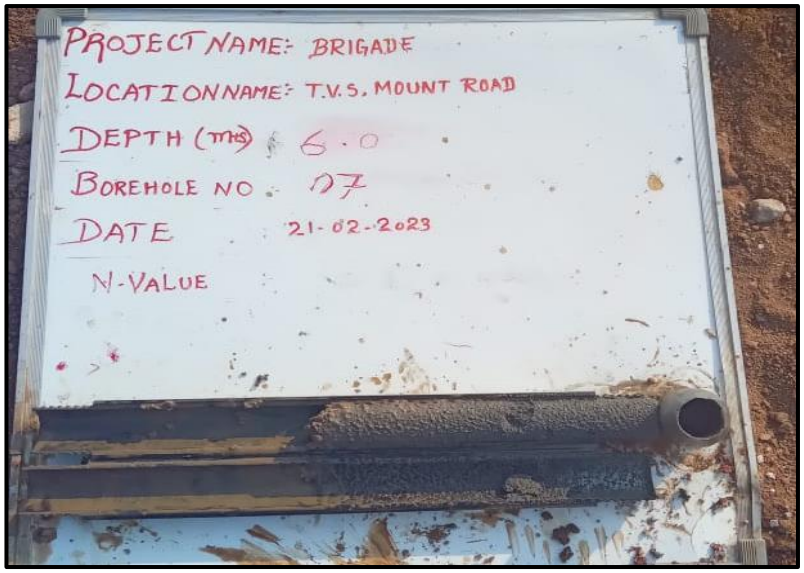




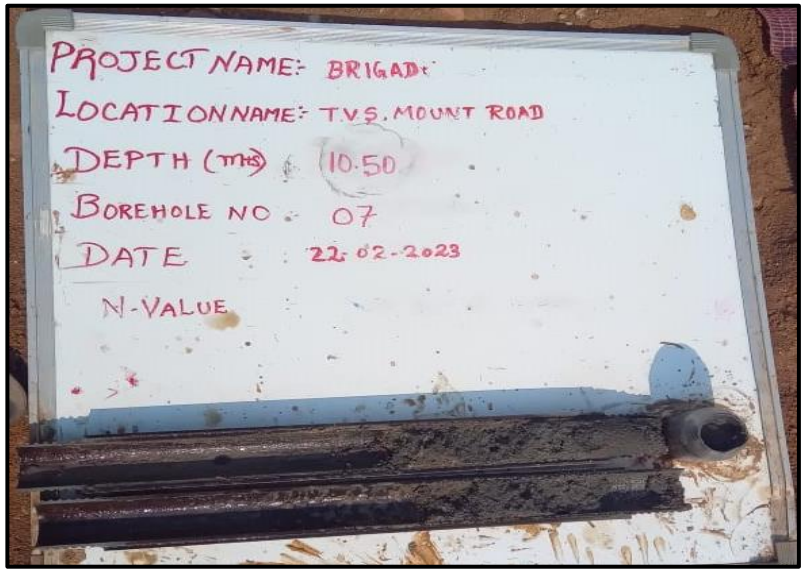


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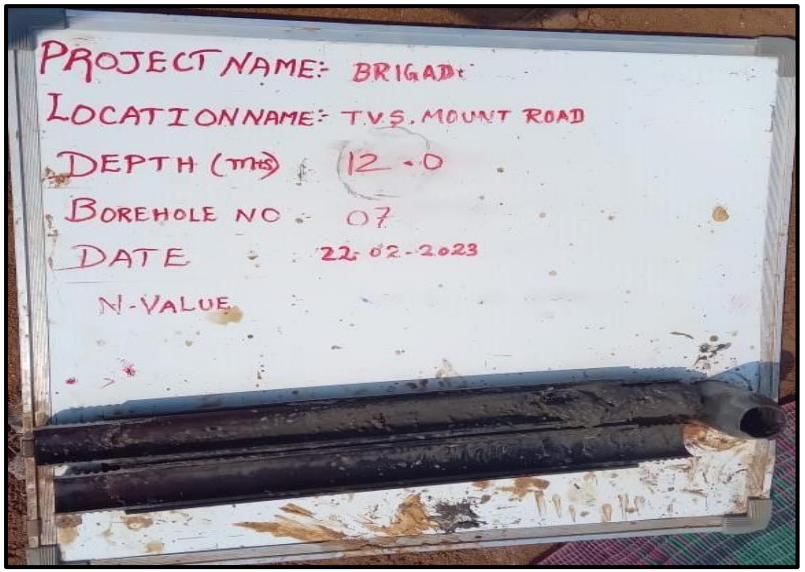




