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## **GEO MARINE CONSULTANTS (P) LTD.,**

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### **NAME OF PROJECT**

**PROPOSED CONSTRUCTION OF COMMERCIAL BUILDING CONSISTING OF  
TWO BASEMENT + GROUND + ELEVEN UPPER FLOORS AT PERUMAL  
NAGAR, RADIAL ROAD, PALLAVARAM**

### **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- 2081**

| DATE       | REVISION         | DESCRIPTION                               |             | AUTHORISED SIGNATORY |
|------------|------------------|-------------------------------------------|-------------|----------------------|
| 24/06/2020 | FIRST SUBMISSION | SUBMISSION OF INTERIM GEOTECHNICAL REPORT | SIGN        |                      |
| 29/10/2020 | FIRST SUBMISSION | SUBMISSION OF FINAL GEOTECHNICAL REPORT   | DATE        | 24/06/2020           |
|            |                  |                                           | DESIGNATION | MANAGING DIRECTOR    |
|            |                  |                                           | NAME        | DR. C.V.PRASAD       |

For **BRIGADE ENTERPRISES LTD**

*[Signature]*

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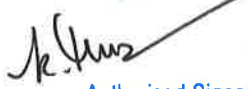
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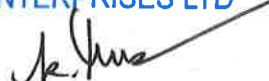
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|                  |                                                               |       |
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## REPORT TEXT

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## **INTRODUCTION**

### **1.0 Project Information Matrix**

Nature of project : Commercial Building (2 Basement + G + 11 Upper Floors)  
Project Owner : **BRIGADE ENTERPRISES LIMITED**  
Project Location : Perumal Nagar, Radial Road, Pallikaranai  
Job Code : GT-2081

### **1.1 Scope Of Work**

#### **1.1.1 Field Work**

- ❖ Conducting twelve soil investigation bore holes of 150 mm & NX diameter.
- ❖ Conducting Standard Penetration Test (SPT) within the borehole at every 1.0m depth in the overburden soil and carrying out NX core drilling in the rock formation.
- ❖ The depth of investigation varies from 8.0m (minimum) to 15.0m (maximum) below the existing ground level.
- ❖ The termination of the borehole is based on the total core recovery ratio and rock quality design encountered in the respective borehole investigation location.
- ❖ Collection of soil samples and undisturbed samples from the clayey strata with SPT-value greater than 2 to less than 15 if met within the investigation depth.
- ❖ Collection of water samples if groundwater table met within the investigation depth.

#### **1.1.2 Laboratory Work**

- ❖ Natural Moisture Content
- ❖ Atterberg limits
- ❖ Grain Size Analysis
- ❖ Strength test on rock core samples
- ❖ 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 aspects
- ❖ Foundation System
- ❖ Recommendation
- ❖ Annexure

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**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).

**2.1.3 Collection of Soil Samples:****2.1.3.1 Disturbed Samples:**

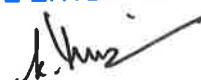
The SPT-samples collected were used as disturbed soil samples. These samples were used for visual and physical identification and for conducting laboratory classification tests as per I.S.1498-1970.

**2.1.4 Collection of Ground Water Samples:**

One representative water sample from each borehole was collected after 24 hours of completing the borehole if water table met within the investigated depth. In the present case, the ground water table during the investigation period is varying from 1.0m to 1.5m below the existing ground level. The borehole ground water table matches with ground water table observed at the open well exists at the project site.

**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 grain size distribution curve for the representative samples in each bore is presented in Fig. 2.15 to 2.26.

### **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 2.4. The graphical representation of hydrometer analyses curve for the representative samples in each bore is presented in Fig. 2.27 to 2.40.

### **2.2.3 Chemical Analysis Tests**

On representative soil-water extract and ground water samples chemical analysis tests were conducted to estimate pH, Chloride and Sulphates and these results are presented in Table-2.13

## **2.3 Summary:**

The locations of the field investigation boreholes are shown in site plan given in Fig.2.0. The average sub soil profiles encountered at each location along with their classification and engineering properties are presented in Figs.2.1 to 2.12.

The cross section variation of sub soil strata in both lateral and vertical is presented in Fig. 2.13 & 2.14.

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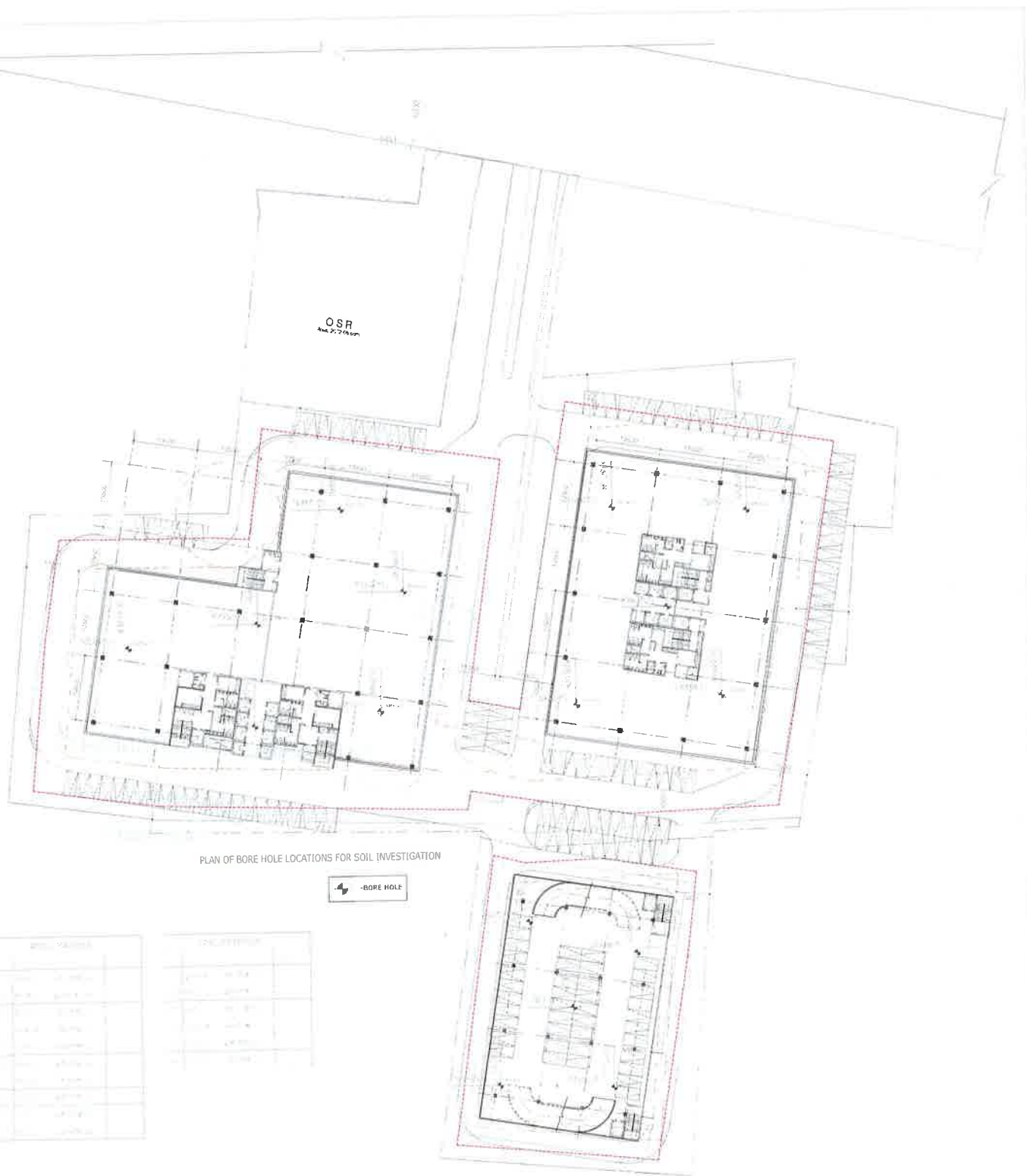
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## SITE PLAN

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CLIENT :

STRUCTURAL CONSULTANTS

PROJECT :

TITLE :

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| GEOMARINE<br>THE SPIRIT OF ENGINEERING |                             | SITE INVESTIGATION RECORD                      |                                   |                       |         |                        |       | BORE HOLE No. <b>BH-01</b> |                |       |     |            |        |        |     |       |                                                                                                                                                                                            |
|----------------------------------------|-----------------------------|------------------------------------------------|-----------------------------------|-----------------------|---------|------------------------|-------|----------------------------|----------------|-------|-----|------------|--------|--------|-----|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PROJECT NAME                           |                             | PROPOSED CONSTRUCTION OF A COMMERCIAL BUILDING |                                   |                       |         |                        |       | SHEET 1 OF 1               |                |       |     |            |        |        |     |       |                                                                                                                                                                                            |
| LOCATION                               |                             | MACHINE No.                                    |                                   | CHAINAGE (m)          |         | BORE START DATE        |       | DIA OF BORE HOLE           |                |       |     |            |        |        |     |       |                                                                                                                                                                                            |
| Perumal Nagar, Radial Road, Pallavaram |                             |                                                |                                   |                       |         | 03/06/2020             |       | 150mm ✓<br>NX ✓            |                |       |     |            |        |        |     |       |                                                                                                                                                                                            |
| STRUCTURE                              |                             | DRILLING METHOD                                |                                   | CO-ORDINATES          |         | BORE END DATE          |       |                            |                |       |     |            |        |        |     |       |                                                                                                                                                                                            |
| 2B + G + 11 Upper Floors               |                             | Rotary                                         |                                   | N -<br>E -            |         | 05/06/2020             |       |                            |                |       |     |            |        |        |     |       |                                                                                                                                                                                            |
| JOB CODE                               |                             | FLUSHING MEDIUM                                |                                   |                       |         | TOTAL DRILL DAYS       |       |                            |                |       |     |            |        |        |     |       |                                                                                                                                                                                            |
| GT-2081                                |                             | Bentonite                                      |                                   |                       |         | 3                      |       |                            |                |       |     |            |        |        |     |       |                                                                                                                                                                                            |
| Depth below E.G.L (m)                  | Drilling progress per metre |                                                | Type of Drill Bit (SC / TCB / DB) | Core Details          |         | SPT Details            |       |                            | Sample Details |       |     | Layer Data |        |        |     |       |                                                                                                                                                                                            |
|                                        | Time                        |                                                |                                   | Total Core Recovery % | R Q D % | Blows/cm               |       |                            | SPT 'N' Value  | Depth | No. | Type       | RL (m) | Legend | No  | Depth | Geotechnical Description                                                                                                                                                                   |
|                                        | Hr.                         | Min.                                           |                                   |                       |         | 0-15                   | 15-30 | 30-45                      |                |       |     |            |        |        |     |       |                                                                                                                                                                                            |
| 1                                      | 03/06/2020                  | 11:40 To 11:44                                 | SC                                | -                     | -       | 7                      | 12    | 14                         | 26             | 1.00  | 1   | SS         | -1.0   | L1     | 2.0 |       | Brownish Grey, Moist, Poorly Graded, Fine to Medium Grains, Medium Dense, <b>Clayey Silty SAND (SC)</b>                                                                                    |
|                                        |                             | 12:03 To 12:08                                 | SC                                | -                     | -       | 6cm penet for 55blows  |       |                            | >100           | 1.45  |     | WS         | -2.0   |        |     |       |                                                                                                                                                                                            |
| 2                                      | 04/06/2020                  | 14:37 To 15:30                                 | DB                                | -                     | -       | 12cm penet for 58blows |       |                            | >100           | 2.00  |     |            | -3.0   | L2     | 4.5 |       | Brown, Greyish Brown, Moist, Very Dense, <b>Completely Weathered Rock - Grade V Weathering</b> Partly Mixed With Residual Soil Grade VI Weathering (Descent from Hypersthene Granite Rock) |
|                                        |                             | 11:10 To 11:22                                 | DB                                | -                     | -       | 7cm penet for 55blows  |       |                            | >100           | 2.06  |     | WS         | -4.0   |        |     |       |                                                                                                                                                                                            |
| 3                                      | 05/06/2020                  | Total Drilling Time 1hr 25min                  | DB                                | 27                    | 0       |                        |       |                            |                | 3.00  | 2   | SS         | -3.0   | L3     | 6.0 |       | Grey (Medium to Dark), Brownish Grey at Times, Medium to Coarse Grains, Fractured at Places, <b>Moderately Weathered Rock Grade III Rock</b> (Descent from Hypersthene Granite Rock)       |
|                                        |                             | Total Drilling Time 1hr 58min                  | DB                                | 83                    | 34      |                        |       |                            |                | 3.15  |     | CS         | -5.0   |        |     |       |                                                                                                                                                                                            |
| 4                                      | 05/06/2020                  | Total Drilling Time 2hrs 27min                 | DB                                | 82                    | 70      |                        |       |                            |                | 4.00  | 3   | WS         | -4.0   | L4     | 8.0 |       | Grey (Medium to Dark), Pink Shades, Medium to Coarse Grains, <b>Slightly Weathered Rock to Fresh Rock Grade II to I Rock</b> (Descent from Hypersthene Granite Rock)                       |
|                                        |                             | 15:19 To 17:17                                 | DB                                | 95                    | 76      |                        |       |                            |                | 4.07  |     | CS         | -6.0   |        |     |       |                                                                                                                                                                                            |
| 5                                      |                             |                                                |                                   |                       |         |                        |       |                            |                | 5.00  | 4   | CS         | -5.0   |        |     |       |                                                                                                                                                                                            |
|                                        |                             |                                                |                                   |                       |         |                        |       |                            |                | 6.00  | 5   | CS         | -6.0   |        |     |       |                                                                                                                                                                                            |
| 6                                      |                             |                                                |                                   |                       |         |                        |       |                            |                | 7.00  | 6   | CS         | -7.0   |        |     |       |                                                                                                                                                                                            |
|                                        |                             |                                                |                                   |                       |         |                        |       |                            |                | 8.00  | 7   | CS         | -8.0   |        |     |       |                                                                                                                                                                                            |
| 7                                      |                             |                                                |                                   |                       |         |                        |       |                            |                |       |     |            |        |        |     |       |                                                                                                                                                                                            |
|                                        |                             |                                                |                                   |                       |         |                        |       |                            |                |       |     |            |        |        |     |       |                                                                                                                                                                                            |
| 8                                      |                             |                                                |                                   |                       |         |                        |       |                            |                |       |     |            |        |        |     |       |                                                                                                                                                                                            |
|                                        |                             |                                                |                                   |                       |         |                        |       |                            |                |       |     |            |        |        |     |       |                                                                                                                                                                                            |
| 9                                      |                             |                                                |                                   |                       |         |                        |       |                            |                |       |     |            |        |        |     |       |                                                                                                                                                                                            |
|                                        |                             |                                                |                                   |                       |         |                        |       |                            |                |       |     |            |        |        |     |       |                                                                                                                                                                                            |
| 10                                     |                             |                                                |                                   |                       |         |                        |       |                            |                |       |     |            |        |        |     |       |                                                                                                                                                                                            |
|                                        |                             |                                                |                                   |                       |         |                        |       |                            |                |       |     |            |        |        |     |       |                                                                                                                                                                                            |

