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GEOTECHNICAL INVESTIGATION REPORT

REPORT NO: -GEO-45/2023-24 **DATE: -06.10 2023 & 07.10.2023**

PROJECT NAME: -

GEOTECHNICAL INVESTIGATION FOR THE PROPOSED CONSTRUCTION OF APARTMENT BUILDING (STILT+GROUND+4 FLOOR) IN D.NO: -49, S.F.NO: -99, WARD NO: -H (8), BLOCK NO: -03, WEST PERIYASAMY ROAD, R.S. PURAM, COIMBATORE DISTRICT.

CLIENT: -

Mr.K.SANTHANAM & K.KRISHNAMOORTHY,

WEST PERIYASAMY ROAD, R.S. PURAM, COIMBATORE DISTRICT.

SUNSTAR FOUNDATION CONSULTANT

(Civil Engineering Consultant & Contractor)

Topographical Surveying, Soil Investigation, Pile Load Test, Plate Load Test, Rock Core Drilling, Earth Resistivity & Laboratory Material Testing

(An ISO 9001: 2015 Certified laboratory)

No: -15/16, First Floor, Kasthuribai 4th Street, Ganapathy, Coimbatore-641006.

Mob: -+91-8300404680,8300404681, E-mail: -sunstarfoundationconsultant@gmail.com

www.sunstarfoundationconsultant.com

S.NO	LIST OF CONTENT	PAGE NO
1	**INTRODUCTION**	3
2	**SCOPE OF WORK**	3
3	**DISCRIPTION OF THE SITE**	3
4	**FIELD EXPLORATION PROCEDURES**	
	4.1. Advancing Bore Hole	4
	4.2. Standard Penetration Test	4
	4.3. Collection of Samples	5
5	**LABORATORY TEST ON SOIL AND ROCK SAMPLES**	5
6	**DISCUSSION ON FOUNDATION**	
	6.1. Subsurface Conditions	5
	6.2. Engineering Appraisal	6
	6.3. Design of Methodology	6
7	**FOUNDATION RECOMMENDATION**	7
8	**BIS CODE & REFERENCES**	8
9	**ANNEXURE**	
	9.1. Field Bore logs	9 – 10
	9.2. Laboratory Test Results	11 – 12
	9.3. Soil Profile Curve	13
	9.4. Site Photos	14

SUNSTAR FOUNDATION CONSULTANT CBE 641006

1.INTRODUCTION: -

Mr.R.Sivaraman,West TV Samy Road, R.S. Puram, Coimbatore District has entrusted the work of conducting geotechnical investigations at structures locations pertaining to geotechnical investigation for The Proposed Construction of Apartment Building (Stilt+Ground+4 Floor) in D.No: -49, S.F.No: -99, Ward No: -H (8), Block No: -03, West Periyasamy Road, R.S. Puram,Coimbatore District was awarded to M/s.Sunstar Foundation Consultant. This report presents results of the geotechnical investigation along with foundation recommendations for the proposed structure.

2. SCOPE OF WORK: -

- Conducting Geotechnical Investigation along with suitable foundation recommendation for the proposed structure.
- Determine the soil profile at the site with ground water level observation.
- Conducting SPT's at regular depth intervals.
- Collecting Disturbed Soil (DS) Samples.
- Conducting relevant laboratory tests on Soil samples.
- Submitting report with field observations, laboratory test results along with recommendations and safe bearing pressure at foundations level.

In this report, preliminary details of sub-soil layers encountered, brief account of the strength of the strata based on the field tests, discussion on foundation options and recommendations for foundations are presented.

3. DISCRIPTION OF THE SITE: -

Based on boreholes information, sub surface profile for geotechnical investigation for The Proposed Construction of Apartment Building (Stilt+Ground+4 Floor) in D.No: -49, S.F.No: -99, Ward No: -H (8), Block No: -03, West Periyasamy Road, R.S. Puram,Coimbatore District was the area where the tests were conducted for the borehole locations-1&2 fairly level area with respect to surroundings.

