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SOIL INVESTIGATION REPORT

CLIENT

**M/S. ARUN EXCELLO REALTY PVT. LTD
ROYAPETTAH, CHENNAI**

PROJECT LOCATION

PERUMALERI, MAHABALIPURAM

**REPORT NO.: SI/CHN/22/1689/01
DECEMBER 2022**

GEO FOUNDATIONS & STRUCTURES PVT LTD

GEO TECHNICAL DIVISION CHENNAI

Email: soil@geo.net.in

NAME OF PROJECT

**SOIL INVESTIGATION FOR THE PROPOSED
(ZIVA PHASE V) APARTMENTS
(STILT+5 FLOORS) STRUCTURE AT SURVEY NO.
221/13A, 221/13B, 221/14A2 & 221/14A1A1,
PERUMALERI VILLAGE, THIRUKAZUKUNDRAM
TALUK, VADAKADAMPADI, MAHABALIPURAM,
CHENGALPATTU, TAMIL NADU.**

CLIENT



M/s. ARUN EXCELLO REALTY PVT. LTD
BHATTAD TOWER 18 , WEST COTT ROAD,
ROYAPETTAH, CHENNAI - 600 014

GEOTECHNICAL CONSULTANT



GEO FOUNDATIONS & STRUCTURES PVT LTD,
No.89, 1ST MAIN ROAD, GANDHI NAGAR,
ADYAR, CHENNAI - 600 020

PROJECT No.: 1689

Rev. No.	Date	Description	Created by	Verified by	Approved by
FR/01	02.12.2022	FINAL REPORT	NAMRITHA RAVI M.Sc (UK)	A. SURESH KUMAR, M. Tech - (Geotechnical)	DR. K. MUTHUKRISHNAIAH M. Tech., Ph.D.,
			Engineer	General Manager	Chief Consultant

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SOIL INVESTIGATION REPORT

1.0 INTRODUCTION

- 1.1 The work of "Soil Investigation for the Proposed (Ziva Phase V) Apartments (Stilt+5 Floors) Structure at Survey No. 221/13A, 221/13B, 221/14A2 & 221/14A1A1, Perumaleri Village, Vadakadampadi Panchayat, Thirukazukundram Taluk, Mahabalipuram, Chengalpattu, Tamil Nadu. " was entrusted to **M/s. Geo Foundations and Structures (P) Ltd., Adyar, Chennai – 600 020**, by **M/s. Arun Excello Realty Private Limited, Royapettah, Chennai, Tamil Nadu**.
- 1.2 The soil investigation (field investigation) works were carried out during **22nd November to 29th November 2022**. This report summarizes the results of the soil investigation, and presents recommendations for suitable type of foundations for the proposed (Stilt +5 Floors) structure.

2.0 OBJECTIVE OF INVESTIGATION

- 2.1 The objective of soil investigation is to determine the nature and characteristics of sub-soil below the ground level for the proposed (Stilt+5 Floors) structure. The study includes identification of suitable type of foundations and assessment of safe bearing capacities for the proposed (Stilt+5 Floors) structure.

3.0 SCOPE OF WORK

The scope of work at this site comprises of the following:

- 3.1 Mobilization of Calyx drilling machine with all necessary equipments and personnel.
- 3.2 Boring of 6 bore holes of 150 mm diameter with Calyx drilling equipments through sand, silt, clay & up to hard strata (where 3 consecutive SPT N>100 are obtained).
- 3.3 Conducting Standard Penetration Tests in the bore holes and collecting the disturbed but representative soil samples, including packing and transportation to laboratory.

3.4 To conduct the following laboratory tests on soil samples, which are applicable to the type of soil to be tested.

- (a) Grain size analysis
- (b) Index properties:
 - (i) Liquid limit
 - (ii) Plastic limit
 - (iii) Shrinkage limit
- (c) Moisture content
- (d) Dry and bulk density
- (e) Specific Gravity
- (f) Free Swell Index
- (g) Triaxial / Direct Shear Test
- (h) Unconfined Compressive Strength
- (i) Chemical Analysis of Ground Water

3.5 Preparation and submission of detailed report of field and laboratory results with recommendations for suitable type of foundations.

4.0 FIELD INVESTIGATIONS-GEO-TECHNICAL STUDIES

4.1 Boring rig, with all requisite equipments and accessories, were mobilized at the worksite. A team of technical personnel with skilled laborers were also deputed.

4.2 **Six** bore holes of 150 mm diameter were bored to a maximum depth up to **6 m** below the existing ground level (up to hard stratum). The bore holes were made as per relevant Indian Standard IS: 1892: 2021.