|                          |                            |         |              |                      |      |         |
|--------------------------|----------------------------|---------|--------------|----------------------|------|---------|
| CS - Core Sample         | DS - Disturbed Sample      | LOGGED  | S. Tyson Raj | PROJECT SITE DETAILS |      | REMARKS |
| SS - Split Spoon Sample  | SC - Soil Cutter           | DATE    | 03/06/2020   | GROUND LEVEL (m)     | 0.00 |         |
| UDS - Undisturbed Sample | TCB - Tungsten Carbide Bit | CHECKED | A. Vinoth    | WATER TABLE (m)      | 1.20 |         |
| WS - Wash Sample         | DB - Diamond Bit           | DATE    | 09/06/2020   | CASING DEPTH (m)     | 0.00 |         |

Borehole terminated at 8 m depth below E.G.L

FIG.2.1 Sub Soil Profile at BH-01 Location

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|  |                             |                                |                                     |                       |         |                               |                       |       |                                      |       |     |            |        |        | <b>SITE INVESTIGATION RECORD</b>       |       |                                                                                                                                                                                      |  |  |  |  |  |  |  | <b>BORE HOLE No.</b><br><b>BH-02</b> |  |
|-----------------------------------------------------------------------------------|-----------------------------|--------------------------------|-------------------------------------|-----------------------|---------|-------------------------------|-----------------------|-------|--------------------------------------|-------|-----|------------|--------|--------|----------------------------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|--|--|--|--------------------------------------|--|
|                                                                                   |                             |                                |                                     |                       |         |                               |                       |       |                                      |       |     |            |        |        | <b>SHEET</b><br>1 OF 1                 |       |                                                                                                                                                                                      |  |  |  |  |  |  |  |                                      |  |
| <b>PROJECT NAME</b><br><b>PROPOSED CONSTRUCTION OF A COMMERCIAL BUILDING</b>      |                             |                                |                                     |                       |         |                               |                       |       |                                      |       |     |            |        |        | <b>DIA OF BORE HOLE</b><br>150mm<br>NX |       |                                                                                                                                                                                      |  |  |  |  |  |  |  |                                      |  |
| <b>LOCATION</b><br>Perumal Nagar, Radial Road, Pallavaram                         |                             |                                | <b>MACHINE No.</b>                  |                       |         | <b>CHAINAGE (m)</b>           |                       |       | <b>BORE START DATE</b><br>06/06/2020 |       |     |            |        |        |                                        |       |                                                                                                                                                                                      |  |  |  |  |  |  |  |                                      |  |
| <b>STRUCTURE</b><br>2B + G + 11 Upper Floors                                      |                             |                                | <b>DRILLING METHOD</b><br>Rotary    |                       |         | <b>CO-ORDINATES</b><br>N<br>E |                       |       | <b>BORE END DATE</b><br>10/06/2020   |       |     |            |        |        |                                        |       |                                                                                                                                                                                      |  |  |  |  |  |  |  |                                      |  |
| <b>JOB CODE</b><br>GT-2081                                                        |                             |                                | <b>FLUSHING MEDIUM</b><br>Bentonite |                       |         |                               |                       |       | <b>TOTAL DRILL DAYS</b><br>4         |       |     |            |        |        |                                        |       |                                                                                                                                                                                      |  |  |  |  |  |  |  |                                      |  |
| Depth below E.G.L (m)                                                             | Drilling progress per metre |                                | Type of Drill Bit (SC / TCB / DB)   | Core Details          |         | SPT Details                   |                       |       | Sample Details                       |       |     | Layer Data |        |        |                                        |       |                                                                                                                                                                                      |  |  |  |  |  |  |  |                                      |  |
|                                                                                   | Date                        | Time                           |                                     | Total Core Recovery % | R Q D % | Blows/cm                      |                       |       | SPT 'N' Value                        | Depth | No. | Type       | RL (m) | Legend | No                                     | Depth | Geotechnical Description                                                                                                                                                             |  |  |  |  |  |  |  |                                      |  |
|                                                                                   |                             |                                |                                     |                       |         | 0-15                          | 15-30                 | 30-45 |                                      |       |     |            |        |        |                                        |       |                                                                                                                                                                                      |  |  |  |  |  |  |  |                                      |  |
| 1                                                                                 | 06/06/2020                  | 14:17 To 14:19                 | SC                                  | -                     | -       | 3                             | 7                     | 10    | 17                                   | 1.00  | 1   | SS         | -1.0   |        |                                        |       | Brownish Grey, Brown, Moist, Poorly Graded, Fine to Medium Grains, Medium Dense, <b>Clayey Silty SAND (SC)</b>                                                                       |  |  |  |  |  |  |  |                                      |  |
| 2                                                                                 |                             | 14:45 To 14:50                 | SC                                  | -                     | -       | 35                            | 15Cm Penet for 65Bows |       | >100                                 | 1.45  | 2   | SS         | -2.0   |        | L1                                     | 2.0   | Brown, Greyish Brown, Moist, Very Dense, <b>Completely Weathered Rock - Grade V Rock</b> (Descent from Hypersthene Granite Rock)                                                     |  |  |  |  |  |  |  |                                      |  |
| 3                                                                                 | 08/06/2020                  | 09:15 To 09:30                 | SC                                  | -                     | -       | 10Cm penet for 55blows        |                       |       | >100                                 | 2.00  | 3   | WS         | -3.0   |        | L2                                     | 3.0   | Grey, Medium to Coarse Grains, Highly Fractured, <b>Highly Weathered Rock Grade IV Rock</b> (Descent from Hypersthene Granite Rock)                                                  |  |  |  |  |  |  |  |                                      |  |
| 4                                                                                 |                             | Total Drilling Time 30min      | DB                                  | 8                     | 0       |                               |                       |       |                                      | 3.10  | 4   | CS         | -4.0   |        | L3                                     | 4.0   | Grey (Medium to Dark), Brownish Grey at Times, Medium to Coarse Grains, Fractured at Places, <b>Moderately Weathered Rock Grade III Rock</b> (Descent from Hypersthene Granite Rock) |  |  |  |  |  |  |  |                                      |  |
| 5                                                                                 |                             | Total Drilling Time 5hr        | DB                                  | 70                    | 43      |                               |                       |       |                                      | 4.00  | 5   | CS         | -5.0   |        | L4                                     | 5.0   | Grey (Medium to Dark), Pink Shades, Medium to Coarse Grains, <b>Slightly Weathered Rock to Fresh Rock Grade II to I Rock</b> (Descent from Hypersthene Granite Rock)                 |  |  |  |  |  |  |  |                                      |  |
| 6                                                                                 | 09/06/2020                  | Total Drilling Time 1hr 30min  | DB                                  | 90                    | 90      |                               |                       |       |                                      | 5.00  | 6   | CS         | -6.0   |        |                                        |       |                                                                                                                                                                                      |  |  |  |  |  |  |  |                                      |  |
| 7                                                                                 |                             | Total Drilling Time 2hrs       | DB                                  | 52                    | 52      |                               |                       |       |                                      | 6.00  | 7   | CS         | -7.0   |        |                                        |       |                                                                                                                                                                                      |  |  |  |  |  |  |  |                                      |  |
| 8                                                                                 | 10/06/2020                  | Total Drilling Time 5hrs 10min | DB                                  | 92                    | 92      |                               |                       |       |                                      | 7.00  | 8   | CS         | -8.0   |        | L5                                     | 8.0   |                                                                                                                                                                                      |  |  |  |  |  |  |  |                                      |  |
| 9                                                                                 |                             |                                |                                     |                       |         |                               |                       |       |                                      | 8.00  |     |            |        |        |                                        |       |                                                                                                                                                                                      |  |  |  |  |  |  |  |                                      |  |
| 10                                                                                |                             |                                |                                     |                       |         |                               |                       |       |                                      |       |     |            |        |        |                                        |       |                                                                                                                                                                                      |  |  |  |  |  |  |  |                                      |  |

|                          |                            |         |                 |                      |      |         |
|--------------------------|----------------------------|---------|-----------------|----------------------|------|---------|
| CS - Core Sample         | DS - Disturbed Sample      | LUGGED  | K. Givasankaran | PROJECT SITE DETAILS |      | REMARKS |
| SS - Split Spoon Sample  | SC - Soil Cutter           | DATE    | 10/06/2020      | GROUND LEVEL (m)     | 0.00 |         |
| UDS - Undisturbed Sample | TCB - Tungsten Carbide Bit | CHECKED | A. Vinoth       | WATER TABLE (m)      | 1.20 |         |
| WS - Wash Sample         | DB - Diamond Bit           | DATE    | 12/06/2020      | CASING DEPTH (m)     | 0.00 |         |