4. FIELD EXPLORATION PROCEDURES: -

4.1. Drilling in Overburden: -

Rotary drilling machines were mobilized and drilling operation was taken up. 150mm diameter boreholes were made at pre-determined locations and the boreholes were advanced up-to varying depths. The drilling was commenced by driving a casing of suitable diameter in the upper layers of the bore holes. Drilling was carried out as per IS 1892 -1979.In this method, boring is effected by the cutting action of a rotating bit that is kept in firm contact with the bottom of the hole. The bit is attached to the lower end of a hollow drill rod that is rotated by a suitable chuck. Drilling mud (usually Bentonite) is continuously forced down the hollow drill rods. The mud returning upwards though the annular space between the drill rods and the side of the hold bring the cutting to the surface. As stated earlier, the boreholes are terminated after sufficiently advancing in hard strata.

4.2. Standard Penetration Test: -

Standard Penetration Tests (SPT) were conducted as per IS 2131-1981. In a SPT test, a standard split spoon sampler is driven at the bottom of the borehole. The penetration resistance in terms of blows for 300mm penetration of the split spoon sampler is measured as 'N' Value. The blows are imparted by a standard weight of 63.5 kg falling through a height of 750 mm. The resistance is measured for 150 mm, 300 mm, and 450 mm penetrations. The resistance of first 150 mm is ignored since those blows are considered as seating blows due to the loosening of the strata. The resistance of next 300 mm is recorded as standard penetration value 'N'. If the sampler is driven less than 450 mm (total) then the penetration resistance is given for the last 300 mm of penetration. If the penetration depth is less than 300 mm and the blow count is more than 50 then the 'N' value is considered as 'Refusal' and actual penetration is recorded with the blows. These tests were conducted at close intervals of 1.50m depth intervals at shallow depths. Disturbed Soil (DS) collected in the SPT sampler was

preserved in polythene covers and transported to the laboratory. One more polythene cover was provided to prevent the loss of moisture during the transit period.

4.3. Collection of Samples: -

Soil samples were collected through Split spoon, In Rock strata, rock coring was done using N_x size diamond bits, using single tube core barrel and drilling in rock was done up to bore hole termination level.

5. LABORATORY TEST SOIL AND ROCK SAMPLES: -

Following laboratory tests are conducted on the soil and rock samples

- Natural moisture content, wet density & dry density
- Atterberg's Limit
- Sieve Analysis
- Specific Gravity
- Shear Test Parameters

6. DISCUSSION ON FOUNDATION: -

6.1. Sub surface Conditions: -

Subsurface profile at this site generally consists of top filling soil then low plastic clay then silty gravel with kankar then gravelly sand underlain by soft disintegrated rock. Groundwater accumulation in boreholes was monitored during and after completion of drilling activities. Ground water was observed in borehole up to drilled depth not met below ground surface. Seasonal and annual fluctuations in ground water levels can be expected.

6.2. Engineering Appraisal: -

Based on field and laboratory results on the samples collected from investigation locations, the shear strength parameters such as c (cohesive strength) and φ (angle of internal friction) can be correlated with SPT 'N' values.

6.3. Design Methodology: -

The safe bearing capacity of the soil can be calculated on shear failure criteria and settlement criteria and any foundation system has to satisfy the above said criteria. The former one depends on shear strength and the bearing capacity equation suggested by IS 6403 as follows. Net ultimate bearing capacity is given by

$$C\ Nc\ Sc\ dc\ ic + \gamma\ D\ (Nq - 1)\ Sq\ dq\ \ iq + 0.5\ \gamma\ B\ \ N\gamma\ S\gamma\ d\gamma\ i\gamma\ W'$$

The safe bearing capacity is the maximum gross intensity of loading that the soil can carry safely without failing in shear which is obtained by the net ultimate bearing capacity divided by factor of safety (2.5 to 3.0).The later one follows settlement criteria, that the intensity of the loading will cause within the permissible settlement is termed as allowable bearing pressure given by correcting the field SPT 'N' values.