4.3 Representative soil samples were collected at every change of strata or at about 1 m depth intervals, up to termination depth. The samples so collected were sealed and numbered with full particulars for identification and sent to the laboratory for conducting the required tests.

4.4 Standard Penetration tests were conducted in the bore holes at 1 m depth intervals, up to termination depth, as per the relevant Indian Standard, IS: 2131-1981 (Reaffirmed 2021). In this test, a standard split spoon sampler was driven into the ground at the required depth by means of standard hammer of 63.5 kgs weight, falling from a height of 75 cm. Number of blows for the first 15 cm was not taken into consideration because of possible disturbances or presence of settled, suspended matters at the bottom of the bore- holes. The total number of blows for the next 30 cm depth of penetration is considered as SPT 'N' value as shown in Figure nos. 01 to 06 (**Appendix I**).

5.0 LABORATORY INVESTIGATION

The following laboratory tests were conducted on the selected soil samples collected from the bore holes:

- (a) Grain size analysis
- (b) Natural Moisture content
- (c) Dry & Bulk Density
- (d) Specific Gravity
- (e) Direct Shear Test
- (f) Chemical Analysis of Ground Water

All the above laboratory tests were carried out as per relevant Indian Standards.

All the soil samples were identified and classified as per relevant Indian Standard, IS: 1498-1970 (Reaffirmed 2021). The results are shown in Table Nos.1 to 7 (**Appendix II&III**).

6.0 SOIL PROFILE

In **borehole BH 1**, Dense gravelly clayey sand occurs from ground level up to 2 m, followed by medium dense gravelly sand up to 3 m, weathered rock up to 3.08 m, followed by jointed rock up to **3.5 m**, at which depth the bore hole was terminated.

In borehole BH 2, Medium dense silty sand occurs from ground level up to 2 m, followed by dense gravelly clayey sand up to 3 m, very dense silty gravelly sand up to 4 m, followed by weathered rock up to **6 m**, at which depth the bore hole was terminated.

In borehole BH 3, Very dense silty sand occurs from ground level up to 2 m, followed by medium dense clayey sand up to 2.5 m, followed by boulders up to **4 m**, at which depth the bore hole was terminated.

In borehole BH 4, Medium dense clayey sand occurs from ground level up to 2 m, followed by dense gravelly clayey sand up to 3 m, weathered rock up to 4 m, followed by boulders up to **5 m**, at which depth the bore hole was terminated.

In borehole BH 5, Very dense gravelly silty sand occurs from ground level up to 2 m, followed by medium dense clayey sand up to 3 m, weathered rock up to 4 m, followed by boulders up to **5 m**, at which depth the bore hole was terminated.

In borehole BH 6, Medium dense clayey sand occurs from ground level up to 2 m, dense clayey sand up to 3 m, followed by weathered rock up to 4.10 m, followed by boulders up to **5 m**, at which depth the bore hole was terminated.

7.0 GROUND WATER TABLE

Ground water levels were met at a depth ranging from **0.2 m to 0.4 m** from the existing ground level at the time of investigation in all the 6 boreholes, during continuous boring from **22.11.2022 to 29.11.2022.**

8.0 RECOMMENDATIONS FOR SUITABLE TYPE OF FOUNDATIONS:

Bore holes were made for soil investigation to assess the nature and strength of the subsoil strata for sustainability of the loads. This report gives the details of the soil strata, suitable type of foundations and safe bearing capacity. Based on the subsoil conditions described in Sl. No. 6, the following recommendations are made for suitable type of foundations for the proposed (Stilt+5 Floors) structure.

8.1 Open Foundations

8.1.1 Open Foundations (individual column footings or combined footings if there are two or more columns close to each other, or Strip Raft combining each row of columns, if each row of columns are close to each other when compared to the distance or span between the rows of columns, or raft foundation) are recommended.

8.1.2 Excavation shall be made up to the required depth below the existing ground level as given in the **Table A**.

8.1.3 After thorough compaction of the bottom of excavation, PCC for the foundations can then be laid at the depth below the ground level which existed at the time of soil investigation as given in the **Table A**.

8.1.4 The recommended safe bearing capacities under the RCC foundation are given in **Table A**. However, the width of any column footing or strip raft shall not be less than 1 m.

Table A

Structure	Depth of Excavation for foundation from EGL (m)	Recommended Safe Bearing Capacity (T/m ²)
(Silt+5 Floors)	1.5	15
	2	20
	2.5	25
	3	40*

***- Safe Bearing Capacity Restricted to 40 T/m²**

8.1.5 At the time of excavation for foundations, if ground water table occurs within the recommended depth of excavation, sumps may be made to an additional depth of 0.3 m at one or more corners of the foundation pits for column footings/combined footings or at

desired locations along the periphery of excavation for strip raft/raft foundation, and the water collected in the sumps may be bailed out. At the time of laying the PCC, the bottom of excavation shall be relatively dry (not slushy). Dewatering shall be maintained until that part of the concrete in the foundations, which comes below the ground water table level, sets.