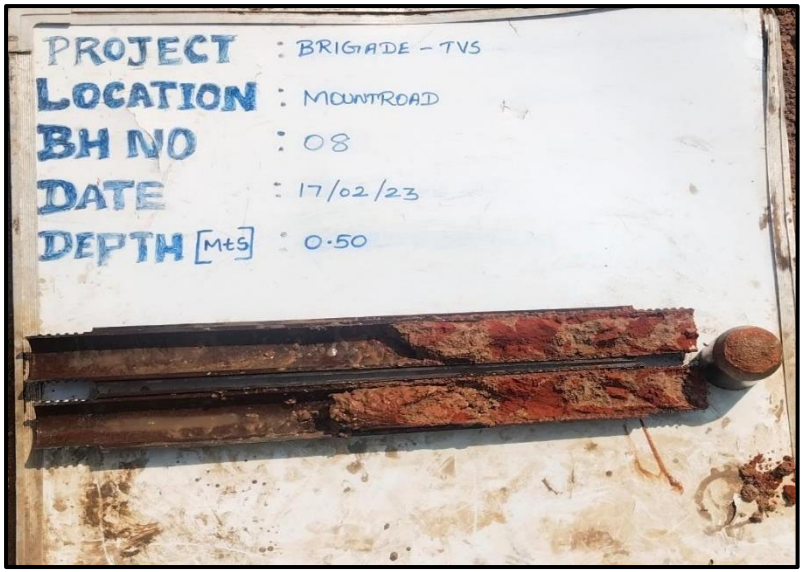


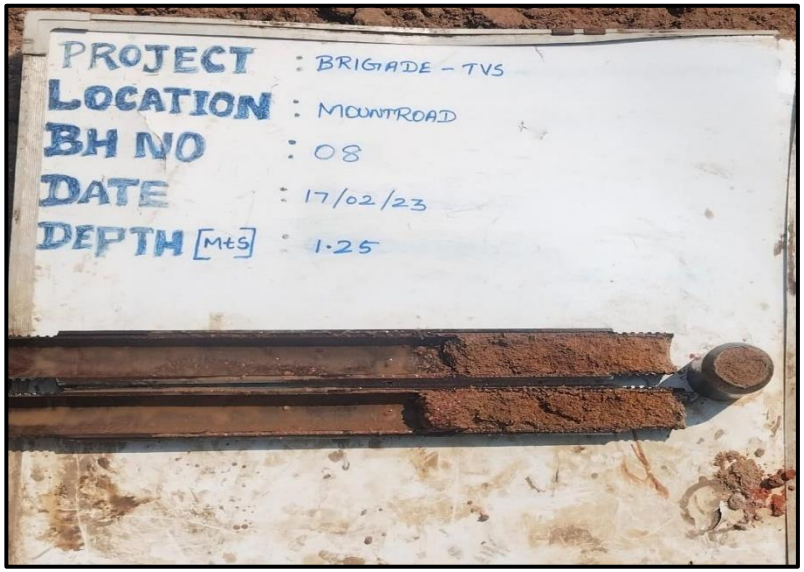


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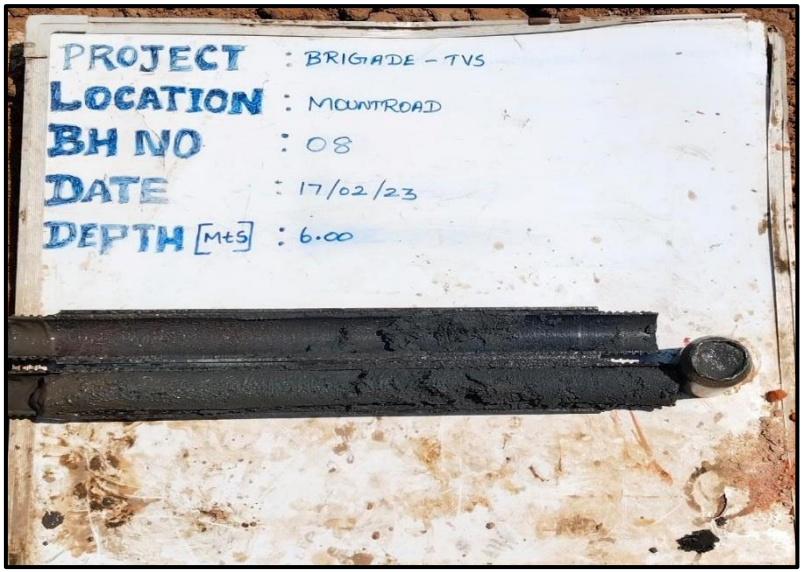