1. **Correction due to dilatancy (N').** This correction is based on the assumption that critical void ratio occurs at approximately N = 15, and in fine grained cohesionless soils, the coefficient of permeability is low that the excess pore water pressure developed by the driving impedes the penetration of split spoon sampler, thus increasing the N value.

$$N' = 15 + 0.5\ (N_O - 15)$$

2. **Correction due to overburden pressure**

$$N = 0.77\ N'\ Log_{10}\ (2000/\ P'_O)$$

P'o effective over burden pressure should be greater than 25 kpa

Net allowable bearing pressure developed by Taraghi and peck (1948)

$$Q_S\ = 3.5\ (N_{cor} - 3\ )\ (\ (B + 0.3)/\ 2B\ )^2\ R_{W2}\ F_D$$

The Allowable Bearing Pressure of Soil = Net Allowable Bearing Pressure of Soil + P'o

Where

N' = Corrected N value,

N'' = Corrected N value due to dilatancy

B = Size of the Footing = constant 1.80x1.80m

RW = Water Correction= constant 0.30m to 0.50m

FD = Depth of Factor,

P = Over Burden Pressure

7. FOUNDATION RECOMMENDATION: -

Based on the sub-soil conditions and possible loads on foundations, following recommendations for Geotechnical Investigation for The Proposed Construction of Apartment Building (Stilt+Ground+4 Floor) in D.No: -49, S.F.No: -99, Ward No: -H (8), Block No: -03, West Periyasamy Road, R.S. Puram, Coimbatore District.

- The **Isolated/Combined Footing** will be recommended for the proposed structure.
- Rest the Foundation depth at **2.70m to 3.00m** from the Existing Ground Level.
- The recommended SBC of **21.70 Ton/m^2 at 2.70m depth**. Its calculated based on SPT– 'N' values conducted inside the boreholes.
- In case, ground water table is encountered within recommended depth of foundation system, provision shall be made to continuously bail the water out of the foundation pits to keep the surfaces of pit consolidated dry. Excavated fine-grained soil shall be in no case used for back filling purposes.

Er M ANANDHAKUMAR, B.E., M.I.G.S.
Project Engineer
Sunstar Foundation Consultant

Er.M.ANANDHAKUMAR,B.E,M.I.G.S
Project Engineer,
Sunstar Foundation Consultant.

Dr E RAVI, M.E., Ph.D., F.I.E., F.I.G.S.
Chief GeoTechnical Consultant
Sunstar Foundation Consultant

Dr.E.RAVI,M.E.,Ph.D(Soil Mechanics).,F.I.E,F.I.G.S.,
Chief Geotechnical Consultant ,
Sunstar Foundation Consultant.

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8. BIS CODE & REFERENCES: -

S. NO	CODE NUMBERS	DESCRIPTION
1	IS 1888: 1982	Method of load tests on soils
2	IS 6403: 1981	Code of practice for Determination of Bearing capacity of foundation.
3	IS 1892: 1979	Code of practice for subsurface investigations for foundations.
4	IS 8009(Part-1&2) 1976	Code of practice for calculation of settlement of foundations
5	IS 2131: 1981	Method of standard penetration test for soils
6	IS 2132: 1986	Code of practice for thin-walled tube sampling of soils
7	IS 2720 PART 1 to PART 31 & IS 2720 PART 33 to PART 41	Methods of Test of Soils
8	IS 3043 :1987	Code of practice of Earthling
9	IS 4464: 1985	Code of practice for presentation of drilling information and core description in foundation investigation
10	IS 6935: 1973	Method of determination of water level in a borehole

9.1. FIELD BORELOG -1

NAME OF THE PROJECT: - "THE PROPOSED CONSTRUCTION OF APARTMENT BUILDING (STILT+GROUND+4 FLOOR) IN D.NO: -49, S.F.NO: -99, WARD NO: -H (8), BLOCK NO: -03, WEST PERIYASAMY ROAD, R.S. PURAM, COIMBATORE DISTRICT ."