**Borehole terminated at 8 m depth below E.G.L**  
**FIG.2.2 Sub Soil Profile at BH-02 Location**

  
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| GEOMARINE<br>THE SPIRIT OF ENGINEERING |                             | SITE INVESTIGATION RECORD                      |                                   |                       |         |                 |      | BORE HOLE No. <b>BH-03</b> |                |       |       |            |        |        |    |       |                          |                                                                                                                                                                               |
|----------------------------------------|-----------------------------|------------------------------------------------|-----------------------------------|-----------------------|---------|-----------------|------|----------------------------|----------------|-------|-------|------------|--------|--------|----|-------|--------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PROJECT NAME                           |                             | PROPOSED CONSTRUCTION OF A COMMERCIAL BUILDING |                                   |                       |         |                 |      | SHEET 1 OF 1               |                |       |       |            |        |        |    |       |                          |                                                                                                                                                                               |
| LOCATION                               |                             | MACHINE No.                                    |                                   | CHAINAGE (m)          |         | BORE START DATE |      | DIA OF BORE HOLE           |                |       |       |            |        |        |    |       |                          |                                                                                                                                                                               |
| Perumal Nagar, Radial Road, Pallavaram |                             |                                                |                                   |                       |         | 06/06/2020      |      | 150mm ✓<br>NX ✓            |                |       |       |            |        |        |    |       |                          |                                                                                                                                                                               |
| STRUCTURE                              |                             | DRILLING METHOD                                |                                   | CO-ORDINATES          |         | BORE END DATE   |      | TOTAL DRILL DAYS           |                |       |       |            |        |        |    |       |                          |                                                                                                                                                                               |
| 2B + G + 11 Upper Floors               |                             | Rotary                                         |                                   | N -<br>E -            |         | 10/06/2020      |      | 4                          |                |       |       |            |        |        |    |       |                          |                                                                                                                                                                               |
| JOB CODE                               |                             | FLUSHING MEDIUM                                |                                   |                       |         |                 |      |                            |                |       |       |            |        |        |    |       |                          |                                                                                                                                                                               |
| GT-2081                                |                             | Bentonite                                      |                                   |                       |         |                 |      |                            |                |       |       |            |        |        |    |       |                          |                                                                                                                                                                               |
| Depth below E.G.L (m)                  | Drilling progress per metre |                                                | Type of Drill Bit (SC / TCB / DB) | Core Details          |         | SPT Details     |      |                            | Sample Details |       |       | Layer Data |        |        |    |       |                          |                                                                                                                                                                               |
|                                        | Date                        | Time                                           |                                   | Total Core Recovery % | R.Q.D % | Blows/cm        |      |                            | SPT 'N' Value  | Depth | No.   | Type       | RL (m) | Legend | No | Depth | Geotechnical Description |                                                                                                                                                                               |
|                                        |                             | Hr.                                            |                                   |                       |         | Min.            | 0-15 | 15-30                      |                |       |       |            |        |        |    |       |                          | 30-45                                                                                                                                                                         |
| 1                                      | 06/06/2020                  | 16                                             | 47                                | SC                    | -       | -               | 4    | 7                          | 7              | 14    | 1.00  | 1          | SS     | -1.0   |    | L1    | 3.0                      | Brownish Grey, Brown, Moist, Poorly Graded, Fine to Medium Grains, Medium Dense, Clayey Silty SAND (SC)                                                                       |
|                                        |                             | To                                             | 50                                |                       |         |                 |      |                            |                | 1.45  |       |            |        |        |    |       |                          |                                                                                                                                                                               |
| 2                                      |                             | 17                                             | 07                                | SC                    | -       | -               | 7    | 12                         | 18             | 30    | 2.00  | 2          | SS     | -2.0   |    |       |                          |                                                                                                                                                                               |
|                                        |                             | To                                             | 09                                |                       |         |                 |      |                            |                |       | 2.45  |            |        |        |    |       |                          |                                                                                                                                                                               |
| 3                                      |                             | 10                                             | 44                                | SC                    | -       | -               |      |                            |                | >100  | 3.00  | 3          | WS     | -3.0   | +  | +     | +                        | Grey, Brown, Greyish Brown, Very Dense, Completely Weathered Rock - Grade V Rock (Descent from Hypersthene Granite Rock)                                                      |
|                                        |                             | To                                             | 54                                |                       |         |                 |      |                            |                |       |       |            |        | +      | +  | +     |                          |                                                                                                                                                                               |
| 4                                      |                             | 11                                             | 17                                | TCB                   | 0       | 0               |      |                            |                | >100  | 4.00  | 4          | WS     | -4.0   | +  | +     | +                        |                                                                                                                                                                               |
|                                        |                             | To                                             | 43                                |                       |         |                 |      |                            |                |       |       |            |        |        | +  | +     | +                        | Grey (Medium to Dark), Brownish Grey at Times, Medium to Coarse Grains, Fractured at Places, Moderately Weathered Rock Grade III Rock (Descent from Hypersthene Granite Rock) |
| 5                                      | 08/06/2020                  | Total Drilling Time 1hr 35min                  |                                   | DB                    | 23      | 10              |      |                            |                |       |       |            |        |        | +  | +     | +                        |                                                                                                                                                                               |
|                                        |                             |                                                |                                   |                       |         |                 |      |                            |                |       |       |            |        |        | +  | +     | +                        |                                                                                                                                                                               |
| 6                                      |                             | 15                                             | 08                                | DB                    | 3       | 0               |      |                            |                |       | 5.00  | 5          | CS     | -5.0   | +  | +     | +                        | Grey, Medium to Coarse Grains, Highly Fractured, Highly Weathered Rock Grade IV Rock (Descent from Hypersthene Granite Rock)                                                  |
|                                        |                             | To                                             | 40                                |                       |         |                 |      |                            |                |       |       |            |        |        | +  | +     | +                        |                                                                                                                                                                               |
| 7                                      |                             | 15                                             | 52                                | DB                    | 40      | 11              |      |                            |                |       | 6.00  | 6          | CS     | -6.0   | +  | +     | +                        |                                                                                                                                                                               |
|                                        |                             | To                                             | 26                                |                       |         |                 |      |                            |                |       |       |            |        |        | +  | +     | +                        | Grey (Medium to Dark), Brownish Grey at Times, Medium to Coarse Grains, Fractured at Places, Moderately Weathered Rock Grade III Rock (Descent from Hypersthene Granite Rock) |
| 8                                      | 09/06/2020                  | Total Drilling Time 2hr 45min                  |                                   | DB                    | 35      | 25              |      |                            |                |       | 7.00  | 7          | CS     | -7.0   | +  | +     | +                        |                                                                                                                                                                               |
|                                        |                             |                                                |                                   |                       |         |                 |      |                            |                |       |       |            |        |        | +  | +     | +                        |                                                                                                                                                                               |
| 9                                      |                             | 15                                             | 52                                | DB                    | 40      | 11              |      |                            |                |       | 8.00  | 8          | CS     | -8.0   | +  | +     | +                        | Grey (Medium to Dark), Brownish Grey at Times, Medium to Coarse Grains, Fractured at Places, Moderately Weathered Rock Grade III Rock (Descent from Hypersthene Granite Rock) |
|                                        |                             | To                                             | 26                                |                       |         |                 |      |                            |                |       |       |            |        |        | +  | +     | +                        |                                                                                                                                                                               |
| 10                                     | 10/06/2020                  | Total Drilling Time 3hrs 35min                 |                                   | DB                    | 65      | 49              |      |                            |                |       | 9.00  | 9          | CS     | -9.0   | +  | +     | +                        |                                                                                                                                                                               |
|                                        |                             |                                                |                                   |                       |         |                 |      |                            |                |       |       |            |        |        | +  | +     | +                        | Grey (Medium to Dark), Pink Shades, Medium to Coarse Grains, Slightly Weathered Rock to Fresh Rock Grade II to I Rock (Descent from Hypersthene Granite Rock)                 |
|                                        |                             | 09                                             | 00                                | DB                    | 100     | 44              |      |                            |                |       | 10.00 | 10         | CS     | -10.0  | +  | +     | +                        |                                                                                                                                                                               |
|                                        |                             | To                                             | 00                                |                       |         |                 |      |                            |                |       |       |            |        |        | +  | +     | +                        |                                                                                                                                                                               |

|                          |                            |         |                 |                      |      |         |
|--------------------------|----------------------------|---------|-----------------|----------------------|------|---------|
| CS - Core Sample         | DS - Disturbed Sample      | LOGGED  | R. Sivasankaran | PROJECT SITE DETAILS |      | REMARKS |
| SS - Split Spoon Sample  | SC - Soil Cutter           | DATE    | 10/06/2020      | GROUND LEVEL (m)     | 0.00 |         |
| UDS - Undisturbed Sample | TCB - Tungsten Carbide Bit | CHECKED | A. Vinoth       | WATER TABLE (m)      | 1.10 |         |
| WS - Wash Sample         | DB - Diamond Bit           | DATE    | 12/06/2020      | CASING DEPTH (m)     | 0.00 |         |

Borehole terminated at 10 m depth below E.G.L.

FIG.2.3 Sub Soil Profile at BH-03 Location

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|  <b>SITE INVESTIGATION RECORD</b> |                             |      |                                   |                       |         |             |       |                        |               |                |       |      |        |            | BORE HOLE No.                                  |       | <b>BH-04</b>             |                                                                                                                                                                                |   |                  |  |           |                                     |  |  |  |              |  |   |   |                  |  |            |                 |  |            |  |
|--------------------------------------------------------------------------------------------------------------------|-----------------------------|------|-----------------------------------|-----------------------|---------|-------------|-------|------------------------|---------------|----------------|-------|------|--------|------------|------------------------------------------------|-------|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|------------------|--|-----------|-------------------------------------|--|--|--|--------------|--|---|---|------------------|--|------------|-----------------|--|------------|--|
|                                                                                                                    |                             |      |                                   |                       |         |             |       |                        |               |                |       |      |        |            | SHEET                                          |       | 1                        | OF                                                                                                                                                                             | 2 |                  |  |           |                                     |  |  |  |              |  |   |   |                  |  |            |                 |  |            |  |
| PROJECT NAME                                                                                                       |                             |      |                                   |                       |         |             |       |                        |               |                |       |      |        |            | PROPOSED CONSTRUCTION OF A COMMERCIAL BUILDING |       |                          |                                                                                                                                                                                |   | DIA OF BORE HOLE |  | 150mm     | <input checked="" type="checkbox"/> |  |  |  |              |  |   |   |                  |  |            |                 |  |            |  |
| LOCATION                                                                                                           |                             |      |                                   |                       |         |             |       |                        |               |                |       |      |        |            | Perumal Nagar, Radial Road, Pallavaram         |       |                          |                                                                                                                                                                                |   | MACHINE No.      |  |           |                                     |  |  |  | CHAINAGE (m) |  |   |   |                  |  |            | BORE START DATE |  | 03/06/2020 |  |
| STRUCTURE                                                                                                          |                             |      |                                   |                       |         |             |       |                        |               |                |       |      |        |            | 2B + G + 11 Upper Floors                       |       |                          |                                                                                                                                                                                |   | DRILLING METHOD  |  | Rotary    |                                     |  |  |  | CO-ORDINATES |  | N | - | BORE END DATE    |  | 04/06/2020 |                 |  |            |  |
| JOB CODE                                                                                                           |                             |      |                                   |                       |         |             |       |                        |               |                |       |      |        |            | GT-2081                                        |       |                          |                                                                                                                                                                                |   | FLUSHING MEDIUM  |  | Bentonite |                                     |  |  |  | CO-ORDINATES |  | E | - | TOTAL DRILL DAYS |  | 2          |                 |  |            |  |
| Depth below E.G.L (m)                                                                                              | Drilling progress per metre |      |                                   | Core Details          |         | SPT Details |       |                        |               | Sample Details |       |      |        | Layer Data |                                                |       |                          |                                                                                                                                                                                |   |                  |  |           |                                     |  |  |  |              |  |   |   |                  |  |            |                 |  |            |  |
|                                                                                                                    | Time                        |      | Type of Drill Bit (SC / TCB / DB) | Total Core Recovery % | R Q D % | Blows/cm    |       |                        | SPT 'N' Value | Depth          | No    | Type | RL (m) | Legend     | No                                             | Depth | Geotechnical Description |                                                                                                                                                                                |   |                  |  |           |                                     |  |  |  |              |  |   |   |                  |  |            |                 |  |            |  |
|                                                                                                                    | Hr.                         | Min. |                                   |                       |         | 0-15        | 15-30 | 30-45                  |               |                |       |      |        |            |                                                |       |                          |                                                                                                                                                                                |   |                  |  |           |                                     |  |  |  |              |  |   |   |                  |  |            |                 |  |            |  |
| 1                                                                                                                  |                             | 11   | 55                                | SC                    | -       | -           | 3     | 3                      | 6             | 9              | 1.00  | 1    | SS     | -1.0       |                                                |       |                          | Brownish Grey, Grey, Moist, Poorly Graded, Fine to Medium Grains, Loose, Clayey Silty SAND (SC)                                                                                |   |                  |  |           |                                     |  |  |  |              |  |   |   |                  |  |            |                 |  |            |  |
| 2                                                                                                                  |                             | 12   | 05                                | SC                    | -       | -           | 10    | 13                     | 17            | 30             | 1.45  | 2    | SS     | -2.0       |                                                | L1    | 2.0                      | Brownish Grey, Brown, Moist, Dense, Residual Soil to Completely Weathered Rock Grade V & VI Rock (Descent from Hypersthene Granite)                                            |   |                  |  |           |                                     |  |  |  |              |  |   |   |                  |  |            |                 |  |            |  |
| 3                                                                                                                  |                             | 12   | 17                                | SC                    | -       | -           | 32    | 45                     | 58            | 103            | 2.00  | 3    | SS     | -3.0       |                                                | L2    | 3.0                      |                                                                                                                                                                                |   |                  |  |           |                                     |  |  |  |              |  |   |   |                  |  |            |                 |  |            |  |
| 4                                                                                                                  |                             | 12   | 35                                | SC                    | -       | -           |       |                        |               |                | 2.45  | 4    | SS     | -4.0       |                                                |       |                          |                                                                                                                                                                                |   |                  |  |           |                                     |  |  |  |              |  |   |   |                  |  |            |                 |  |            |  |
| 5                                                                                                                  |                             | 12   | 40                                | SC                    | -       | -           |       |                        |               |                | 3.00  | 5    | SS     | -5.0       |                                                |       |                          |                                                                                                                                                                                |   |                  |  |           |                                     |  |  |  |              |  |   |   |                  |  |            |                 |  |            |  |
| 6                                                                                                                  |                             | 14   | 20                                | SC                    | -       | -           | 28    | 15cm penet for 58blows |               | >100           | 3.45  | 6    | WS     | -6.0       |                                                | L3    | 6.0                      | Grey, Brown, Greyish Brown, Very Dense, Completely Weathered Rock - Grade V Rock (Descent from Hypersthene Granite Rock)                                                       |   |                  |  |           |                                     |  |  |  |              |  |   |   |                  |  |            |                 |  |            |  |
| 7                                                                                                                  |                             | 14   | 24                                | SC                    | -       | -           |       |                        |               |                | 4.00  | 7    | CS     | -7.0       |                                                |       |                          |                                                                                                                                                                                |   |                  |  |           |                                     |  |  |  |              |  |   |   |                  |  |            |                 |  |            |  |
| 8                                                                                                                  |                             | 14   | 40                                | SC                    | -       | -           |       |                        |               |                | 4.30  | 8    | CS     | -8.0       |                                                |       |                          |                                                                                                                                                                                |   |                  |  |           |                                     |  |  |  |              |  |   |   |                  |  |            |                 |  |            |  |
| 9                                                                                                                  |                             | 14   | 47                                | SC                    | -       | -           |       |                        |               |                | 5.00  | 9    | CS     | -9.0       |                                                | L4    | 8.0                      | Grey, Brownish Grey at Times, Medium to Coarse Grains, Highly Fractured, Highly Weathered Rock Grade IV Rock (Descent from Hypersthene Granite Rock)                           |   |                  |  |           |                                     |  |  |  |              |  |   |   |                  |  |            |                 |  |            |  |
| 10                                                                                                                 |                             | 10   | 40                                | DB                    | -       | -           |       |                        |               |                | 5.12  | 10   | CS     | -10.0      |                                                |       |                          | Grey (Medium to Dark), Pinkish to Brown Shades, Medium to Coarse Grains, Fractured at Places, Moderately Weathered Rock Grade III Rock (Descent from Hypersthene Granite Rock) |   |                  |  |           |                                     |  |  |  |              |  |   |   |                  |  |            |                 |  |            |  |
|                                                                                                                    |                             | 11   | 05                                | DB                    | 5       | 0           |       |                        |               |                | 6.00  |      |        |            |                                                |       |                          |                                                                                                                                                                                |   |                  |  |           |                                     |  |  |  |              |  |   |   |                  |  |            |                 |  |            |  |
|                                                                                                                    |                             | 11   | 17                                | DB                    | 5       | 0           |       |                        |               |                | 6.10  |      |        |            |                                                |       |                          |                                                                                                                                                                                |   |                  |  |           |                                     |  |  |  |              |  |   |   |                  |  |            |                 |  |            |  |
|                                                                                                                    |                             | 11   | 39                                | DB                    | 6       | 0           |       |                        |               |                | 7.00  |      |        |            |                                                |       |                          |                                                                                                                                                                                |   |                  |  |           |                                     |  |  |  |              |  |   |   |                  |  |            |                 |  |            |  |
|                                                                                                                    |                             | 11   | 50                                | DB                    | 6       | 0           |       |                        |               |                | 8.00  |      |        |            |                                                |       |                          |                                                                                                                                                                                |   |                  |  |           |                                     |  |  |  |              |  |   |   |                  |  |            |                 |  |            |  |
|                                                                                                                    |                             | 12   | 15                                | DB                    | 13      | 0           |       |                        |               |                | 9.00  |      |        |            |                                                |       |                          |                                                                                                                                                                                |   |                  |  |           |                                     |  |  |  |              |  |   |   |                  |  |            |                 |  |            |  |
|                                                                                                                    |                             | 12   | 20                                | DB                    | 48      | 20          |       |                        |               |                | 10.00 |      |        |            |                                                |       |                          |                                                                                                                                                                                |   |                  |  |           |                                     |  |  |  |              |  |   |   |                  |  |            |                 |  |            |  |
|                                                                                                                    |                             | 12   | 45                                |                       |         |             |       |                        |               |                |       |      |        |            |                                                |       |                          |                                                                                                                                                                                |   |                  |  |           |                                     |  |  |  |              |  |   |   |                  |  |            |                 |  |            |  |
|                                                                                                                    |                             | 12   | 50                                |                       |         |             |       |                        |               |                |       |      |        |            |                                                |       |                          |                                                                                                                                                                                |   |                  |  |           |                                     |  |  |  |              |  |   |   |                  |  |            |                 |  |            |  |
|                                                                                                                    |                             | 13   | 15                                |                       |         |             |       |                        |               |                |       |      |        |            |                                                |       |                          |                                                                                                                                                                                |   |                  |  |           |                                     |  |  |  |              |  |   |   |                  |  |            |                 |  |            |  |