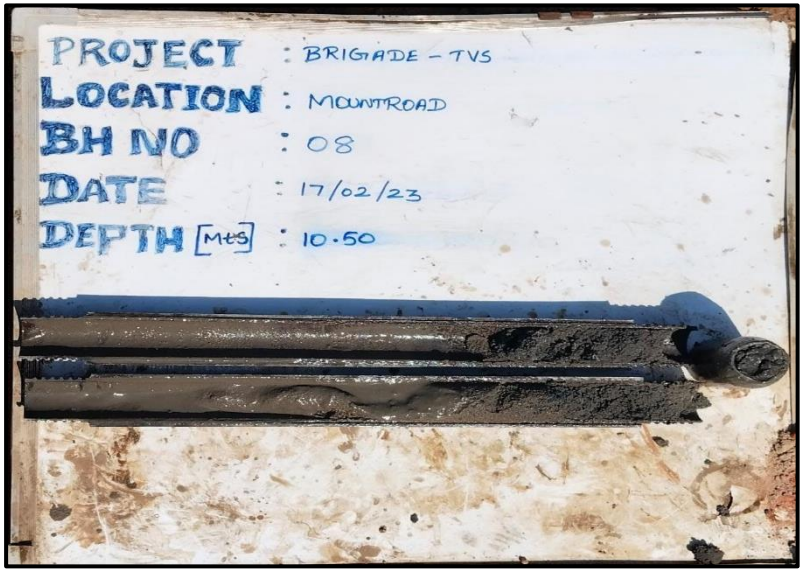


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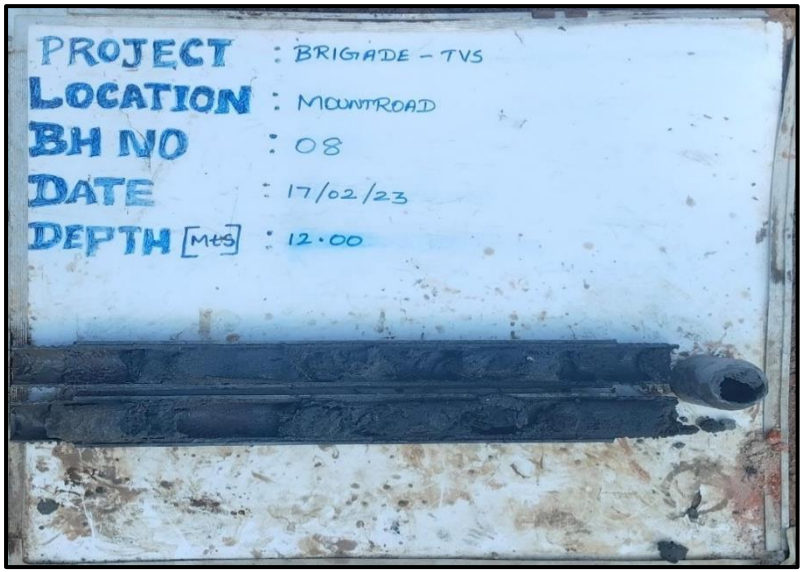








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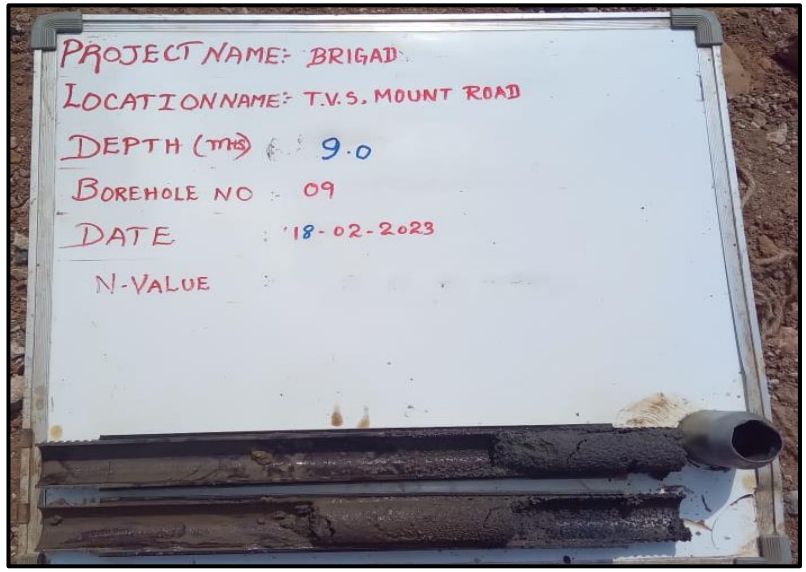