9.0 CHEMICAL COMPOSITION OF GROUND WATER

The results of chemical analysis on the ground water samples collected from the boreholes, presented in **Appendix – III** show that:

- Since the pH value is more than 6, the ground water, in terms of pH value, is suitable for mixing concrete as per Clause 5.4.2 of Indian Standard: 456-2000, (Reaffirmed 2021), plain and reinforced concrete – code of practice (Fourth Revision).
- The chloride content is less than the permissible upper limit of 500 mg/l. for use of ground water for mixing in concrete for RCC, as per IS: 456-2000, (Reaffirmed 2021). Therefore, in terms of chloride content in the ground water, the ground water is suitable for mixing concrete for RCC.
- The sulphate content (expressed as SO_3) is less than the permissible upper limit of 400 mg/l for use of ground water for mixing in concrete, as per IS: 456-2000 (Reaffirmed 2021). Therefore, in terms of sulphate content, the ground water is suitable for mixing concrete for RCC. The sulphate content (expressed as SO_3) is less than 300 mg/l which comes under Class 1 of "Requirements for concrete exposed to sulphate attack", as per IS:456-2000 (Reaffirmed 2021), Table 4. For this Class, the requirements are: Ordinary Portland cement or Portland slag cement or Portland pozzolana cement can be used with a minimum cement content of 280 kg/ m³ of concrete and with a maximum water: cement ratio of 0.55"

Hence, the ground water is suitable for mixing concrete for Construction purpose.

10.0 The results given in this report are based on the results of the soil investigation carried out. In actual execution, if any variation is found, the consultants may also be referred to.

APPROVED BY,


Dr. K. Muthukrishnan BE (Hons), M.Tech., Ph.D.,
(Professor & Head, Ocean Engineering Dept. IIT
Madras)(Rtd),
(Chief Consultant)

For GEO FOUNDATIONS & STRUCTURES PVT.LTD.


Anala Suresh Kumar, M.Tech (Geo technical), M.B.A (T.M)
General Manager (Geo Technical)



APPENDIX-I

BORELOGS

CR-Core Recovery
RQD-Rock Quality Designation

Project : Soil Investigation for the Proposed (Ziva Phase V) Apartments (Still + 5 Floors) Structures at Survey No. 221/13A, 221/13B, 221/14A2 & 221/14A1A1, Perumaleri Village,Vadakadampadi Panchayat, Thirukazukundram Taluk, Mahabalipuram, Chengalpattu, Tamil Nadu.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
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<table><thead><tr><th rowspan="2">SOIL DESCRIPTION</th><th rowspan="2">COLOUR</th><th rowspan="2">STRUCTURE</th><th rowspan="2">DEPTH BELOW GROUND LEVEL (m)</th><th rowspan="2">REDUCED LEVEL (m)</th><th rowspan="2">LEGEND</th><th rowspan="2">TEST NO</th><th rowspan="2">SAMPLE TYPE</th><th rowspan="2">DEPTH BELOW GROUND LEVEL (m)</th><th rowspan="2">TEST DEPTH</th><th colspan="3">PENETRATION VALUES</th><th rowspan="2">SPT 'N' Blows/300mm</th><th colspan="5">SPT 'N' PROFILE</th><th rowspan="2">C.R. (%)</th><th rowspan="2">R.Q.D. (%)</th><th rowspan="2">REMARKS</th></tr><tr><th>15cm</th><th>30cm</th><th>45cm</th><th>20</th><th>40</th><th>60</th><th>80</th><th>100</th></tr></thead><tbody><tr><td>Silty SAND (SC)</td><td>Red</td><td>Dense, Granular</td><td>2.00</td><td>97.60</td><td></td><td>SPT-1</td><td>SS</td><td>1.00</td><td>1.00-1.45</td><td>14</td><td>24</td><td>>50</td><td>>100</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></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DESCRIPTION	COLOUR	STRUCTURE	DEPTH BELOW GROUND LEVEL (m)	REDUCED LEVEL (m)	LEGEND	TEST NO	SAMPLE TYPE	DEPTH BELOW GROUND LEVEL (m)	TEST DEPTH	PENETRATION VALUES			SPT 'N' Blows/300mm	SPT 'N' PROFILE					C.R. (%)	R.Q.D. (%)	REMARKS	15cm	30cm	45cm	20	40	60	80	100	Silty SAND (SC)	Red	Dense, Granular	2.00	97.60		SPT-1	SS	1.00	1.00-1.45	14	24	>50	>100																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									
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Silty SAND (SC)	Red	Dense, Granular	2.00	97.60		SPT-1	SS	1.00	1.00-1.45	14	24	>50	>100																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							