|                         |                            |         |                   |                       |      |                      |
|-------------------------|----------------------------|---------|-------------------|-----------------------|------|----------------------|
| CS - Core Sample        | DS - Disturbed Sample      | LOGGED  | K. Givaseenikaran | PROJ.FGT SITE DETAILS |      | REMARKS              |
| SS - Split Spoon Sample | SC - Soil Cutter           | DATE    | 03/06/2020        | GROUND LEVEL (m)      | 0.00 | *(F) - Sample Failed |
| UDS- Undisturbed Sample | TCB - Tungsten Carbide Bit | CHECKED | A. Vinoth         | WATER TABLE (m)       | 1.30 |                      |
| WS - Wash Sample        | DB - Diamond Bit           | DATE    | 06/06/2020        | CASING DEPTH (m)      | 0.00 |                      |

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|  |                             | SITE INVESTIGATION RECORD                      |      |                 |                                   |                       |                        | BORE HOLE No. <b>BH-05</b>                                                       |                |       |               |       |            |      |        |        |      |                                                                                                                                                                                    |                          |
|-----------------------------------------------------------------------------------|-----------------------------|------------------------------------------------|------|-----------------|-----------------------------------|-----------------------|------------------------|----------------------------------------------------------------------------------|----------------|-------|---------------|-------|------------|------|--------|--------|------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|
|                                                                                   |                             |                                                |      |                 |                                   |                       |                        | SHEET 1 OF 2                                                                     |                |       |               |       |            |      |        |        |      |                                                                                                                                                                                    |                          |
| PROJECT NAME                                                                      |                             | PROPOSED CONSTRUCTION OF A COMMERCIAL BUILDING |      |                 |                                   |                       |                        | DIA OF BORE HOLE                                                                 |                |       |               |       |            |      |        |        |      |                                                                                                                                                                                    |                          |
| LOCATION                                                                          |                             | Perumal Nagar, Radial Road, Pallavaram         |      | MACHINE No.     |                                   |                       |                        | 150mm <input checked="" type="checkbox"/> NX <input checked="" type="checkbox"/> |                |       |               |       |            |      |        |        |      |                                                                                                                                                                                    |                          |
| STRUCTURE                                                                         |                             | 2B + G + 11 Upper Floors                       |      | DRILLING METHOD |                                   | Rotary                |                        | BORE START DATE                                                                  |                |       |               |       |            |      |        |        |      |                                                                                                                                                                                    |                          |
| JOB CODE                                                                          |                             | GT-2081                                        |      | FLUSHING MEDIUM |                                   | Bentonite             |                        | 03/06/2020                                                                       |                |       |               |       |            |      |        |        |      |                                                                                                                                                                                    |                          |
|                                                                                   |                             |                                                |      |                 |                                   |                       |                        | BORE END DATE                                                                    |                |       |               |       |            |      |        |        |      |                                                                                                                                                                                    |                          |
|                                                                                   |                             |                                                |      |                 |                                   |                       |                        | 04/06/2020                                                                       |                |       |               |       |            |      |        |        |      |                                                                                                                                                                                    |                          |
|                                                                                   |                             |                                                |      |                 |                                   |                       |                        | TOTAL DRILL DAYS                                                                 |                |       |               |       |            |      |        |        |      |                                                                                                                                                                                    |                          |
|                                                                                   |                             |                                                |      |                 |                                   |                       |                        | 2                                                                                |                |       |               |       |            |      |        |        |      |                                                                                                                                                                                    |                          |
| Depth below E.G.L. (m)                                                            | Drilling progress per metre |                                                |      | Core Details    | SPT Details                       |                       |                        |                                                                                  | Sample Details |       |               |       | Layer Data |      |        |        |      |                                                                                                                                                                                    |                          |
|                                                                                   | Date                        | Time                                           |      |                 | Type of Drill Bit (SC / TCB / DB) | Total Core Recovery % | R.Q.D. %               | Blows/cm                                                                         |                |       | SPT 'N' Value | Depth | No         | Type | RL (m) | Legend | No   | Depth                                                                                                                                                                              | Geotechnical Description |
|                                                                                   |                             | Hr.                                            | Min. |                 |                                   |                       |                        | 0-15                                                                             | 15-30          | 30-45 |               |       |            |      |        |        |      |                                                                                                                                                                                    |                          |
| 1                                                                                 | 03/06/2020                  | 11                                             | 40   | SC              | -                                 | -                     | 3                      | 4                                                                                | 3              | 7     | 1.00          | 1     | SS         | -1.0 |        |        |      | Pale Grey to Greyish White, Moist, Medium Stiff, <b>Sandy Silty CLAY (CI)</b> Sandy silty clay of medium plasticity                                                                |                          |
| 2                                                                                 |                             | 11                                             | 45   | SC              | -                                 | -                     | 4                      | 10                                                                               | 13             | 23    | 1.45          | 2     | SS         | -2.0 |        | L1     | 2.0  | Brownish Grey, Grey, Moist, Poorly Graded, Fine to Medium Grains, Medium Dense, <b>Clayey Silty SAND (SC)</b>                                                                      |                          |
| 3                                                                                 |                             | 12                                             | 05   | SC              | -                                 | -                     | 5                      | 37                                                                               | 58             | 95    | 2.00          | 3     | SS         | -3.0 |        | L2     | 3.0  |                                                                                                                                                                                    |                          |
| 4                                                                                 |                             | 12                                             | 10   | SC              | -                                 | -                     | 6                      | 25                                                                               | 55             | 80    | 2.45          | 4     | SS         | -4.0 |        |        |      | Grey, Brown, Greyish Brown, Very Dense, <b>Completely Weathered Rock - Grade V Rock</b> (Descent from Hypersthene Granite Rock)                                                    |                          |
| 5                                                                                 |                             | 12                                             | 30   | SC              | -                                 | -                     | 25                     | 11cm penet for 55blows                                                           |                | >100  | 3.00          | 5     | SS         | -5.0 |        |        |      |                                                                                                                                                                                    |                          |
| 6                                                                                 |                             | 12                                             | 35   | SC              | -                                 | -                     | 15cm penet for 55blows |                                                                                  | >100           | 3.45  | 6             | SS    | -6.0       |      |        | L3     | 6.0  | Grey, Brownish Grey at Places, Medium to Coarse Grains, Highly Fractured, <b>Completely to Highly Weathered Rock Grade IV &amp; V Rock</b> (Descent from Hypersthene Granite Rock) |                          |
| 7                                                                                 | 04/06/2020                  | 14                                             | 25   | SC              | -                                 | -                     |                        |                                                                                  |                | 4.00  | 7             | CS    | -7.0       |      |        |        |      |                                                                                                                                                                                    |                          |
| 8                                                                                 |                             | 14                                             | 55   | SC              | -                                 | -                     |                        |                                                                                  |                | 4.45  | 8             | CS    | -8.0       |      |        |        |      |                                                                                                                                                                                    |                          |
| 9                                                                                 |                             | 15                                             | 07   | DB              | 5                                 | 0                     |                        |                                                                                  |                | 5.00  | 9             | CS    | -9.0       |      |        |        |      |                                                                                                                                                                                    |                          |
| 10                                                                                |                             | 10                                             | 25   | DB              | 3                                 | 0                     |                        |                                                                                  |                | 5.26  | 10            | CS    | -10.0      |      |        | L4     | 10.0 |                                                                                                                                                                                    |                          |
|                                                                                   |                             | 11                                             | 00   | DB              | 13                                | 0                     |                        |                                                                                  |                | 6.00  |               |       |            |      |        |        |      |                                                                                                                                                                                    |                          |
|                                                                                   |                             | 11                                             | 18   | DB              | 4                                 | 0                     |                        |                                                                                  |                | 6.15  |               |       |            |      |        |        |      |                                                                                                                                                                                    |                          |
|                                                                                   |                             | 11                                             | 35   |                 |                                   |                       |                        |                                                                                  |                | 7.00  |               |       |            |      |        |        |      |                                                                                                                                                                                    |                          |
|                                                                                   |                             | 11                                             | 45   |                 |                                   |                       |                        |                                                                                  |                | 8.00  |               |       |            |      |        |        |      |                                                                                                                                                                                    |                          |
|                                                                                   |                             | 12                                             | 05   |                 |                                   |                       |                        |                                                                                  |                | 9.00  |               |       |            |      |        |        |      |                                                                                                                                                                                    |                          |
|                                                                                   |                             | 12                                             | 15   |                 |                                   |                       |                        |                                                                                  |                |       |               |       |            |      |        |        |      |                                                                                                                                                                                    |                          |
|                                                                                   |                             | 12                                             | 40   |                 |                                   |                       |                        |                                                                                  |                |       |               |       |            |      |        |        |      |                                                                                                                                                                                    |                          |
|                                                                                   |                             | 12                                             | 50   |                 |                                   |                       |                        |                                                                                  |                |       |               |       |            |      |        |        |      |                                                                                                                                                                                    |                          |
|                                                                                   |                             | 13                                             | 20   |                 |                                   |                       |                        |                                                                                  |                |       |               |       |            |      |        |        |      |                                                                                                                                                                                    |                          |

|                          |                            |         |                 |                      |      |         |
|--------------------------|----------------------------|---------|-----------------|----------------------|------|---------|
| CS - Core Sample         | DS - Disturbed Sample      | LOGGED  | K. Sivasankaran | PROJECT SITE DETAILS |      | REMARKS |
| SS - Split Spoon Sample  | SC - Soil Cutter           | DATE    | 03/06/2020      | GROUND LEVEL (m)     | 0.00 |         |
| UDS - Undisturbed Sample | TCB - Tungsten Carbide Bit | CHECKED | A. Vinoth       | WATER TABLE (m)      | 1.00 |         |
| WS - Wash Sample         | DB - Diamond Bit           | DATE    | 06/06/2020      | CASING DEPTH (m)     | 0.00 |         |