TYPE OF BORING: -Rotary	GPS LOCATION	GROUND WATER TABLE: -Not Met
BOREHOLE: -BH-1	LATITUDE: 11^0 00'45.64''N	DATE OF STARTED: -06.10.2023
LOCATION: -1	LONGITUTE: 76^0 56'48.28" E	DATE OF COMPLETED: -06.10.2023

Depth below 'NGL' (m)	Soil profile	Description of Strata	Thickness of stratum (m)	Depth of samples collected (m)	SPT- 'N' Values Details				Type of samples collected	Relative Density/ Consistency	Graphical representation of SPT- 'N' Values				
					N1=15cm	N2=30cm	N3=45cm	N VALUE= N2+N3			20	40	60	80	100
0.00				0.00	-	-	-	-	-	-					
0.65		TOP FILLING SOIL	0.65												
0.90		LOW PLASTICITY OF CLAY SOIL	0.25												
1.30		CLAYEY GRAVEL (Weathered Kankar)	0.40	1.00	7	7	11	18	DS	Medium					
2.70		GRAVELLY SAND	1.40	2.00	18	27	50/9	>50	DS	V.Dense					
				2.70	50/5	-	-	>50	DS	V.Dense					
		SOFT DISINTEGRATED ROCK	5.30												
8.00		End of Borehole													

ROCK CORE RECOVERY DETAILS FROM 2.70M TO 8.00M DEPTH ENCLOSED THE PAGE NO: -11

9.1. FIELD BORELOG -2

NAME OF THE PROJECT: - "THE PROPOSED CONSTRUCTION OF APARTMENT BUILDING (STILT+GROUND+4 FLOOR) IN D.NO: -49, S.F.NO: -99, WARD NO: -H (8), BLOCK NO: -03, WEST PERIYASAMY ROAD, R.S. PURAM, COIMBATORE DISTRICT ."

TYPE OF BORING: -Rotary	GPS LOCATION	GROUND WATER TABLE: -Not Met
BOREHOLE: -BH-2	LATITUDE:11^0 00'45.17''N	DATE OF STARTED: -07.10.2023
LOCATION: -2	LONGITUTE:76^0 56'47.97" E	DATE OF COMPLETED: -07.10.2023

Depth below NGL (m)	Soil profile	Description of Strata	Thickness of stratum (m)	Depth of samples collected (m)	SPT- 'N' Values Details				Type of samples collected	Relative Density/ Consistency	Graphical representation of SPT- 'N' Values				
					N1=15cm	N2=30cm	N3=45cm	N_{VALUE}= N2+N3			20	40	60	80	100
0.00		TOP FILLING SOIL	0.70	0.00	-	-	-	-	-	-					
0.70		LOW PLASTICITY OF CLAY SOIL	0.40												
1.10		CLAYEY GRAVEL (Weathered Kankar)	0.60	1.00	6	7	9	16	DS	Medium					
1.70		GRAVELLY SAND	0.90	2.00	11	16	22	38	DS	V.Dense					
2.60		SOFT DISINTEGRATED ROCK	5.30	2.60	50/7	-	-	>50	DS	V.Dense					
8.00		End of Borehole													

ROCK CORE RECOVERY DETAILS FROM 2.60M TO 8.00M DEPTH ENCLOSED THE PAGE NO: -12

9.2. LABORATORY TEST RESULTS -1

NAME OF THE PROJECT: - "THE PROPOSED CONSTRUCTION OF APARTMENT BUILDING (STILT+GROUND+4 FLOOR) IN D.NO: -49, S.F.NO: -99, WARD NO: -H (8), BLOCK NO: -03, WEST PERIYASAMY ROAD, R.S. PURAM, COIMBATORE DISTRICT ."