GEO FOUNDATIONS & STRUCTURES PVT. LTD

Bore Hole No : BH 4

Location : Ziva Phase V, Perumaleri,

Type of Boring : Calyx

Ground Water Level : 0.2 m from GL on 27.11.2022

UTM Co-ordinate : 408609 E, 1395084 N

Termination Depth : 5.0 m

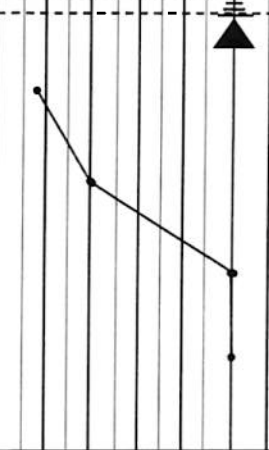
Drilling Hole Record-BH 4

Fig No. 04

Reduced Level : 99.6

Start Date : 26.11.2022

End Date : 26.11.2022

SOIL DESCRIPTION	COLOUR	STRUCTURE	DEPTH BELOW GROUND LEVEL (m)	REDUCED LEVEL (m)	LEGEND	TEST NO	SAMPLE TYPE	DEPTH BELOW GROUND LEVEL (m)	TEST DEPTH	PENETRATION VALUES			SPT'N' Blows/300mm	SPT 'N' PROFILE					REMARKS
										15cm	30cm	45cm		20	40	60	80	100	
Clayey SAND (SC)	Red	Medium Dense, Granular	2.00	97.60		SPT-1	SS	1.00	1.00-1.45	6	8	8	16			G.W.L			
					UDS-1	OT	1.50	1.50-1.95	-	-	-	-							
Gravelly Clayey SAND (SC)	Brown	Dense, Granular	3.00	96.60		SPT-2	SS	2.00	2.00-2.45	9	20	20	40						
					SPT-3	SS	3.00	3.00-3.43	17	20	>50	>100							
Weathered Rock			4.00	95.60		SPT-4	SS	4.00	4.00-4.00	>50	-	-	>100						
					CR-1	CS	4.00	4.00-5.00	-	-	-	-							
Boulders			5.00	94.60															
G.W.L: 0.2 m from GL on 27.11.2022			No of SPT: 4 Nos			No of UDS : 1 No			No of CR : 1 No			Remarks							

Project : Soil Investigation for the Proposed (Ziva Phase V) Apartments (Stillt + 5 Floors) Structures at Survey No. 221/13A, 221/13B, 221/14A2 & 221/14A1A1, Perumaleri Village,Vadakadampadi Panchayat, Thirukazukundram Taluk, Mahabalipuram, Chengalpattu, Tamil Nadu.



GEO FOUNDATIONS & STRUCTURES PVT. LTD

Bore Hole No : BH 5

Location : Ziva Phase V, Perumaleri,

Type of Boring : Calyx

Ground Water Level : 0.4 m from GL on 28.11.2022

UTM Co-ordinate : 408609 E, 1395084 N

Termination Depth : 5.0 m

Drilling Hole Record-BH 5

Fig No. 05

Reduced Level : 99.5

Start Date : 27.11.2022

End Date : 27.11.2022

SOIL DESCRIPTION	COLOUR	STRUCTURE	DEPTH BELOW GROUND LEVEL (m)	REDUCED LEVEL (m)	LEGEND	TEST NO	SAMPLE TYPE	DEPTH BELOW GROUND LEVEL (m)	TEST DEPTH	PENETRATION VALUES			SPT "N" Blows/300mm	SPT "N" PROFILE					REMARKS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
										15cm	30cm	45cm		20	40	60	80	100		C.L.R (%)	R.Q.D.(%)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
Gravelly Silty SAND (SM)	Brown	Very Dense, Granular	2.00	97.50		SPT-1	SS	1.00	1.00-1.45	6	18	37	55																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										

Project : Soil Investigation for the Proposed (Ziva Phase V) Apartments (Stilt + 5 Floors) Structures at Survey No. 221/13A, 221/13B, 221/14A2 & 221/14A1A1, Perumaleri Village,Vadakadampadi Panchayat, Thirukazukundram Taluk, Mahabalipuram, Chengalpattu, Tamil Nadu.