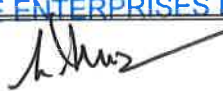
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|  |                                        | SITE INVESTIGATION RECORD                      |                                   |                       |         |              |      | BORE HOLE No. <b>BH-05</b>                |                  |            |            |      |        |        |     |       |                          |                                                                                                                                                                                       |
|-----------------------------------------------------------------------------------|----------------------------------------|------------------------------------------------|-----------------------------------|-----------------------|---------|--------------|------|-------------------------------------------|------------------|------------|------------|------|--------|--------|-----|-------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                   |                                        |                                                |                                   |                       |         |              |      | SHEET 2 OF 2                              |                  |            |            |      |        |        |     |       |                          |                                                                                                                                                                                       |
| PROJECT NAME                                                                      |                                        | PROPOSED CONSTRUCTION OF A COMMERCIAL BUILDING |                                   |                       |         |              |      | DIA OF BORE HOLE                          |                  |            |            |      |        |        |     |       |                          |                                                                                                                                                                                       |
|                                                                                   |                                        |                                                |                                   |                       |         |              |      | 150mm <input checked="" type="checkbox"/> |                  |            |            |      |        |        |     |       |                          |                                                                                                                                                                                       |
|                                                                                   |                                        |                                                |                                   |                       |         |              |      | NX <input checked="" type="checkbox"/>    |                  |            |            |      |        |        |     |       |                          |                                                                                                                                                                                       |
| LOCATION                                                                          | Perumal Nagar, Radial Road, Pallavaram |                                                | MACHINE No.                       |                       |         | CHAINAGE (m) |      |                                           | BORE START DATE  | 03/06/2020 |            |      |        |        |     |       |                          |                                                                                                                                                                                       |
| STRUCTURE                                                                         | 2B + G + 11 Upper Floors               |                                                | DRILLING METHOD                   | Rotary                |         | CO-ORDINATES | N    | -                                         | BORE END DATE    | 04/06/2020 |            |      |        |        |     |       |                          |                                                                                                                                                                                       |
| JOB CODE                                                                          | GT-2081                                |                                                | FLUSHING MEDIUM                   | Bentonite             |         | CO-ORDINATES | E    | -                                         | TOTAL DRILL DAYS | 2          |            |      |        |        |     |       |                          |                                                                                                                                                                                       |
| Depth below E.G.L (m)                                                             | Drilling progress per metre            |                                                | Type of Drill Bit (SC / TCB / DB) | Core Details          |         | SPT Details  |      |                                           | Sample Details   |            | Layer Data |      |        |        |     |       |                          |                                                                                                                                                                                       |
|                                                                                   | Date                                   | Time                                           |                                   | Total Core Recovery % | R.Q.D % | Blows/cm     |      |                                           | SPT 'N' Value    | Depth      | No.        | Type | RL (m) | Legend | No. | Depth | Geotechnical Description |                                                                                                                                                                                       |
|                                                                                   |                                        | Hr.                                            |                                   |                       |         | Min.         | 0-15 | 15-30                                     |                  |            |            |      |        |        |     |       |                          | 30-45                                                                                                                                                                                 |
| 11                                                                                | 04/06/2020                             | 14 To 15                                       | 15                                | DB                    | 23      | 15           |      |                                           |                  |            | 11.00      | 11   | CS     | -11.0  | +   | +     | +                        | Grey (Medium to Dark), Pinkish to Brown Shades, Medium to Coarse Grains, Fractured at Places, <b>Moderately Weathered Rock Grade III Rock</b> (Descent from Hypersthene Granite Rock) |
| 12                                                                                |                                        | Total Drilling Time 1hr 50min                  |                                   | DB                    | 25      | 0            |      |                                           |                  |            | 12.00      | 12   | CS     | -12.0  | +   | +     | +                        |                                                                                                                                                                                       |
| 13                                                                                | 05/06/2020                             | Total Drilling Time 2hr 52min                  |                                   | DB                    | 63      | 17           |      |                                           |                  |            | 13.50      | 13   | CS     | -13.5  | +   | +     | +                        |                                                                                                                                                                                       |
| 14                                                                                |                                        |                                                |                                   |                       |         |              |      |                                           |                  |            |            |      |        |        |     |       |                          |                                                                                                                                                                                       |
| 15                                                                                |                                        |                                                |                                   |                       |         |              |      |                                           |                  |            |            |      |        |        |     |       |                          |                                                                                                                                                                                       |
| 16                                                                                |                                        |                                                |                                   |                       |         |              |      |                                           |                  |            |            |      |        |        |     |       |                          |                                                                                                                                                                                       |
| 17                                                                                |                                        |                                                |                                   |                       |         |              |      |                                           |                  |            |            |      |        |        |     |       |                          |                                                                                                                                                                                       |
| 18                                                                                |                                        |                                                |                                   |                       |         |              |      |                                           |                  |            |            |      |        |        |     |       |                          |                                                                                                                                                                                       |
| 19                                                                                |                                        |                                                |                                   |                       |         |              |      |                                           |                  |            |            |      |        |        |     |       |                          |                                                                                                                                                                                       |
| 20                                                                                |                                        |                                                |                                   |                       |         |              |      |                                           |                  |            |            |      |        |        |     |       |                          |                                                                                                                                                                                       |

|                          |                            |         |                 |                      |      |         |
|--------------------------|----------------------------|---------|-----------------|----------------------|------|---------|
| CS - Core Sample         | US - Disturbed Sample      | LOGGED  | K. Sivasankaran | PROJECT SITE DETAILS |      | REMARKS |
| SS - Split Spoon Sample  | SC - Soil Cutter           | DATE    | 05/06/2020      | GROUND LEVEL (m)     | 0.00 |         |
| UDS - Undisturbed Sample | TCB - Tungsten Carbide Bit | CHECKED | A. Vinoth       | WATER TABLE (m)      | 1.00 |         |
| WS - Wash Sample         | DB - Diamond Bit           | DATE    | 09/06/2020      | CASING DEPTH (m)     | 0.00 |         |

Borehole terminated at 13.5 m depth below E.G.L  
FIG.2.5 Sub Soil Profile at BH-05 Location

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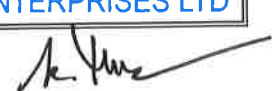
|  |                                | SITE INVESTIGATION RECORD                      |                                   |                       |         |                        |       | BORE HOLE No. <b>BH-06</b> |                |       |     |            |        |        |     |       |                                                                                                         |
|-----------------------------------------------------------------------------------|--------------------------------|------------------------------------------------|-----------------------------------|-----------------------|---------|------------------------|-------|----------------------------|----------------|-------|-----|------------|--------|--------|-----|-------|---------------------------------------------------------------------------------------------------------|
|                                                                                   |                                |                                                |                                   |                       |         |                        |       | SHEET 1 OF 1               |                |       |     |            |        |        |     |       |                                                                                                         |
| PROJECT NAME                                                                      |                                | PROPOSED CONSTRUCTION OF A COMMERCIAL BUILDING |                                   |                       |         |                        |       | DIA OF BORE HOLE           |                |       |     |            |        |        |     |       |                                                                                                         |
| LOCATION                                                                          |                                | Perumal Nagar, Radial Road, Pallavaram         |                                   | MACHINE No.           |         |                        |       | 150mm NX                   |                |       |     |            |        |        |     |       |                                                                                                         |
| STRUCTURE                                                                         |                                | 2B + G + 11 Upper Floors                       |                                   | DRILLING METHOD       |         | Rotary                 |       | BORE START DATE            |                |       |     |            |        |        |     |       |                                                                                                         |
| JOB CODE                                                                          |                                | GT-2081                                        |                                   | FLUSHING MEDIUM       |         | Bentonite              |       | 05/06/2020                 |                |       |     |            |        |        |     |       |                                                                                                         |
|                                                                                   |                                |                                                |                                   |                       |         | CO-ORDINATES           |       | BORE END DATE              |                |       |     |            |        |        |     |       |                                                                                                         |
|                                                                                   |                                |                                                |                                   |                       |         | N                      |       | 06/06/2020                 |                |       |     |            |        |        |     |       |                                                                                                         |
|                                                                                   |                                |                                                |                                   |                       |         | E                      |       | TOTAL DRILL DAYS           |                |       |     |            |        |        |     |       |                                                                                                         |
|                                                                                   |                                |                                                |                                   |                       |         |                        |       | 2                          |                |       |     |            |        |        |     |       |                                                                                                         |
| Depth below E.G.L (m)                                                             | Drilling progress per metre    |                                                | Type of Drill Bit (SC / TCB / DB) | Core Details          |         | SPT Details            |       |                            | Sample Details |       |     | Layer Data |        |        |     |       |                                                                                                         |
|                                                                                   | Time                           |                                                |                                   | Total Core Recovery % | R.Q.D % | Blows/cm.              |       |                            | SPT 'N' Value  | Depth | No  | Type       | RL (m) | Legend | No  | Depth | Geotechnical Description                                                                                |
|                                                                                   | Hr.                            | Min.                                           |                                   |                       |         | 0-15                   | 15-30 | 30-45                      |                |       |     |            |        |        |     |       |                                                                                                         |
| 1                                                                                 | 10                             | 35                                             | SC                                | -                     | -       | -                      | -     | -                          | 1.00           | 1     | UDS | -1.0       |        |        |     |       | Brownish Grey, Brown, Moist, Poorly Graded, Fine to Medium Grains, Medium Dense, Clayey Silty SAND (SC) |
| 2                                                                                 | 10                             | 40                                             | SC                                | -                     | -       | -                      | -     | -                          | 2.00           | 2     | SS  | -2.0       |        | L1     | 2.0 |       | Brownish Grey, Brown, Moist, Dense, Residual Soil Grade VI Rock (Descent from Hypersthene Granite)      |
| 3                                                                                 | 11                             | 02                                             | SC                                | -                     | -       | 13                     | 25    | 25                         | 2.45           |       |     |            |        |        |     |       |                                                                                                         |
| 4                                                                                 | 11                             | 18                                             | SC                                | -                     | -       | 15cm penet for 55blows |       |                            | >100           | 3.00  | 3   | SS         | -3.0   |        | L2  | 3.0   |                                                                                                         |
| 5                                                                                 | 11                             | 23                                             | SC                                | -                     | -       | 15cm penet for 58blows |       |                            | >100           | 3.15  |     |            |        |        |     |       |                                                                                                         |
| 6                                                                                 | 11                             | 40                                             | SC                                | -                     | -       | 15cm penet for 58blows |       |                            | >100           | 4.00  | 4   | SS         | -4.0   |        |     |       |                                                                                                         |
| 7                                                                                 | 11                             | 45                                             | SC                                | -                     | -       | SPT Hammer Rebound     |       |                            | >100           | 4.15  |     |            |        |        |     |       |                                                                                                         |
| 8                                                                                 | 11                             | 58                                             | SC                                | -                     | -       | SPT Hammer Rebound     |       |                            | >100           | 5.00  | 5   | WS         | -5.0   |        | L3  | 5.0   |                                                                                                         |
| 9                                                                                 | 12                             | 15                                             | SC                                | -                     | -       | SPT Hammer Rebound     |       |                            | >100           | 6.00  | 6   | CS         | -6.0   |        | L4  | 6.0   |                                                                                                         |
| 10                                                                                | Total Drilling Time 1hr 50min  |                                                | DB                                | 11                    | 0       | SPT Hammer Rebound     |       |                            | >100           | 7.00  | 7   | CS         | -7.0   |        | L5  | 7.0   |                                                                                                         |
| 11                                                                                | 15                             | 10                                             | DB                                | 41                    | 12      | SPT Hammer Rebound     |       |                            | >100           | 8.00  | 8   | CS         | -8.0   |        |     |       |                                                                                                         |
| 12                                                                                | 16                             | 25                                             | DB                                | 92                    | 80      | SPT Hammer Rebound     |       |                            | >100           | 9.00  | 9   | CS         | -9.0   |        |     |       |                                                                                                         |
| 13                                                                                | Total Drilling Time 2hrs 20min |                                                | DB                                | 90                    | 90      | SPT Hammer Rebound     |       |                            | >100           | 10.00 | 10  | CS         | -10.0  |        | L6  | 10.0  |                                                                                                         |
| 14                                                                                | 13                             | 50                                             | DB                                | 61                    | 61      | SPT Hammer Rebound     |       |                            | >100           |       |     |            |        |        |     |       |                                                                                                         |
| 15                                                                                | 15                             | 55                                             | DB                                |                       |         | SPT Hammer Rebound     |       |                            | >100           |       |     |            |        |        |     |       |                                                                                                         |
| 16                                                                                | 16                             | 05                                             | DB                                |                       |         | SPT Hammer Rebound     |       |                            | >100           |       |     |            |        |        |     |       |                                                                                                         |
| 17                                                                                | 17                             | 35                                             | DB                                |                       |         | SPT Hammer Rebound     |       |                            | >100           |       |     |            |        |        |     |       |                                                                                                         |

|                         |                            |         |                 |                      |      |         |
|-------------------------|----------------------------|---------|-----------------|----------------------|------|---------|
| CS - Core Sample        | DS - Disturbed Sample      | LOGGED  | K. Sivasankaran | PROJECT SITE DETAILS |      | REMARKS |
| SS - Split Spoon Sample | SC - Soil Cutter           | DATE    | 06/06/2020      | GROUND LEVEL (m)     | 0.00 |         |
| UDS- Undisturbed Sample | TCB - Tungsten Carbide Bit | CHECKED | A. Vinoth       | WATER TABLE (m)      | 1.20 |         |
| WS - Wash Sample        | DB - Diamond Bit           | DATE    | 09/06/2020      | CASING DEPTH (m)     | 0.00 |         |