M/S.SUNSTAR FOUNDATION CONSULTANT, COIMBATORE

BOREHOLE LOCATION: - 1
GROUND WATER TABLE: - Not Met

DATE OF LAB TESTING STARTED: -08.10.2023
DATE OF LAB TESTING COMPLETED: -12.10.2023

SOIL PROFILE AND DEPTH IN METRES	DEPTH OF SAMPLING	IS SOIL CLASSIFICATION	NATURAL WET DENSITY (kN/m³)	NATURAL MOISTURE CONTENT (%)	NATURAL DRY DENSITY (kN/m³)	INDEX TEST			SIEVE ANALYSIS % PASSING IS SIEVE					SPECIFIC GRAVITY	SHEAR TEST PARAMETERS		STANDARD PENETRATION TEST		
						Liquid Limit (%)	Plastic Limit (%)	Plasticity Index	Gravel % (>4.755MM)	SAND % (4.75MM -75MIC)			Silt & Clay %		Cohesion (C -Ton / m²)	Angle of Internal Friction (Φ)	DEPTH OF TESTING (m)	OBSERVED N VALUE	SAFE BEARING CAPACITY (Ton/m²)
										Coarse	Medium	Fine							
	0.00	FS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.65	-
	0.65	CL	14.60	10.40	13.22	35	28	7	2	4	8	15	71	2.72	3.60	-	1.00	18	9.39
	0.90	GC	15.34	-	15.34	NP	NP	NP	33	14	13	11	29	2.68	-	27	2.00	>50	20.45
	1.30	SW	18.65	-	18.60	NP	NP	NP	48	31	14	5	2	2.66	-	35	2.65	>50	21.75
	2.70	SDR																	

Depth at which collected (m)	Length of Individual Pieces (cm)	Total length (cm)	Core Recovery (%)	Rock Quality Designation (%)	Ultimate Unconfined Compressive Strength (MPa)	Remarks
2.70 – 4.50	7.00+6.00+2.00	15.00	8.33	-	0.52	SDR-Soft Disintegrated Rock
4.50 – 6.00	10.60+8.60+6.50	25.70	17.13	7.06	0.67	SDR-Soft Disintegrated Rock
6.00 – 8.00	16.60+11.00+7.30	34.90	17.45	13.80	0.82	SDR-Soft Disintegrated Rock

8.00

FS-FILLING SOIL, CL-LOW PLASTICITY OF CLAY, GC-CLAYEY GRAVEL, SW-GRAVELLY SAND, SDR-SOFT DISINTEGRADEDROCK, NP-NON-PLASTIC.

9.2. LABORATORY TEST RESULTS -2

NAME OF THE PROJECT: - "THE PROPOSED CONSTRUCTION OF APARTMENT BUILDING (STILT+GROUND+4 FLOOR) IN D.NO: -49, S.F.NO: -99, WARD NO: -H (8), BLOCK NO: -03, WEST PERIYASAMY ROAD, R.S. PURAM, COIMBATORE DISTRICT."