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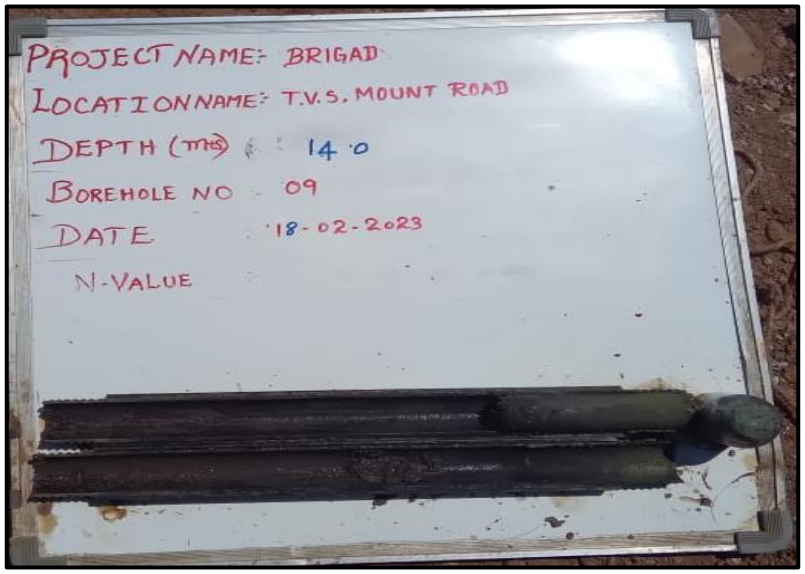


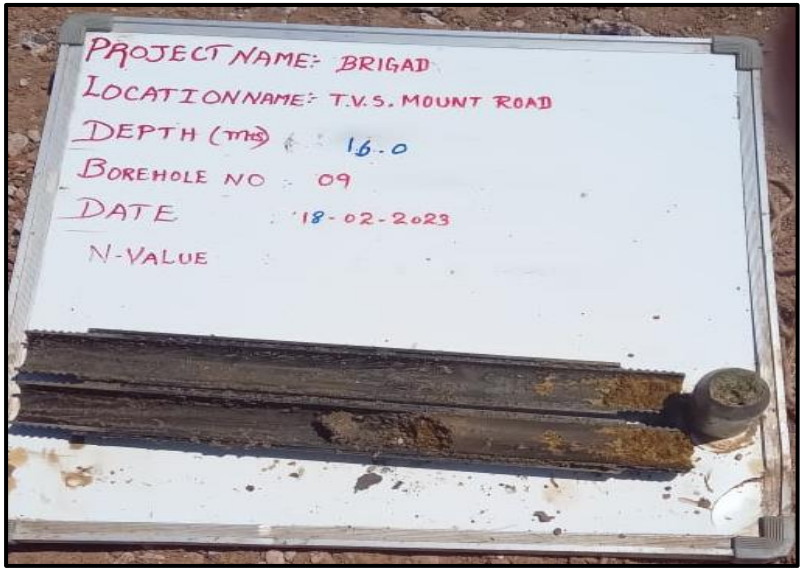




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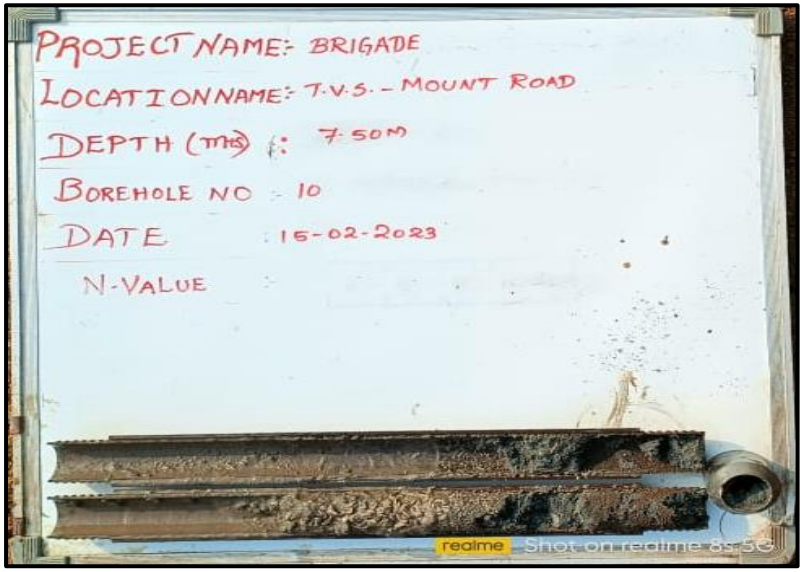