Borehole terminated at 10 m depth below E.G.L

FIG.2.6 Sub Soil Profile at BH-06 Location

  
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| GEO MARINE<br>THE SPIRIT OF ENGINEERING |                             | SITE INVESTIGATION RECORD                      |                                   |                       |         |                       |                      |              |                |                  |      | BORE HOLE No.   |            | BH-07      |     |                                                                                                                                                                         |                          |                                                                                                                                                                                |
|-----------------------------------------|-----------------------------|------------------------------------------------|-----------------------------------|-----------------------|---------|-----------------------|----------------------|--------------|----------------|------------------|------|-----------------|------------|------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PROJECT NAME                            |                             | PROPOSED CONSTRUCTION OF A COMMERCIAL BUILDING |                                   |                       |         |                       |                      |              |                |                  |      | SHEET           |            | 1 OF 1     |     |                                                                                                                                                                         |                          |                                                                                                                                                                                |
| LOCATION                                |                             | Perumal Nagar, Radial Road, Pallavaram         |                                   | MACHINE No.           |         |                       |                      | CHAINAGE (m) |                |                  |      | BORE START DATE |            | 13/06/2020 |     |                                                                                                                                                                         |                          |                                                                                                                                                                                |
| STRUCTURE                               |                             | 2B + G + 11 Upper Floors                       |                                   | DRILLING METHOD       |         | Rotary                |                      | CO-ORDINATES |                | N -              |      | BORE END DATE   |            | 14/06/2020 |     |                                                                                                                                                                         |                          |                                                                                                                                                                                |
| JOB CODE                                |                             | GT-2081                                        |                                   | FLUSHING MEDIUM       |         | Bentonite             |                      | E -          |                | TOTAL DRILL DAYS |      | 2               |            |            |     |                                                                                                                                                                         |                          |                                                                                                                                                                                |
| Depth below E.G.L (m)                   | Drilling progress per metre |                                                | Type of Drill Bit (SC / TCB / DB) | Core Details          |         | SPT Details           |                      |              | Sample Details |                  |      |                 | Layer Data |            |     |                                                                                                                                                                         |                          |                                                                                                                                                                                |
|                                         | Date                        | Time                                           |                                   | Total Core Recovery % | R.Q.D % | Blows/cm              |                      |              | SPT 'N' Value  | Depth            | No.  | Type            | RL (m)     | Legend     | No. | Depth                                                                                                                                                                   | Geotechnical Description |                                                                                                                                                                                |
|                                         |                             | Hr.                                            |                                   |                       |         | Min.                  | 0-15                 | 15-30        |                |                  |      |                 |            |            |     |                                                                                                                                                                         |                          | 30-45                                                                                                                                                                          |
| 1                                       | 13/06/2020                  | 12                                             | 02                                | SC                    | -       | -                     | 9                    | 9            | 10             | 19               | 1.00 | 1               | SS         | -1.0       |     | L1                                                                                                                                                                      | 2.0                      | Brownish Grey, Brown, Moist, Poorly Graded, Fine to Medium Grains, Medium Dense, Clayey Silty SAND (SC)                                                                        |
| 12                                      |                             | 03                                             | SC                                | -                     | -       | 4cm penet for 52blows | >100                 | 2.00         | 2              | SS               | -2.0 |                 |            |            |     |                                                                                                                                                                         |                          |                                                                                                                                                                                |
| 2                                       |                             | 12                                             | 10                                | SC                    | -       | -                     | SPT Hammer Rebounded | >100         | 2.04           | 3                | SS   | -3.0            |            | L2         | 4.0 | Grey, Brownish Grey at Places, Medium to Coarse Grains, Highly Fractured, Completely to Highly Weathered Rock Grade IV & V Rock (Descent from Hypersthene Granite Rock) |                          |                                                                                                                                                                                |
| 12                                      |                             | 14                                             | SC                                | -                     | -       | 15                    | 34                   | DB           | 10             | 0                | 4.00 | 4               |            |            |     |                                                                                                                                                                         | CS                       | -4.0                                                                                                                                                                           |
| 3                                       | 14/06/2020                  | 12                                             | 15                                | SC                    | -       | -                     | -                    | -            | -              | -                | 5.00 | 5               | CS         | -5.0       |     | L3                                                                                                                                                                      | 6.0                      | Grey (Medium to Dark), Pinkish to Brown Shades, Medium to Coarse Grains, Fractured at Places, Moderately Weathered Rock Grade III Rock (Descent from Hypersthene Granite Rock) |
| 13                                      |                             | 55                                             | DB                                | 10                    | 0       | 6.00                  | 6                    | CS           | -6.0           |                  |      |                 |            |            |     |                                                                                                                                                                         |                          |                                                                                                                                                                                |
| 4                                       |                             | Total Drilling Time 2hrS 41min                 | 10                                | 15                    | DB      | 89                    | 55                   | -            | -              | -                | 7.00 | 7               | CS         | -7.0       |     | L4                                                                                                                                                                      | 8.0                      | Grey (Medium to Dark), Pink Shades, Medium to Coarse Grains, Slightly Weathered Rock to Fresh Rock Grade II to I Rock (Descent from Hypersthene Granite Rock)                  |
| 13                                      |                             | 00                                             | DB                                | 92                    | 79      | 8.00                  | 8                    | CS           | -8.0           |                  |      |                 |            |            |     |                                                                                                                                                                         |                          |                                                                                                                                                                                |
| 5                                       | 10                          | 40                                             | DB                                | 95                    | 81      | -                     | -                    | -            | -              | -                | -    | -               | -          | -          | -   | -                                                                                                                                                                       | -                        | -                                                                                                                                                                              |
| 6                                       | 12                          | 00                                             | DB                                | 92                    | 79      | -                     | -                    | -            | -              | -                | -    | -               | -          | -          | -   | -                                                                                                                                                                       | -                        | -                                                                                                                                                                              |
| 7                                       | 13                          | 15                                             | DB                                | 95                    | 81      | -                     | -                    | -            | -              | -                | -    | -               | -          | -          | -   | -                                                                                                                                                                       | -                        | -                                                                                                                                                                              |
| 8                                       | 13                          | 33                                             | DB                                | 95                    | 81      | -                     | -                    | -            | -              | -                | -    | -               | -          | -          | -   | -                                                                                                                                                                       | -                        | -                                                                                                                                                                              |
| 9                                       | 14                          | 50                                             | DB                                | 95                    | 81      | -                     | -                    | -            | -              | -                | -    | -               | -          | -          | -   | -                                                                                                                                                                       | -                        | -                                                                                                                                                                              |
| 10                                      |                             |                                                |                                   |                       |         |                       |                      |              |                |                  |      |                 |            |            |     |                                                                                                                                                                         |                          |                                                                                                                                                                                |

|                          |                            |         |              |                      |      |                      |
|--------------------------|----------------------------|---------|--------------|----------------------|------|----------------------|
| CS - Core Sample         | DS - Disturbed Sample      | LOGGED  | K Loganathan | PROJECT SITE DETAILS |      | REMARKS              |
| SS - Split Spoon Sample  | SC - Soil Cutter           | DATE    | 13/06/2020   | GROUND LEVEL (m)     | 0.00 | *(F) - Sample Failed |
| UDS - Undisturbed Sample | TCB - Tungsten Carbide Bit | CHECKED | A. Vinoth    | WATER TABLE (m)      | 1.10 |                      |
| WS - Wash Sample         | DB - Diamond Bit           | DATE    | 15/06/2020   | CASING DEPTH (m)     | 0.00 |                      |

Borehole terminated at 8 m depth below E.G.L

FIG.2.7 Sub Soil Profile at BH-07 Location

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| GEOMARINE<br>THE SPIRIT OF ENGINEERING                                    |                             | SITE INVESTIGATION RECORD                      |                                      |                       |             |                  |               | BORE HOLE No. <b>BH-08</b> |     |                |            |        |       |       |                          |                                                                                                                                                                                               |
|---------------------------------------------------------------------------|-----------------------------|------------------------------------------------|--------------------------------------|-----------------------|-------------|------------------|---------------|----------------------------|-----|----------------|------------|--------|-------|-------|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PROJECT NAME                                                              |                             | PROPOSED CONSTRUCTION OF A COMMERCIAL BUILDING |                                      |                       |             |                  |               | SHEET 1 OF 1               |     |                |            |        |       |       |                          |                                                                                                                                                                                               |
| LOCATION                                                                  |                             | MACHINE No.                                    |                                      | CHAINAGE (m)          |             | BORE START DATE  |               | 11/06/2020                 |     |                |            |        |       |       |                          |                                                                                                                                                                                               |
| STRUCTURE                                                                 |                             | DRILLING METHOD                                |                                      | Rotary                |             | BORE END DATE    |               | 12/06/2020                 |     |                |            |        |       |       |                          |                                                                                                                                                                                               |
| JOB CODE                                                                  |                             | FLUSHING MEDIUM                                |                                      | Bentonite             |             | TOTAL DRILL DAYS |               | 2                          |     |                |            |        |       |       |                          |                                                                                                                                                                                               |
| Depth below E.G.L.<br>(m)                                                 | Drilling progress per metre |                                                | Core Details                         |                       | SPT Details |                  |               | Sample Details             |     |                | Layer Data |        |       |       |                          |                                                                                                                                                                                               |
|                                                                           | Date                        | Time                                           | Type of Drill Bit<br>(SC / TCB / DB) | Total Core Recovery % | R.Q.D. %    | Blows/cm         | SPT 'N' Value | Depth                      | No. | Type           | RL (m)     | Legend | No    | Depth | Geotechnical Description |                                                                                                                                                                                               |
|                                                                           | Hr.                         | Min.                                           |                                      |                       |             | 0-15             | 15-30         | 30-45                      |     |                |            |        |       |       |                          |                                                                                                                                                                                               |
| 1                                                                         | 11/06/2020                  | 10:20 To 10:21                                 | SC                                   | -                     | -           | 3                | 3             | 10                         | 13  | 1.00           | 1          | SS     | -1.0  |       |                          | Brownish Grey, Brown, Moist, Poorly Graded, Fine to Medium Grains, Medium Dense, Clayey Silty SAND (SC)                                                                                       |
| 2                                                                         |                             | 10:31 To 10:34                                 | SC                                   | -                     | -           | 8                | 15            | 30                         | 45  | 1.45 ↓<br>2.00 | 2          | SS     | -2.0  | L1    | 2.0                      |                                                                                                                                                                                               |
| 3                                                                         |                             | 10:45 To 10:49                                 | SC                                   | -                     | -           | 18               | 24            | 32                         | 56  | 2.45 ↓<br>3.00 | 3          | SS     | -3.0  |       |                          | Greyish Brown, Brown, Very Dense, Completely Weathered Rock - Grade V Rock (Descent from Hypersthene Granite Rock)                                                                            |
| 4                                                                         |                             | 11:01 To 11:34                                 | DB                                   | 10                    | 0           | -                | -             | -                          | -   | 3.45 ↓<br>4.00 | 4          | CS     | -4.0  | L2    | 4.0                      |                                                                                                                                                                                               |
| 5                                                                         |                             | 11:50 To 12:57                                 | DB                                   | 29                    | 12          | -                | -             | -                          | -   | 5.00           | 5          | CS     | -5.0  |       |                          | Grey (Medium to Dark), Pinkish to Brown Shades, Medium to Coarse Grains, Fractured at Places, Highly to Moderately Weathered Rock Grade III & IV Rock (Descent from Hypersthene Granite Rock) |
| 6                                                                         |                             | Total Drilling Time 1 hr 59min                 | DB                                   | 38                    | 0           | -                | -             | -                          | -   | 6.00           | 6          | CS     | -6.0  | L3    | 6.0                      |                                                                                                                                                                                               |
| 7                                                                         |                             | Total Drilling Time 2 hr 17min                 | DB                                   | 89                    | 61          | -                | -             | -                          | -   | 7.00           | 7          | CS     | -7.0  |       |                          |                                                                                                                                                                                               |
| 8                                                                         | 12/06/2020                  | 10:37 To 12:00                                 | DB                                   | 86                    | 71          | -                | -             | -                          | -   | 8.00           | 8          | CS     | -8.0  |       |                          | Grey (Medium to Dark), Pink Shades, Medium to Coarse Grains, Slightly Weathered Rock Grade II Rock (Descent from Hypersthene Granite Rock)                                                    |
| 9                                                                         |                             | 12:14 To 13:40                                 | DB                                   | 90                    | 35          | -                | -             | -                          | -   | 9.00           | 9          | CS     | -9.0  |       |                          |                                                                                                                                                                                               |
| 10                                                                        |                             | Total Drilling Time 2 hr 23min                 | DB                                   | 90                    | 30          | -                | -             | -                          | -   | 10.00          | 10         | CS     | -10.0 | L4    | 10.0                     |                                                                                                                                                                                               |
| CS - Core Sample                                                          |                             | DS - Disturbed Sample                          |                                      | LOGGED                |             | K. Loganathan    |               | PROJECT SITE DETAILS       |     | REMARKS        |            |        |       |       |                          |                                                                                                                                                                                               |
| SS - Split Spoon Sample                                                   |                             | SC - Soil Cutter                               |                                      | DATE                  |             | 12/06/2020       |               | GROUND LEVEL (m)           |     | 0.00           |            |        |       |       |                          |                                                                                                                                                                                               |
| UDS- Undisturbed Sample                                                   |                             | TCB - Tungsten Carbide Bit                     |                                      | CHECKED               |             | A. Vinoth        |               | WATER TABLE (m)            |     | 1.30           |            |        |       |       |                          |                                                                                                                                                                                               |
| WS - Wash Sample                                                          |                             | DB - Diamond Bit                               |                                      | DATE                  |             | 15/06/2020       |               | CASING DEPTH (m)           |     | 0.00           |            |        |       |       |                          |                                                                                                                                                                                               |
| Borehole terminated at 10 m depth below E.G.L.                            |                             |                                                |                                      |                       |             |                  |               |                            |     |                |            |        |       |       |                          |                                                                                                                                                                                               |
| FIG.2.8 Sub Soil Profile at BH-08 Location <b>BRIGADE ENTERPRISES LTD</b> |                             |                                                |                                      |                       |             |                  |               |                            |     |                |            |        |       |       |                          |                                                                                                                                                                                               |