GEO FOUNDATIONS & STRUCTURES PVT. LTD

Bore Hole No : BH 6

Location : Ziva Phase V, Perumaleri,

Type of Boring : Calyx

Ground Water Level : 0.2 m from GL on 30.11.2022

UTM Co-ordinate :

Termination Depth : 5.0 m

Drilling Hole Record-BH 6

Fig No. 06

Reduced Level : 99.6

Start Date : 29.11.2022

End Date : 29.11.2022

SOIL DESCRIPTION	COLOUR	STRUCTURE	DEPTH BELOW GROUND LEVEL (m)	REDUCED LEVEL (m)	LEGEND	TEST NO	SAMPLE TYPE	DEPTH BELOW GROUND LEVEL (m)	TEST DEPTH	PENETRATION VALUES			SPT 'N' Blows/300mm	SPT 'N' PROFILE					REMARKS	
										15cm	30cm	45cm		20	40	60	80	100		C.R (%)
Clayey SAND (SC)	Red	Medium Dense, Granular	2.00	97.60		SPT-1	SS	1.00	1.00-1.45	7	8	10	18							G.W.L 50/12 cm Penetration 50/10 cm Penetration
						UDS-1	OT	1.50	1.50-1.95	-	-	-	-							
	Brown Dense, Granular	3.00	96.60		SPT-2	SS	2.00	2.00-2.45	11	15	18	33								
					SPT-3	SS	3.00	3.00-3.27	45	>50	-	>100								
Weathered Rock			4.00	95.60		SPT-4	SS	4.00	4.00-4.10	>50	-	-	>100							
Boulders			5.00	94.60		CR-1	CS		4.10-5.00	-	-	-	-							
G.W.L: 0.2 m from GL on 30.11.2022			No of SPT: 4 Nos			No of UDS : 1 No			No of CR : 1 No			Remarks								

APPENDIX – II

LABORATORY TEST RESULTS

 GEO FOUNDATIONS & STRUCTURES PVT LTD				Project : Soil Investigation for the Proposed (Ziva Phase V) Apartments (Still + 5 Floors) Structures at Survey No. 221/13A, 221/13B, 221/14A2 & 221/14A1A1, Perumaleri Village, Vadakadampadi Panchayat, Thirukazukundram Taluk, Mahabalipuram, Chengalpattu, Tamil Nadu.																		Table No. 1			
LABORATORY TEST RESULTS				Ziva Phase V, Perumaleri																		Termination Depth: 3.5 m			
Site Recorded N Value	Corrected N Value	DEPTH (m)	SAMPLE	SOIL DESCRIPTION	IS. CLASSIFICATION	GRAIN SIZE ANALYSIS			ATTERBERG LIMITS				DRY DENSITY, gm/cc	WET DENSITY, gm/cc	WATER CONTENT, %	SPECIFIC GRAVITY	FREE SWELL INDEX, %	SHEAR PARAMETERS							
						GRAVEL, %	SAND, %	SILT & CLAY %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX	SHRINKAGE LIMIT, %						TEST METHOD	C In Kg/cm²	φ In degrees					
45	47	1.00	SPT-1	Gravelly Clayey SAND	SC	13	61	26	39	19	20				12										
23	26	2.00	SPT-2	Gravelly SAND	SP	36	61	3							9	2.61									
>100	>100	3.00-3.08	SPT-3	Weathered Rock																					
-	-	3.08-3.50	CR-1	Jointed Rock																					

NOTE: Type of Sample
 SPT - Standard Penetration Test
 UCS - Un Disturbed Sample

Test Method:
 UCS - UnConfined Compressive Strength
 DS - Direct Shear
 TA - Tri Axial Test

GEO FOUNDATIONS & STRUCTURES PVT LTD				Project : Soil Investigation for the Proposed (Ziva Phase V) Apartments (Silt + 5 Floors) Structures at Survey No. 221/13A, 221/13B, 221/14A2 & 221/14A1A1, Perumaleri Village, Vadakadampadi Panchayat, Thirukazukundram Taluk, Mahabalipuram, Chengalpattu, Tamil Nadu.															Table No. 2			
LABORATORY TEST RESULTS				Ziva Phase V, Perumaleri																	Termination Depth: 6.0 m	
She Recorded N Value	Corrected N Value	DEPTH (m)	SAMPLE	SOIL DESCRIPTION	IS CLASSIFICATION	GRAIN SIZE ANALYSIS			ATTERBERG LIMITS				DRY DENSITY, gm/cc	WET DENSITY, gm/cc	WATER CONTENT, %	SPECIFIC GRAVITY	FREE SWELL INDEX, %	SHEAR PARAMETERS				
						GRAVEL, %	SAND, %	SILT & CLAY %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX	SHRINKAGE LIMIT, %						TEST METHOD	C in Kg/cm²	φ In degrees		
14	25	1.00	SPT-1	Silty SAND	SM	5	66	29								14						
-	-	1.50	UDS-1											1.69	1.96	16	2.66		DS		31	
30	31	2.00	SPT-2	Gravelly Clayey SAND	SC	10	58	32								17						
65	55	3.00	SPT-3	Silty Gravelly SAND	SP	25	62	13								19						
>100	>100	4.00-4.43	SPT-4	Weathered Rock	SP	25	52	23								19						
>100	>100	5.00-5.10	SPT-5		SP	20	66	14									11					
>100	>100	6.00-6.00	SPT-6																			