M/S.SUNSTAR FOUNDATION CONSULTANT, COIMBATORE

BOREHOLE LOCATION: - 2
GROUND WATER TABLE: - Not Met

DATE OF LAB TESTING STARTED: -08.10.2023
DATE OF LAB TESTING COMPLETED: -12.10.2023

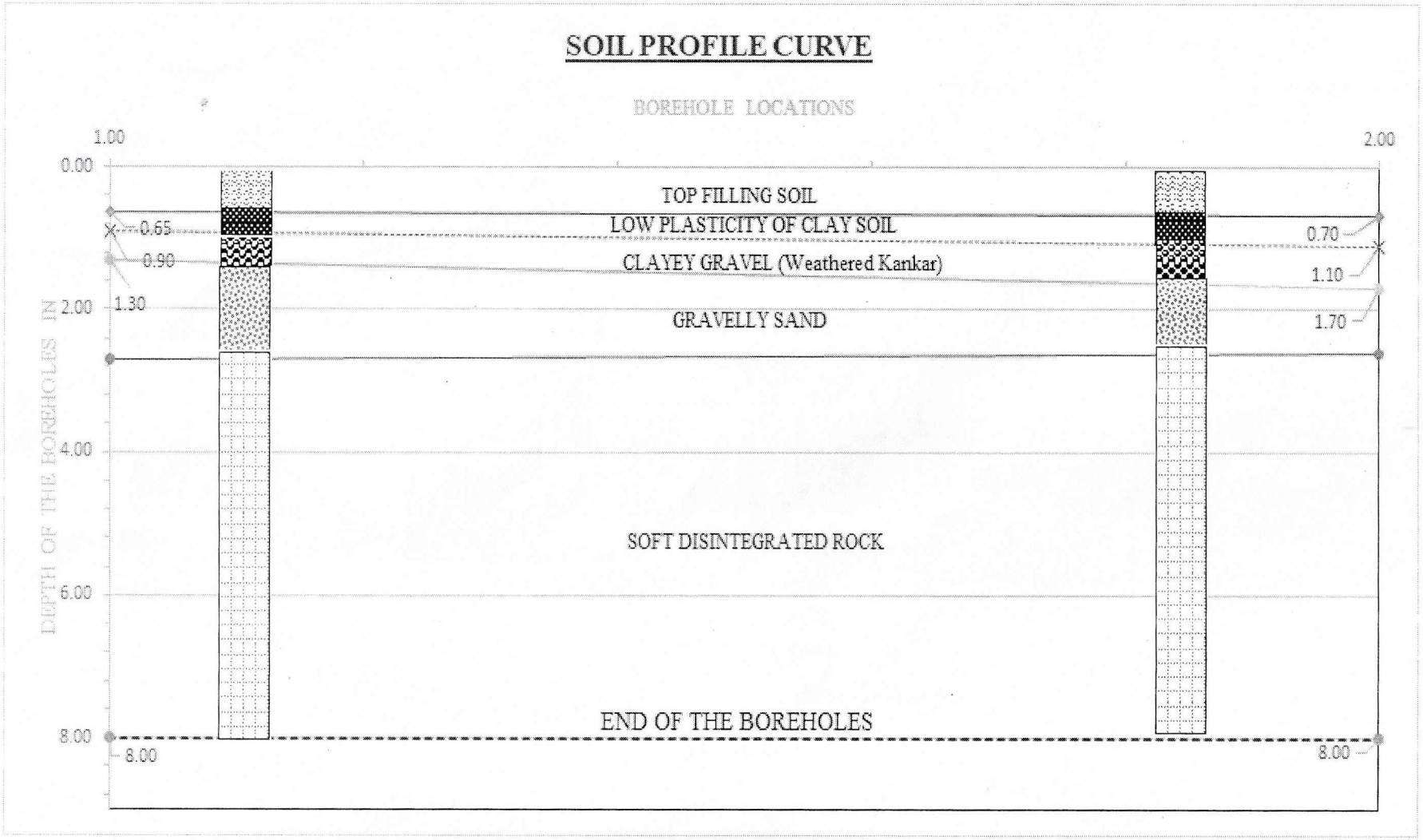
SOIL PROFILE AND DEPTH IN METRES	DEPTH OF SAMPLING	IS SOIL CLASSIFICATION	NATURAL WET DENSITY (kN/m³)	NATURAL MOISTURE CONTENT (%)	NATURAL DRY DENSITY (kN/m³)	INDEX TEST			SIEVE ANALYSIS % PASSING IS SIEVE					SPECIFIC GRAVITY	SHEAR TEST PARAMETERS		STANDARD PENETRATION TEST		
						Liquid Limit (%)	Plastic Limit (%)	Plasticity Index	Gravel % (>4.75MM)	SAND % (4.75MM -75MIC)			Silt & Clay %		Cohesion (C -Ton / m²)	Angle of Internal Friction (Φ)	DEPTH OF TESTING (m)	OBSERVED N VALUE	SAFE BEARING CAPACITY (Ton/m²)
										Coarse	Medium	Fine							
	0.00	FS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.70	-
	0.70	CL	14.50	10.40	13.13	33	29	4	2	5	9	17	67	2.70	3.45	-	1.00	16	8.20
	1.10	GC	15.47	-	15.47	NP	NP	NP	31	13	14	13	29	2.66	-	25	2.00	>50	20.41
	1.70	SW	18.83	-	18.83	NP	NP	NP	45	35	12	6	2	2.62	-	33	2.70	>50	21.70
	2.60	SDR																	
	8.00																		