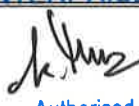
| GEOMARINE<br>THE SPIRIT OF ENGINEERING |                             | SITE INVESTIGATION RECORD                      |                                   |                       |          |             |                       |              |                |                  |     | BORE HOLE No.    |            | BH-09           |    |       |                                                                                                                                                                                  |
|----------------------------------------|-----------------------------|------------------------------------------------|-----------------------------------|-----------------------|----------|-------------|-----------------------|--------------|----------------|------------------|-----|------------------|------------|-----------------|----|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PROJECT NAME                           |                             | PROPOSED CONSTRUCTION OF A COMMERCIAL BUILDING |                                   |                       |          |             |                       |              |                |                  |     | SHEET            |            | 1 OF 1          |    |       |                                                                                                                                                                                  |
| LOCATION                               |                             | Perumal Nagar, Radial Road, Pallavaram         |                                   | MACHINE No.           |          | -           |                       | CHAINAGE (m) |                | -                |     | DIA OF BORE HOLE |            | 150mm ✓<br>NX ✓ |    |       |                                                                                                                                                                                  |
| STRUCTURE                              |                             | 2B + G + 11 Upper Floors                       |                                   | DRILLING METHOD       |          | Rotary      |                       | CO-ORDINATES |                | N -<br>E -       |     | BORE START DATE  |            | 10/06/2020      |    |       |                                                                                                                                                                                  |
| JOB CODE                               |                             | GT-2081                                        |                                   | FLUSHING MEDIUM       |          | Bentonite   |                       |              |                |                  |     | BORE END DATE    |            | 13/06/2020      |    |       |                                                                                                                                                                                  |
|                                        |                             |                                                |                                   |                       |          |             |                       |              |                |                  |     | TOTAL DRILL DAYS |            | 4               |    |       |                                                                                                                                                                                  |
| Depth below E.G.L. (m)                 | Drilling progress per metre |                                                | Type of Drill Bit (SC / TCB / DB) | Core Details          |          | SPT Details |                       |              | Sample Details |                  |     |                  | Layer Data |                 |    |       |                                                                                                                                                                                  |
|                                        | Date                        | Time                                           |                                   | Total Core Recovery % | R.Q.D. % | Blows/cm    |                       |              | SPT 'N' Value  | Depth            | No. | Type             | RL (m)     | Legend          | No | Depth | Geotechnical Description                                                                                                                                                         |
|                                        |                             |                                                |                                   |                       |          | 0-15        | 15-30                 | 30-45        |                |                  |     |                  |            |                 |    |       |                                                                                                                                                                                  |
| 1                                      | 10/06/2020                  | 13:53 To 13:54                                 | SC                                | -                     | -        | 6           | 7                     | 9            | 16             | 1.00             | 1   | SS               | -1.0       |                 |    |       | Brownish Grey, Brown, Moist, Poorly Graded, Fine to Medium Grains, Medium Dense, Clayey Silty SAND (SC)                                                                          |
| 2                                      | 10/06/2020                  | 14:13 To 14:14                                 | SC                                | -                     | -        | 14          | 12                    | 13           | 25             | 1.45 ↓<br>2.00 ↓ | 2   | SS               | -2.0       |                 | L1 | 2.0   |                                                                                                                                                                                  |
| 3                                      | 10/06/2020                  | 14:37 To 14:41                                 | SC                                | -                     | -        | 30          | 7cm penet for 22blows |              |                | 3.00 ↓<br>3.22 ↓ | 3   | SS               | -3.0       | +               |    |       | Brownish Grey, Brown, Moist, Medium Dense, Residual Soil Grade VI Rock (Descent from Hyperthene Granite)                                                                         |
| 4                                      | 11/06/2020                  | Total Drilling Time 2hrs 1min                  |                                   | DB                    | 46       | 10          |                       |              |                |                  |     |                  |            | +               | L2 | 3.4   |                                                                                                                                                                                  |
| 5                                      | 11/06/2020                  | 09:25 To 11:01                                 | DB                                | 38                    | 10       |             |                       |              |                | 4.00 ↓           | 4   | CS               | -4.0       | +               |    |       | Grey (Medium to Dark), Pinkish to Brown Shades, Medium to Coarse Grains, Fractured at Places, Moderately Weathered Rock Grade III Rock (Descent from Hypersthenite Granite Rock) |
| 6                                      | 11/06/2020                  | Total Drilling Time 6 hr 30min                 |                                   | DB                    | 26       | 0           |                       |              |                | 5.00 ↓           | 5   | CS               | -5.0       | +               |    |       |                                                                                                                                                                                  |
| 7                                      | 12/06/2020                  | Total Drilling Time 2 hr 47min                 |                                   | DB                    | 36       | 22          |                       |              |                | 6.00 ↓           | 6   | CS               | -6.0       | +               |    |       |                                                                                                                                                                                  |
| 8                                      | 12/06/2020                  | 10:30 To 11:50                                 | DB                                | 89                    | 70       |             |                       |              |                | 7.00 ↓           | 7   | CS               | -7.0       | +               | L3 | 7.0   |                                                                                                                                                                                  |
| 9                                      | 13/06/2020                  | 12:10 To 12:55                                 | DB                                | 92                    | 79       |             |                       |              |                | 8.00 ↓           | 8   | CS               | -8.0       | +               |    |       | Grey (Medium to Dark), Pink Shades, Medium to Coarse Grains, Slightly Weathered Rock Grade II Rock (Descent from Hypersthenite Granite Rock)                                     |
| 10                                     | 13/06/2020                  | 14:03 To 15:30                                 | DB                                | 81                    | 75       |             |                       |              |                | 9.00 ↓           | 9   | CS               | -9.0       | +               |    |       |                                                                                                                                                                                  |
|                                        |                             |                                                |                                   |                       |          |             |                       |              |                | 10.00 ↓          | 10  | CS               | -10.0      | +               | L4 | 1.0   |                                                                                                                                                                                  |

|                          |  |                            |  |         |  |             |  |                      |  |         |  |
|--------------------------|--|----------------------------|--|---------|--|-------------|--|----------------------|--|---------|--|
| CS - Core Sample         |  | DS - Disturbed Sample      |  | LOGGERS |  | S. Tyronraj |  | PROJECT SITE DETAILS |  | REMARKS |  |
| SS - Split Spoon Sample  |  | SC - Soil Cutter           |  | DATE    |  | 10/06/2020  |  | GROUND LEVEL (m)     |  | 0.00    |  |
| UDS - Undisturbed Sample |  | TCB - Tungsten Carbide Bit |  | CHECKED |  | A. Vinoth   |  | WATER TABLE (m)      |  | 1.20    |  |
| WS - Wash Sample         |  | DB - Diamond Bit           |  | DATE    |  | 15/06/2020  |  | CASING DEPTH (m)     |  | 0.00    |  |