NOTE: Type of Sample
SPT- Standard Penetration Test
UDS- Un Disturbed Sample

Test Method:
UCS- UnConfined Compressive Strength
DS - Direct Shear
TA - Tri Axial Test

				Table No. 3																								
GEO FOUNDATIONS & STRUCTURES PVT LTD				Boring Start : 24.11.2022																								
				Boring End : 25.11.2022																								
				Location																								
				Termination Depth: 4.0 m																								
				Ziva Phase V, Perumaleri																								
Project : Soil Investigation for the Proposed (Ziva Phase V) Apartments (Shift + 5 Floors) Structures at Survey No. 221/13A, 221/13B, 221/14A2 & 221/14A1A1, Perumaleri Village, Vadakadampadi Panchayat, Thirukazukundram Taluk, Mahabalipuram, Chengalpattu, Tamil Nadu.				GRAIN SIZE ANALYSIS								ATTERBERG LIMITS				FREE SWELL INDEX, %				SHEAR PARAMETERS								
				IS. CLASSIFICATION				GRAVEL, %		SAND, %		SILT & CLAY %		LIQUID LIMIT, %		PLASTIC LIMIT, %		PLASTICITY INDEX		SHRINKAGE LIMIT, %		DRY DENSITY, gm/cc	WET DENSITY, gm/cc	WATER CONTENT, %	SPECIFIC GRAVITY	TEST METHOD	C In Kg/cm²	Φ In degrees
				SM		8		66		26																		
				SC		0		66		34		22		12		10												
				Boulders		Clayey SAND		Silty SAND		SM																		
				SPT-1		1.00-1.36		SPT-1																				
				SPT-2		2.00		SPT-2																				
				SPT-3		2.50-2.50		SPT-3																				
				CR-1		2.50-4.00		CR-1																				

NOTE: Type of Sample
SPT - Standard Penetration Test
UDS - Undisturbed Sample

Test Method:
UCS - UnConfined Compressive Strength
DS - Direct Shear
TA - Tri Axial Test

				Project : Soil Investigation for the Proposed (Ziva Phase V) Apartments (SIH + 5 Floors) Structures at Survey No. 221/13A, 221/13B, 221/14A2 & 221/14A1A1, Perumaleri Village, Vadakadampadi Panchayat, Thirukazukundram Taluk, Mahabalipuram, Chengalpattu, Tamil Nadu.														Table No. 4																	
LABORATORY TEST RESULTS				Boring Start : 26.11.2022																															
				Boring End : 26.11.2022																															
				Location																															
				G.W.T: 0.2 m																															
				Ziva Phase V, Perumaleri																															
Termination Depth: 5.0 m				DRY DENSITY, gm/cc				WET DENSITY, gm/cc				WATER CONTENT, %		SPECIFIC GRAVITY		FREE SWELL INDEX, %		TEST METHOD		SHEAR PARAMETERS															
				C In Kg/cm²				φ In degrees																											
SHE RECORDED N VALUE				CORRECTED N VALUE		DEPTH (m)		SAMPLE		SOIL DESCRIPTION		IS. CLASSIFICATION		GRAIN SIZE ANALYSIS				ATTERBERG LIMITS																	
																GRAVEL, %		SAND, %		SILT & CLAY %		LIQUID LIMIT, %		PLASTIC LIMIT, %		PLASTICITY INDEX		SHRINKAGE LIMIT, %							
16				27		1.00		SPT-1		Clayey SAND		SC		9		57		34		35		21		14											
-				-		1.50		UDS-1																											
40				38		2.00		SPT-2		Gravelly Clayey SAND		SC		22		40		38		32		21		11								DS		32	
>100				>100		3.00-3.43		SPT-3		Weathered Rock		SM		20		54		26																	
>100				>100		4.00-4.00		SPT-4																											
-				-		4.00-5.00		CR-1		Boulders																									

NOTE: Type of Sample
SPT- Standard Penetration Test
UDS- Un Disturbed Sample

Test Method:
UC3- UnConfined Compressive Strength
DS - Direct Shear
TA - Tri Axial test