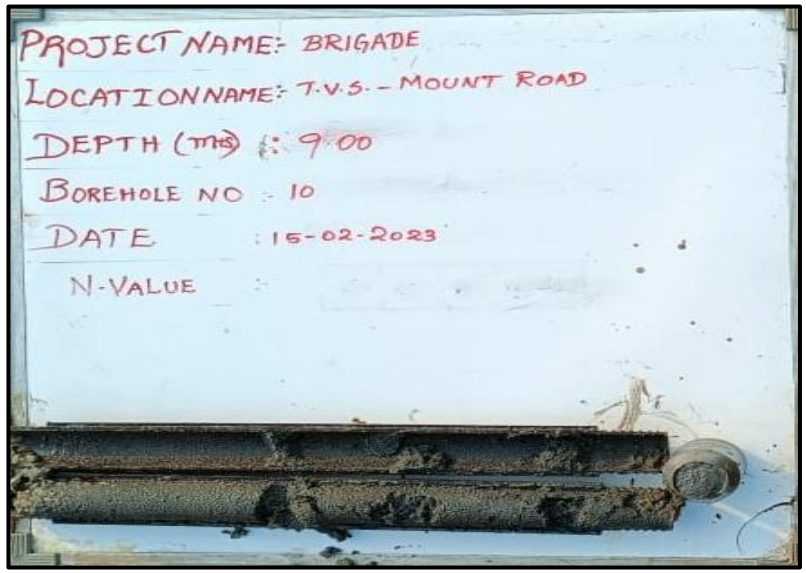


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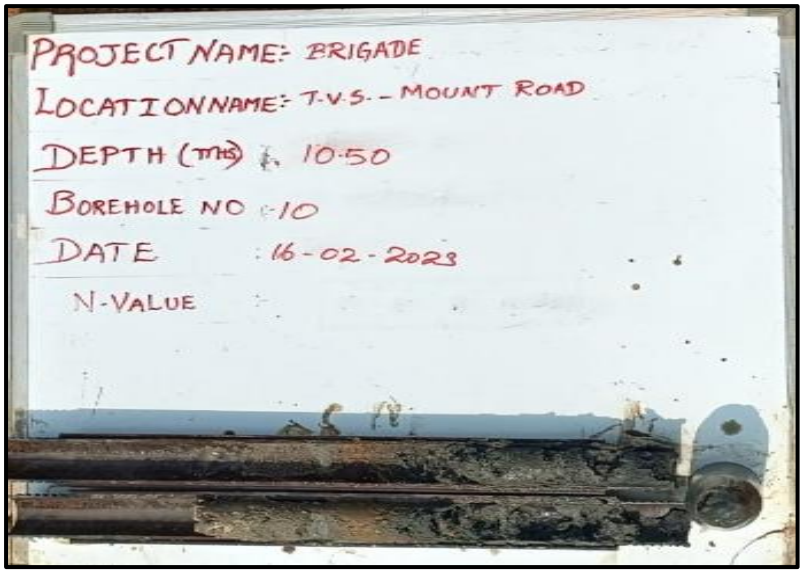