Depth at which collected (m)	Length of Individual Pieces (cm)	Total length (cm)	Core Recovery (%)	Rock Quality Designation (%)	Ultimate Unconfined Compressive Strength (MPa)	Remarks
2.60 – 4.50	8.35+6.10+3.50	17.95	12.82	-	0.55	SDR-Soft Disintegrated Rock
4.50 – 6.00	12.30+9.70+2.80	24.80	16.53	8.20	0.71	SDR-Soft Disintegrated Rock
6.00 – 8.00	15.50+13.10+7.65	36.10	18.05	14.30	0.87	SDR-Soft Disintegrated Rock

FS-FILLING SOIL, CL-LOW PLASTICITY OF CLAY, GC-CLAYEY GRAVEL, SW-GRAVELLY SAND, SDR-SOFT DISINTEGRADEDROCK, NP-NON-PLASTIC.

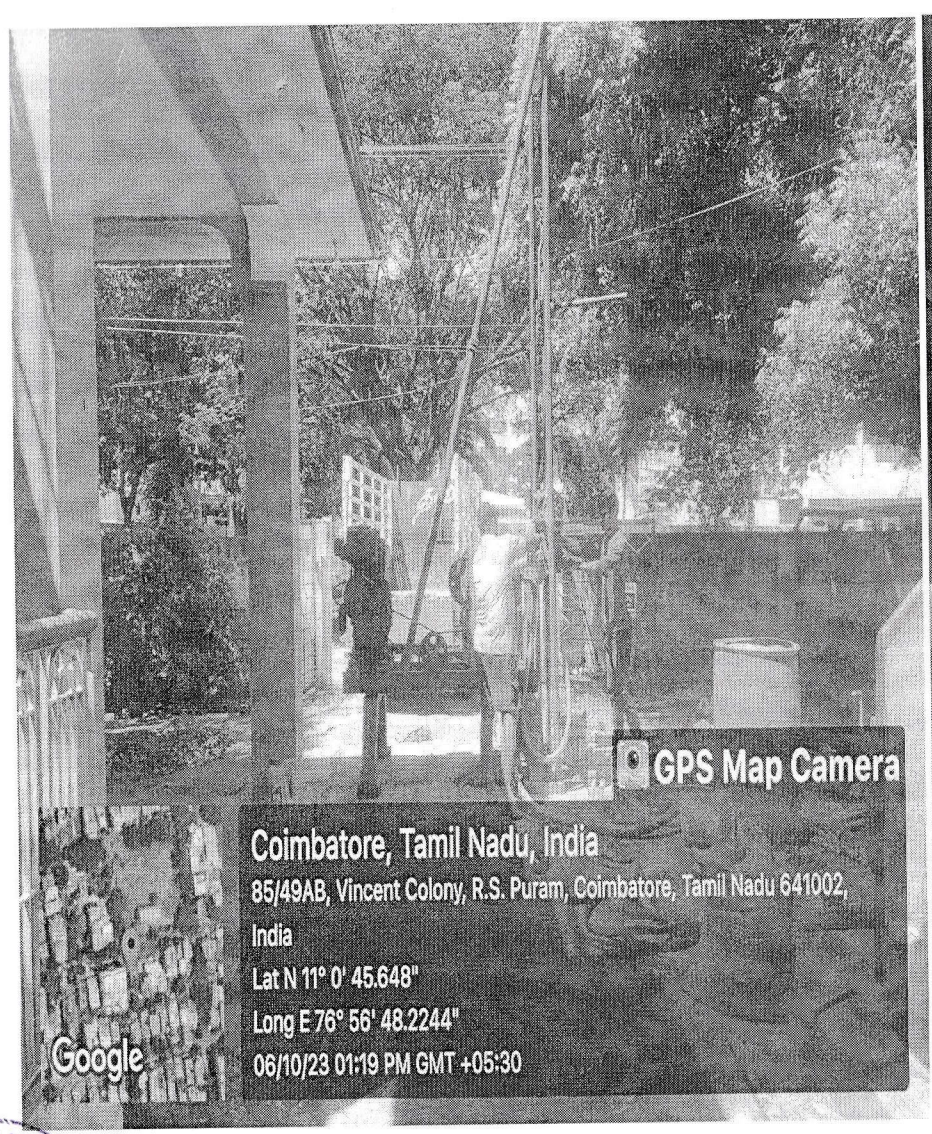