Project No.: 1689

Soil Investigation for the Proposed (Ziva Phase V) Apartments (Silt + 5 Floors) Structures at Vadakadampadi, Mahabalipuram, Chengalpattu, Tamil Nadu

 GEO FOUNDATIONS & STRUCTURES PVT LTD				Project : Soil Investigation for the Proposed (Ziva Phase V) Apartments (Silt + 5 Floors) Structures at Survey No. 221/13A, 221/13B, 221/14A2 & 221/14A1A1, Perumaleri Village, Vadakadampadi Panchayat, Thirukazukundram Taluk, Mahabalipuram, Chengalpattu, Tamil Nadu.																	Table No. 5	
LABORATORY TEST RESULTS				Ziva Phase V, Perumaleri																	Termination Depth: 5.0 m	
Site Recorded N Value	Corrected N Value	DEPTH (m)	SAMPLE	SOIL DESCRIPTION	IS CLASSIFICATION	GRAIN SIZE ANALYSIS			ATTERBERG LIMITS				DRY DENSITY, gm/cc	WET DENSITY, gm/cc	WATER CONTENT, %	SPECIFIC GRAVITY	FREE SWELL INDEX, %	SHEAR PARAMETERS				
						GRAVEL, %	SAND, %	SILT & CLAY %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX	SHRINKAGE LIMIT, %						TEST METHOD	C In Kg/cm²	φ In degrees		
55	54	1.00	SPT-1	Gravelly Silty SAND	SM	18	57	25							18							
25	27	2.00	SPT-2	Clayey SAND	SC	0	53	47	30	17	13				18							
>100	>100	3.00-3.13	SPT-3	Weathered Rock	SM	3	78	19							9							
>100	>100	4.00-4.00	SPT-4																			
-	-	4.00-5.00	CR-1	Boulders																		

NOTE: Type of Sample
SPT- Standard Penetration Test
UDS- Un Disturbed Sample

Test Method:
UCS- UnConfined Compressive Strength
DS - Direct Shear
TA - Tri Axial Test

GEO FOUNDATIONS & STRUCTURES PVT LTD				Project : Soil Investigation for the Proposed (Ziva Phase V) Apartments (Silt + 5 Floors) Structures at Survey No. 221/13A, 221/13B, 221/14A2 & 221/14A1A1, Perumaleri Village, Vadakampadi Panchayat, Thirukazukundram Taluk, Mahabalipuram, Chengalpattu, Tamil Nadu.																	Boring Start : 29.11.2022		Table No. 6	
LABORATORY TEST RESULTS																					Boring End : 29.11.2022		Bore-Hole No. 6	
																					Location		G.W.T: 0.2 m	
																					Ziva Phase V, Perumaleri		Termination Depth: 5.0 m	
Site Recorded N Value	Corrected N Value	DEPTH (m)	SAMPLE	SOIL DESCRIPTION	IS CLASSIFICATION	GRAIN SIZE ANALYSIS			ATTERBERG LIMITS				FREE SWELL INDEX, %	SHEAR PARAMETERS										
						GRAVEL, %	SAND, %	SILT & CLAY %	LIQUID LIMIT, %	PLASTIC LIMIT, %	PLASTICITY INDEX	SHRINKAGE LIMIT, %		TEST METHOD	C in Kg/cm²	Φ in degrees								
18	23	1.00	SPT-1	Clayey SAND	SC	3	54	43	39	19	20													
-	-	1.50	UDS-1																					
33	34	2.00	SPT-2		SC	2	51	47	42	19	23							DS	32					
>100	>100	3.00-3.27	SPT-3	Weathered Rock	SP	20	61	19																
>100	>100	4.00-4.10	SPT-4		SM	17	58	25																
-	-	4.10-5.00	CR-1	Boulders																				

NOTE: Type of Sample
SPT - Standard Penetration Test
UDS - Un Disturbed Sample

Test Method:
UCS - UnConfined Compressive Strength
DS - Direct Shear
TA - Tri Axial Test

APPENDIX-III

CHEMICAL ANALYSIS OF
WATER

Project No.: 1689

Soil Investigation for the Proposed (Ziva Phase V) Apartments (Stilt + 5 Floors) Structures
at Vadakadampadi, Mahabalipuram, Chengalpattu, Tamil Nadu.



GEO FOUNDATIONS & STRUCTURES PVT.LTD.

CHEMICAL ANALYSIS OF GROUND WATER

Project. No.
: 1689

Name of Project
: Soil Investigation for the Proposed (Ziva Phase V) Apartments (Stilt + 5 Floors) Structures at Survey No. 221/13A, 221/13B, 221/14A2 & 221/14A1A1, Perumaleri Village,Vadakadampadi Panchayat, Thirukazukundram Taluk, Mahabalipuram, Chengalpattu, Tamil Nadu.