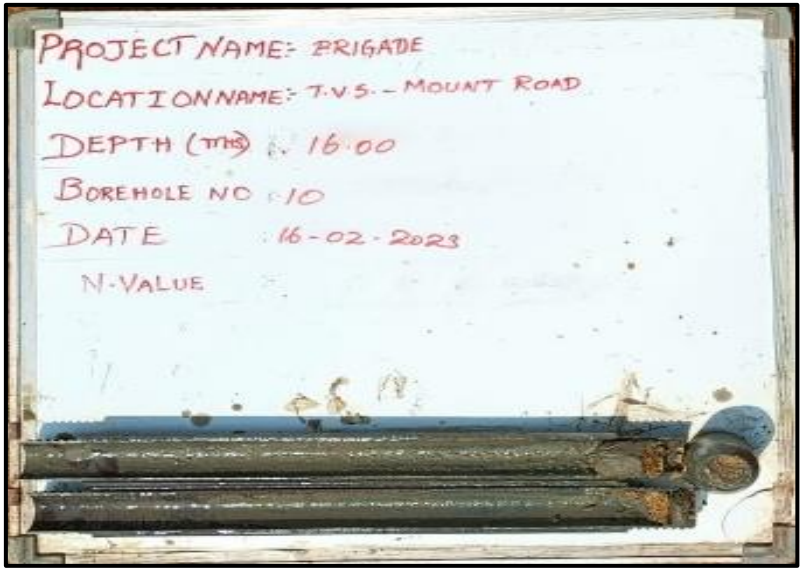


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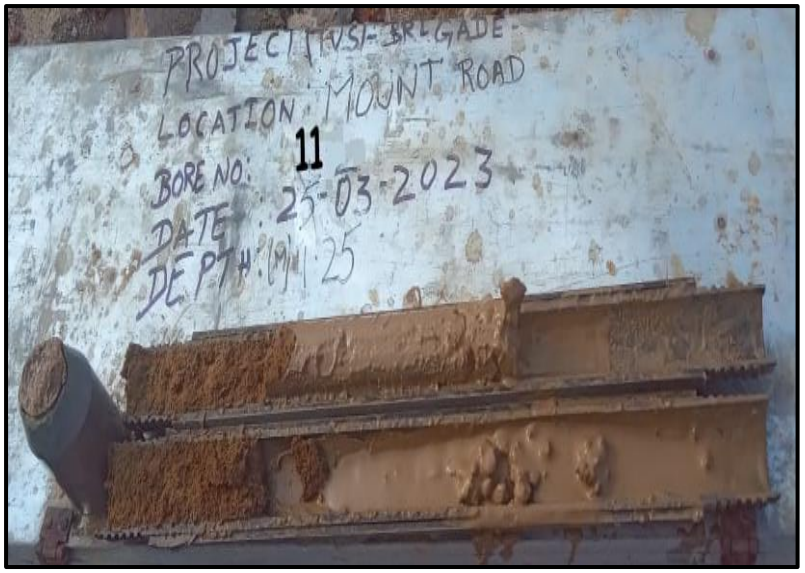








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PROJECT: TVSI-BRIGADE
LOCATION: MOUNT ROAD
BORE NO: 11
DATE: 27-03-2023
DEPTH: (M) 6.0