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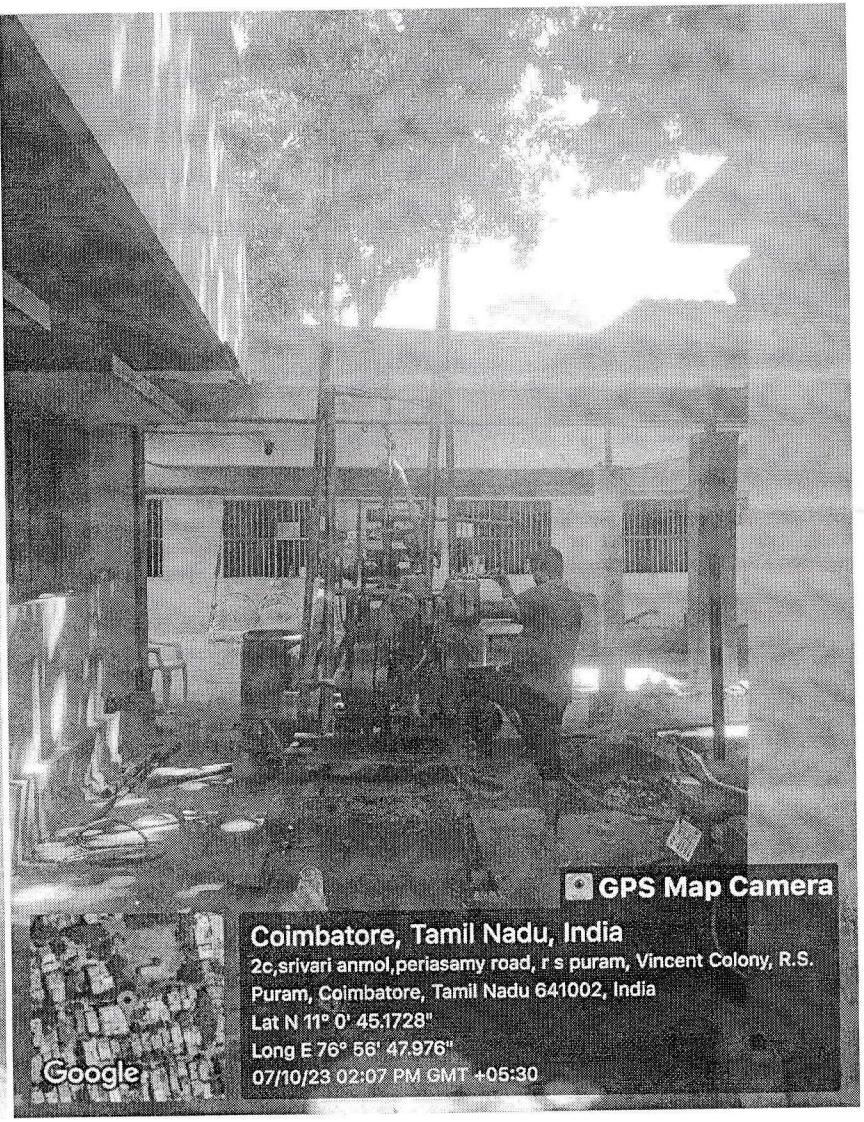
9.3. SOIL PROFILE CURVE: -



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9.4. SITE PHOTOS: -







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Vastu & Property Management Tools

Home Vastu Shastra, Plot Vastu Shastra, Property Management

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3/350/2 Mettukuppam,
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Chennai, India

hello@verified.realestate
+91 9996 12 9996
www.verified.realestate