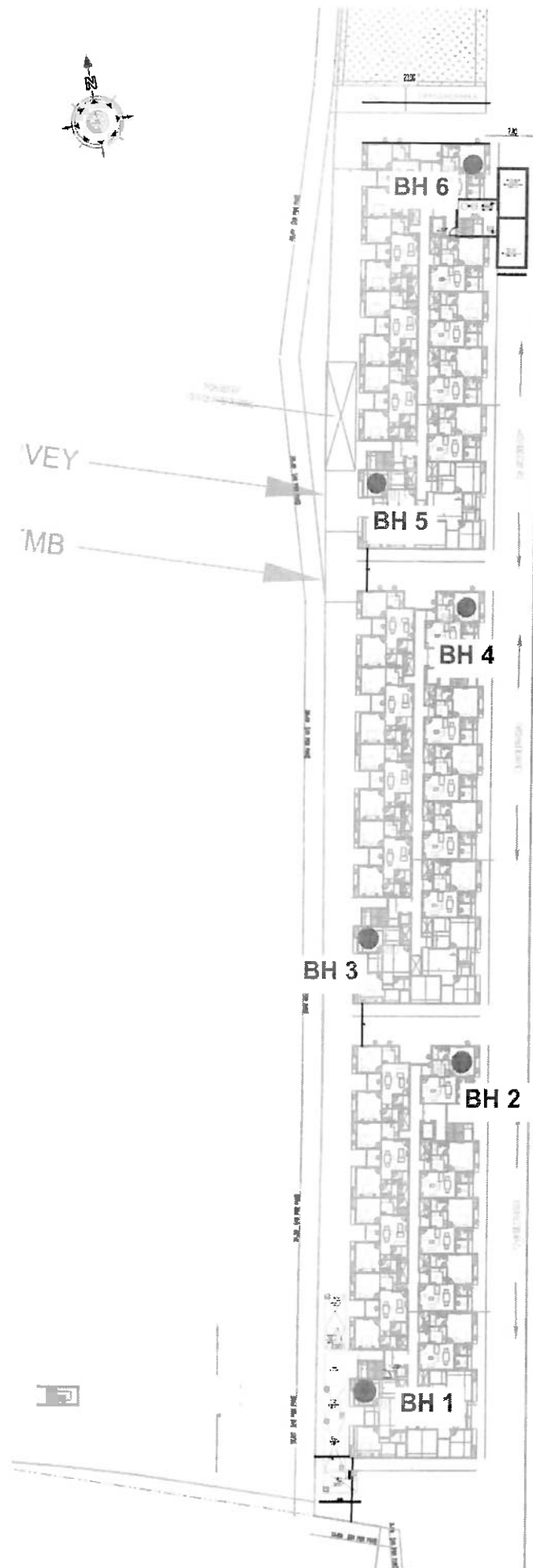
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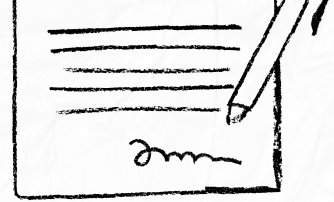
Table No. 7

Sl. No.	Tests	BH 1	BH 5	Limits for using the ground water for mixing concrete
1	Sulphate as SO ₃ mg/l	2	4	400 mg/l
2	Chloride as Cl mg/l	80	80	I.2000 mg/l for Plain concrete II. 500 mg/l for reinforced concrete
3	pH @ 25° C	7	7	6.0 Min

APPENDIX-IV

BOREHOLES LOCATION
DRAWING





our services doesn't just end there



Buying & Selling Services

Property Buying Assistance, Property Selling Support, Market Price Analysis, Owner Outreach and Negotiation.



Legal & Documentation Services

Certified EC, Patta, legal opinions, property verification, due diligence, litigation solutions, and legal heir certificates.



Property Development & Approvals

Building plan approvals, construction, layout and sub-division approvals, zone conversion, and occupancy certification.



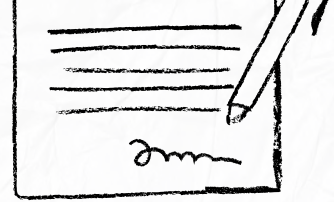
NRI & Investment Services

Escrow Services, Rentals, Litigation Solutions, Property Valuation and Property Management



Compliance & Special Services

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



 **empowering your real estate decisions
with smart tools**



Property Valuation & Cost Estimation

Guideline Value, Apartment Composite Value, Stamp Duty & Registration Fees Calculator, Building Value Calculator, Capital Gains Calculator, Area Unit Converter, Length Unit Converter



Ownership, Compliance & Legal Verification

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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real estate journey

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