PROJECT: TVSI-BRIGADE
LOCATION: MOUNT ROAD
BORE NO: 11
DATE: 27-03-2023
DEPTH: (M) 7.50


PROJECT: TVSI-BRIGADE
LOCATION: MOUNT ROAD
BORE NO: 11
DATE: 27-03-2023
DEPTH: (M) 9.0


PROJECT: TVSI-BRIGADE
LOCATION: MOUNT ROAD
BORE NO: 11
DATE: 27-03-2023
DEPTH: (M) 12.0

GEO MARINE
THE SPIRIT OF ENGINEERING









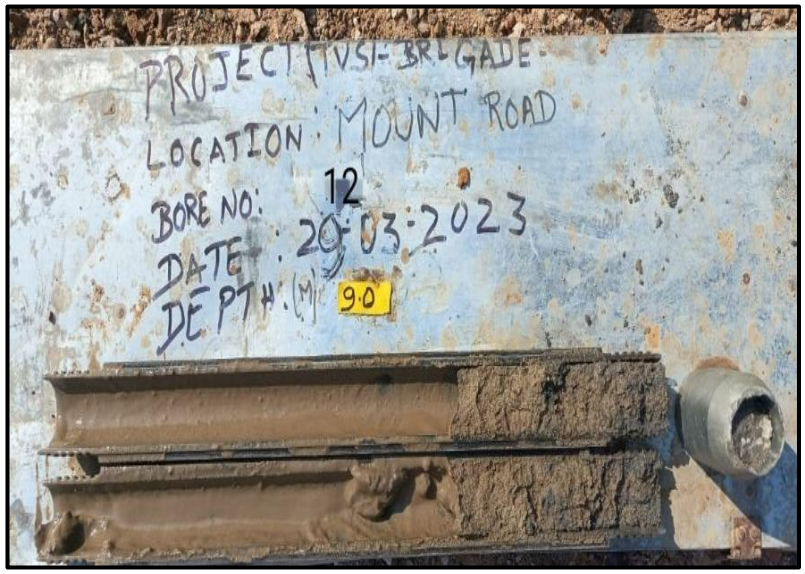

PROJECT : VSI-BRIDGE
LOCATION : MOUNT ROAD
BORE NO: 12
DATE : 20-03-2023
DEPTH : (M) 3.0


PROJECT : VSI-BRIDGE
LOCATION : MOUNT ROAD
BORE NO: 12
DATE : 20-03-2023
DEPTH : (M) 4.0


PROJECT : VSI-BRIDGE
LOCATION : MOUNT ROAD
BORE NO: 12
DATE : 20-03-2023
DEPTH : (M) 5.0


PROJECT : VSI-BRIDGE
LOCATION : MOUNT ROAD
BORE NO: 12
DATE : 20-03-2023
DEPTH : (M) 6.0


PROJECT : TVSI-BRIGADE
LOCATION : MOUNT ROAD
BORE NO: 12
DATE : 29.03.2023
DEPTH (M) 7.50


PROJECT : TVSI-BRIGADE
LOCATION : MOUNT ROAD
BORE NO: 12
DATE : 29.03.2023
DEPTH (M) 9.0

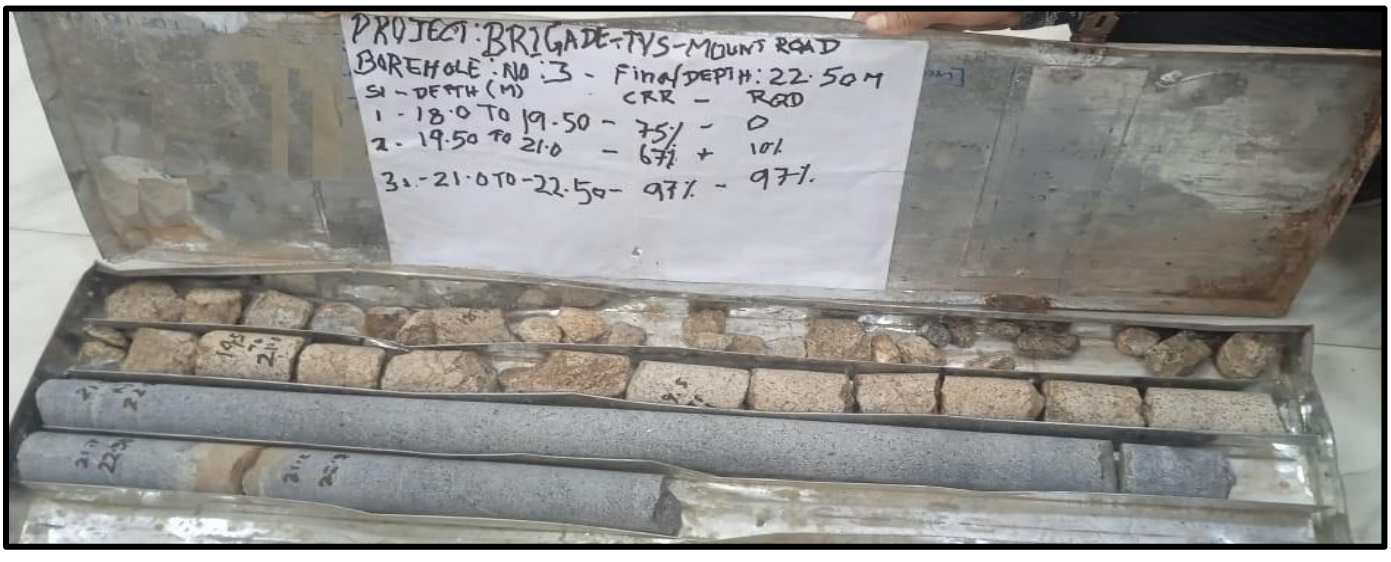

PROJECT : TVSI-BRIGADE
LOCATION : MOUNT ROAD
BORE NO: 12
DATE : 29.03.2023
DEPTH (M) 10.50


PROJECT : TVSI-BRIGADE
LOCATION : MOUNT ROAD
BORE NO: 12
DATE : 29.03.2023
DEPTH (M) 12.0

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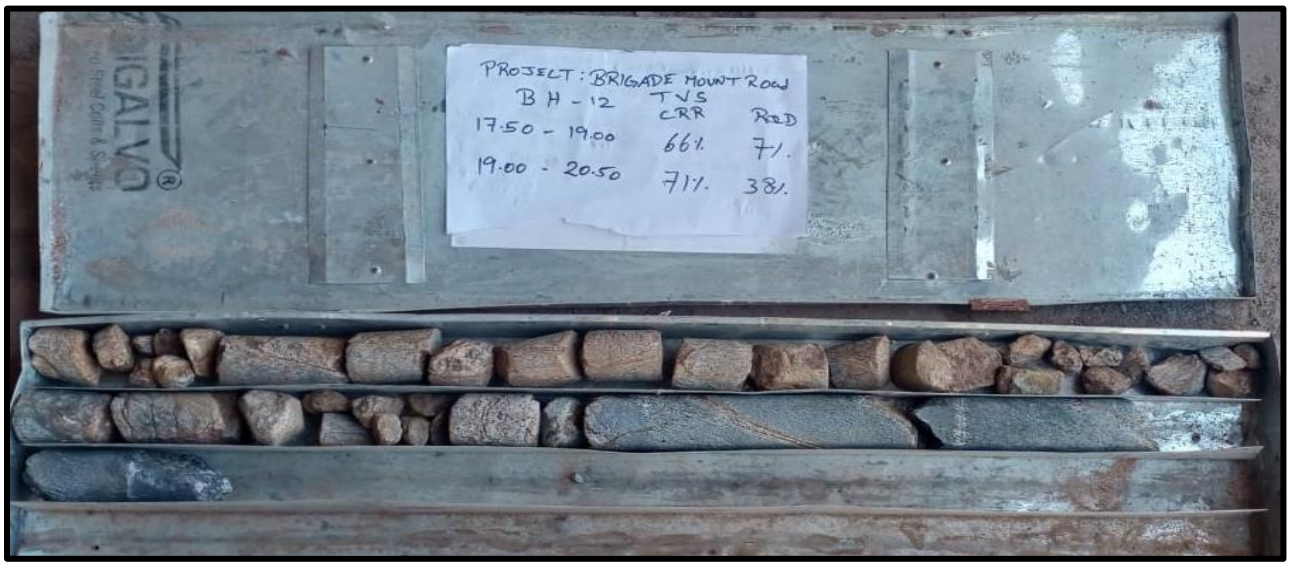







BRIGADE -TVS MOUNT ROAD
DEPTH BH 10 CRR RQD
1. 17.0 to 18.50 16% 0%
2. 18.50 to 20.0 0% 0%
3. 20.0 to 21.50 40% 0%
4. 21.50 to 23.00 43% 0%
5 23.0 to 24.50 91% 63%
6 24.50 to 26.0 95% 95%


BRIGADE TVS MOUNT ROAD
BH-17 CRR RQD
21.00 - 22.50 60% 7%
22.50 - 24.00 67% 7%


PROJECT: BRIGADE MOUNT ROAD
BH - 12 TVS CRR RQD
17.50 - 19.00 66% 7%
19.00 - 20.50 71% 38%





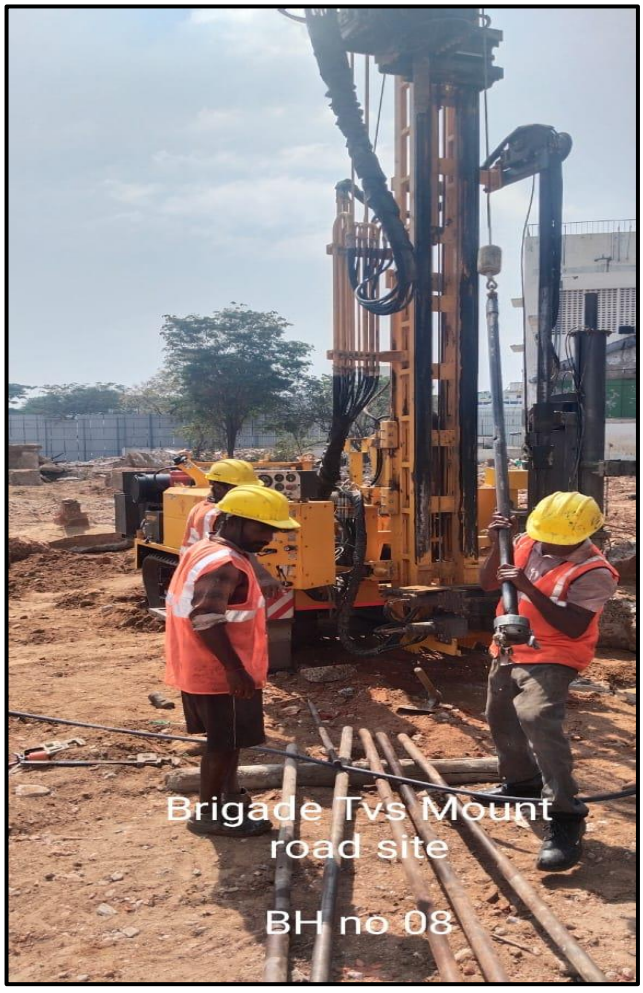

HITACHI




HR.C1






Brigade Tvs Mount
road site
BH no 08




realme Shot on realme 8s 5G







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NRI & Investment Services

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Compliance & Special Services

Demolition, Vaasthu checks, regularization of unauthorized buildings, and office space solutions.



empowering your real estate decisions with smart tools

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Encumbrance Certificate (EC) Search, Find Your SRO, Temple Property Check, WAQF Property Check, View Patta/Chitta, View FMB, Patta Analyzer, EC Analyzer

Zoning & Land Use Analysis

Land Use Zone Finder, CRZ Zone Check, Aquifer Zone Check, CBA Check, EWS Check, Road Width Check, Proposed Road Widening Check, FSI Calculator

Property Documentation & Workflow Tools

Forms & Templates, Document Generator, Document Translation, Dictionary

Vastu & Property Management Tools

Home Vastu Shastra, Plot Vastu Shastra, Property Management

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