Borehole terminated at 10 m depth below E.G.L

FIG.2.9 Sub Soil Profile at BH-09 Location

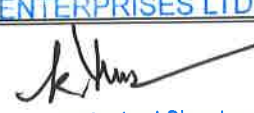
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|  |                                       |           |                                          |                              |                |                    |             |              |                       |                        |           |             |               |                   | <b>SITE INVESTIGATION RECORD</b>                      |              |                                 |                                                                                                                                                             |                                                                                                                                                                                       |                        |  |  |  |  | <b>BORE HOLE No. BH-10</b> |  |              |  |                                     |                        |  |                         |  |                      |  |                   |  |
|-----------------------------------------------------------------------------------|---------------------------------------|-----------|------------------------------------------|------------------------------|----------------|--------------------|-------------|--------------|-----------------------|------------------------|-----------|-------------|---------------|-------------------|-------------------------------------------------------|--------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|--|--|--|--|----------------------------|--|--------------|--|-------------------------------------|------------------------|--|-------------------------|--|----------------------|--|-------------------|--|
|                                                                                   |                                       |           |                                          |                              |                |                    |             |              |                       |                        |           |             |               |                   | <b>SHEET</b>                                          |              | <b>1 OF 1</b>                   |                                                                                                                                                             |                                                                                                                                                                                       |                        |  |  |  |  |                            |  |              |  |                                     |                        |  |                         |  |                      |  |                   |  |
| <b>PROJECT NAME</b>                                                               |                                       |           |                                          |                              |                |                    |             |              |                       |                        |           |             |               |                   | <b>PROPOSED CONSTRUCTION OF A COMMERCIAL BUILDING</b> |              |                                 |                                                                                                                                                             |                                                                                                                                                                                       |                        |  |  |  |  | <b>DIA OF BORE HOLE</b>    |  | <b>150mm</b> |  | <input checked="" type="checkbox"/> |                        |  |                         |  |                      |  |                   |  |
| <b>LOCATION</b>                                                                   |                                       |           |                                          |                              |                |                    |             |              |                       |                        |           |             |               |                   | <b>Perumal Nagar, Radial Road, Pallavaram</b>         |              |                                 |                                                                                                                                                             |                                                                                                                                                                                       | <b>MACHINE No.</b>     |  |  |  |  | <b>CHAINAGE (m)</b>        |  |              |  |                                     | <b>BORE START DATE</b> |  | <b>08/06/2020</b>       |  |                      |  |                   |  |
| <b>STRUCTURE</b>                                                                  |                                       |           |                                          |                              |                |                    |             |              |                       |                        |           |             |               |                   | <b>2B + G + 11 Upper Floors</b>                       |              |                                 |                                                                                                                                                             |                                                                                                                                                                                       | <b>DRILLING METHOD</b> |  |  |  |  | <b>Rotary</b>              |  |              |  |                                     | <b>CO-ORDINATES</b>    |  | <b>N</b>                |  | <b>BORE END DATE</b> |  | <b>09/06/2020</b> |  |
| <b>JOB CODE</b>                                                                   |                                       |           |                                          |                              |                |                    |             |              |                       |                        |           |             |               |                   | <b>GT-2081</b>                                        |              |                                 |                                                                                                                                                             |                                                                                                                                                                                       | <b>FLUSHING MEDIUM</b> |  |  |  |  | <b>Bentonite</b>           |  |              |  |                                     | <b>E</b>               |  | <b>TOTAL DRILL DAYS</b> |  | <b>2</b>             |  |                   |  |
| Depth below E.G.L (m)                                                             | <b>Drilling progress per metre</b>    |           |                                          | <b>Core Details</b>          |                | <b>SPT Details</b> |             |              |                       | <b>Sample Details</b>  |           |             |               | <b>Layer Data</b> |                                                       |              |                                 |                                                                                                                                                             |                                                                                                                                                                                       |                        |  |  |  |  |                            |  |              |  |                                     |                        |  |                         |  |                      |  |                   |  |
|                                                                                   | <b>Time</b>                           |           | <b>Type of Drill Bit (SC / TCB / DB)</b> | <b>Total Core Recovery %</b> | <b>R Q D %</b> | <b>Blows/cm</b>    |             |              | <b>SPT 'N' Value</b>  | <b>Depth</b>           | <b>No</b> | <b>Type</b> | <b>RL (m)</b> | <b>Legend</b>     | <b>No</b>                                             | <b>Depth</b> | <b>Geotechnical Description</b> |                                                                                                                                                             |                                                                                                                                                                                       |                        |  |  |  |  |                            |  |              |  |                                     |                        |  |                         |  |                      |  |                   |  |
|                                                                                   | <b>Date</b>                           | <b>Hr</b> |                                          |                              |                | <b>Min</b>         | <b>0-15</b> | <b>15-30</b> |                       |                        |           |             |               |                   |                                                       |              |                                 | <b>30-45</b>                                                                                                                                                |                                                                                                                                                                                       |                        |  |  |  |  |                            |  |              |  |                                     |                        |  |                         |  |                      |  |                   |  |
| 1                                                                                 | 14                                    | 00        | To                                       | 14                           | 03             | SC                 | -           | -            | 5                     | 6                      | 6         | 12          | 1.00          | 1                 | SS                                                    | -1.0         |                                 |                                                                                                                                                             | Brownish Grey, Brown, Moist, Poorly Graded, Fine to Medium Grains, Medium Dense, <b>Clayey Silty SAND (SC)</b>                                                                        |                        |  |  |  |  |                            |  |              |  |                                     |                        |  |                         |  |                      |  |                   |  |
| 2                                                                                 | 14                                    | 15        | To                                       | 14                           | 17             | SC                 | -           | -            | 5                     | 18                     | 20        | 38          | 1.45          | 2                 | SS                                                    | -2.0         | L1                              | 2.0                                                                                                                                                         | Brownish Grey, Brown, Moist, Medium Dense, <b>Residual Soil Grade VI Rock</b> (Descent from Hypersthene Granite)                                                                      |                        |  |  |  |  |                            |  |              |  |                                     |                        |  |                         |  |                      |  |                   |  |
| 3                                                                                 | 14                                    | 27        | To                                       | 14                           | 30             | SC                 | -           | -            | 10                    | 27                     | 39        | 66          | 2.00          | 3                 | SS                                                    | -3.0         | L2                              | 3.0                                                                                                                                                         | Greyish Brown, Brown, Very Dense, <b>Completely Weathered Rock - Grade V Rock</b> (Descent from Hypersthene Granite Rock)                                                             |                        |  |  |  |  |                            |  |              |  |                                     |                        |  |                         |  |                      |  |                   |  |
| 4                                                                                 | 14                                    | 45        | To                                       | 14                           | 49             | SC                 | -           | -            | 18                    | 15cm penet for 58blows |           | >100        | 3.45          | 4                 | SS                                                    | -4.0         |                                 |                                                                                                                                                             | Grey (Medium to Dark), Pinkish to Brown Shades, Medium to Coarse Grains, Fractured at Places, <b>Moderately Weathered Rock Grade III Rock</b> (Descent from Hypersthene Granite Rock) |                        |  |  |  |  |                            |  |              |  |                                     |                        |  |                         |  |                      |  |                   |  |
| 5                                                                                 | 15                                    | 02        | To                                       | 15                           | 05             | TCB                | -           | -            | 5cm penet for 58blows |                        | >100      | 4.00        | 5             | WS                | -5.0                                                  | L3           | 5.4                             | Grey, Brownish Grey at times, Medium to Coarse Grains, Highly Fractured, <b>Highly Weathered Rock Grade IV Rock</b> (Descent from Hypersthene Granite Rock) |                                                                                                                                                                                       |                        |  |  |  |  |                            |  |              |  |                                     |                        |  |                         |  |                      |  |                   |  |
| 6                                                                                 | 15                                    | 27        | To                                       | 15                           | 50             | DB                 | 15          | 0            |                       |                        |           |             | 4.30          | 6                 | CS                                                    | -6.0         | L4                              | 6.0                                                                                                                                                         | Grey (Medium to Dark), Pinkish to Brown Shades, Medium to Coarse Grains, Fractured at Places, <b>Moderately Weathered Rock Grade III Rock</b> (Descent from Hypersthene Granite Rock) |                        |  |  |  |  |                            |  |              |  |                                     |                        |  |                         |  |                      |  |                   |  |
| 7                                                                                 | 16                                    | 03        | To                                       | 17                           | 30             | DB                 | 70          | 54           |                       |                        |           |             | 6.00          | 7                 | CS                                                    | -7.0         | L5                              | 7.0                                                                                                                                                         | Grey (Medium to Dark), Pink Shades, Medium to Coarse Grains, <b>Slightly Weathered Rock to Fresh Rock Grade II to I Rock</b> (Descent from Hypersthene Granite Rock)                  |                        |  |  |  |  |                            |  |              |  |                                     |                        |  |                         |  |                      |  |                   |  |
| 8                                                                                 | 08                                    | 50        | To                                       | 09                           | 50             | DB                 | 90          | 67           |                       |                        |           |             | 7.00          | 8                 | CS                                                    | -8.0         |                                 |                                                                                                                                                             |                                                                                                                                                                                       |                        |  |  |  |  |                            |  |              |  |                                     |                        |  |                         |  |                      |  |                   |  |
| 9                                                                                 | 10                                    | 02        | To                                       | 11                           | 40             | DB                 | 85          | 63           |                       |                        |           |             | 8.00          | 9                 | CS                                                    | -9.0         |                                 |                                                                                                                                                             |                                                                                                                                                                                       |                        |  |  |  |  |                            |  |              |  |                                     |                        |  |                         |  |                      |  |                   |  |
| 10                                                                                | <b>Total Drilling Time 1 hr 30min</b> |           |                                          |                              |                | DB                 | 95          | 36           |                       |                        |           |             | 9.00          | 10                | CS                                                    | -10.0        | L6                              | 10.0                                                                                                                                                        |                                                                                                                                                                                       |                        |  |  |  |  |                            |  |              |  |                                     |                        |  |                         |  |                      |  |                   |  |

|                          |                            |         |                 |                      |      |                      |
|--------------------------|----------------------------|---------|-----------------|----------------------|------|----------------------|
| CS - Core Sample         | DS - Disturbed Sample      | LOGGED  | K. Sivasankaran | PROJECT SITE DETAILS |      | REMARKS              |
| SS - Split Spoon Sample  | SC - Soil Cutter           | DATE    | 09/06/2020      | GROUND LEVEL (m)     | 0.00 | *(F) - Sample Failed |
| UDS - Undisturbed Sample | TCB - Tungsten Carbide Bit | CHECKED | A. Vinoth       | WATER TABLE (m)      | 1.20 |                      |
| WS - Wash Sample         | DB - Diamond Bit           | DATE    | 12/06/2020      | CASING DEPTH (m)     | 0.00 |                      |

**Borehole terminated at 10 m depth below E.G.L**  
**FIG.2.10 Sub Soil Profile at BH-10 Location**

  
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| GEOMARINE<br>THE SPIRIT OF ENGINEERING |                             | SITE INVESTIGATION RECORD                      |                                   |                       |         |             |      |              |                |                  |      | BORE HOLE No. <b>BH-11</b> |            |        |     |       |                          |                                                                                                                                                               |
|----------------------------------------|-----------------------------|------------------------------------------------|-----------------------------------|-----------------------|---------|-------------|------|--------------|----------------|------------------|------|----------------------------|------------|--------|-----|-------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PROJECT NAME                           |                             | PROPOSED CONSTRUCTION OF A COMMERCIAL BUILDING |                                   |                       |         |             |      |              |                |                  |      | SHEET                      |            |        |     |       |                          |                                                                                                                                                               |
| LOCATION                               |                             | Perumal Nagar, Radial Road, Pallavaram         |                                   | MACHINE No.           |         |             |      | CHAINAGE (m) |                |                  |      | DIA OF BORE HOLE           |            |        |     |       |                          |                                                                                                                                                               |
| STRUCTURE                              |                             | 2B + G + 11 Upper Floors                       |                                   | DRILLING METHOD       |         | Rotary      |      | CO-ORDINATES |                | N -              |      | 150mm ✓                    |            |        |     |       |                          |                                                                                                                                                               |
| JOB CODE                               |                             | GT-2081                                        |                                   | FLUSHING MEDIUM       |         | Bentonite   |      | E -          |                | BORE START DATE  |      | 09/06/2020                 |            |        |     |       |                          |                                                                                                                                                               |
|                                        |                             |                                                |                                   |                       |         |             |      |              |                | BORE END DATE    |      | 10/06/2020                 |            |        |     |       |                          |                                                                                                                                                               |
|                                        |                             |                                                |                                   |                       |         |             |      |              |                | TOTAL DRILL DAYS |      | 2                          |            |        |     |       |                          |                                                                                                                                                               |
| Depth below E.G.L (m)                  | Drilling progress per metre |                                                | Type of Drill Bit (SC / TCB / DB) | Core Details          |         | SPT Details |      |              | Sample Details |                  |      |                            | Layer Data |        |     |       |                          |                                                                                                                                                               |
|                                        | Date                        | Time                                           |                                   | Total Core Recovery % | R.Q.D % | Blows/cm.   |      |              | SPT 'N' Value  | Depth            | No.  | Type                       | RL (m)     | Legend | No. | Depth | Geotechnical Description |                                                                                                                                                               |
|                                        |                             | Hr.                                            |                                   |                       |         | Min.        | 0-15 | 15-30        |                |                  |      |                            |            |        |     |       |                          | 30-45                                                                                                                                                         |
| 1                                      | 09/06/2020                  | 15                                             | 20                                | SC                    | -       | -           | 3    | 4            | 8              | 12               | 1.00 | 1                          | SS         | -1.0   |     | L1    | 3.0                      | Brownish Grey, Brown, Moist, Poorly Graded, Fine to Medium Grains, Medium Dense, Clayey Silty SAND (SC)                                                       |
|                                        |                             | To                                             | 24                                | SC                    | -       | -           | 8    | 11           | 18             | 29               | 1.45 | 2                          | SS         | -2.0   |     |       |                          |                                                                                                                                                               |
| 2                                      |                             | 15                                             | 36                                | SC                    | -       | -           | 13   | 18           | 60             | 78               | 2.00 | 3                          | SS         | -3.0   |     |       |                          |                                                                                                                                                               |
|                                        |                             | To                                             | 40                                | SC                    | -       | -           |      |              |                |                  | 2.45 |                            |            |        |     |       |                          |                                                                                                                                                               |
| 3                                      | 10/06/2020                  | 15                                             | 55                                | SC                    | -       | -           |      |              |                |                  | 3.00 | 4                          | WS         | -4.0   |     | L2    | 4.4                      | Greyish Brown, Brown, Very Dense, Completely Weathered Rock - Grade V Rock (Descent from Hypersthene Granite Rock)                                            |
|                                        |                             | To                                             | 59                                | SC                    | -       | -           |      |              |                |                  | 3.45 |                            |            |        |     |       |                          |                                                                                                                                                               |
| 4                                      |                             | 16                                             | 15                                | SC                    | -       | -           |      |              |                |                  | 4.00 | 5                          | CS         | -5.0   |     |       |                          |                                                                                                                                                               |
|                                        |                             | To                                             | 25                                | SC                    | -       | -           |      |              |                |                  |      |                            |            |        |     |       |                          |                                                                                                                                                               |
| 5                                      |                             | 16                                             | 40                                | DB                    | 86      | 63          |      |              |                |                  |      |                            |            |        |     | L3    | 8.0                      | Grey (Medium to Dark), Pink Shades, Medium to Coarse Grains, Slightly Weathered Rock to Fresh Rock Grade II to I Rock (Descent from Hypersthene Granite Rock) |
|                                        |                             | To                                             | 40                                | DB                    | 76      | 64          |      |              |                |                  | 5.00 | 6                          | CS         | -6.0   |     |       |                          |                                                                                                                                                               |
| 6                                      |                             | 08                                             | 55                                | DB                    | 85      | 70          |      |              |                |                  | 6.00 | 7                          | CS         | -7.0   |     |       |                          |                                                                                                                                                               |
|                                        |                             | To                                             | 40                                | DB                    | 80      | 68          |      |              |                |                  | 7.00 | 8                          | CS         | -8.0   |     |       |                          |                                                                                                                                                               |
| 7                                      |                             | 11                                             | 05                                |                       |         |             |      |              |                |                  |      |                            |            |        |     |       |                          |                                                                                                                                                               |
|                                        |                             | To                                             | 55                                |                       |         |             |      |              |                |                  |      |                            |            |        |     |       |                          |                                                                                                                                                               |
| 8                                      |                             | 14                                             | 00                                |                       |         |             |      |              |                |                  |      |                            |            |        |     |       |                          |                                                                                                                                                               |
|                                        |                             | To                                             | 30                                |                       |         |             |      |              |                |                  |      |                            |            |        |     |       |                          |                                                                                                                                                               |
| 9                                      |                             | 16                                             |                                   |                       |         |             |      |              |                |                  |      |                            |            |        |     |       |                          |                                                                                                                                                               |
|                                        |                             |                                                |                                   |                       |         |             |      |              |                |                  |      |                            |            |        |     |       |                          |                                                                                                                                                               |
| 10                                     |                             |                                                |                                   |                       |         |             |      |              |                |                  |      |                            |            |        |     |       |                          |                                                                                                                                                               |
|                                        |                             |                                                |                                   |                       |         |             |      |              |                |                  |      |                            |            |        |     |       |                          |                                                                                                                                                               |

|                          |                            |         |             |                     |      |         |
|--------------------------|----------------------------|---------|-------------|---------------------|------|---------|
| OO - Core Sample         | DC - Disturbed Sample      | LOGGED  | G. Tyoonraj | PROJECT SITE DETAIL |      | REMARKS |
| SS - Split Spoon Sample  | SC - Soil Cutter           | DATE    | 09/06/2020  | GROUND LEVEL (m)    | 0.00 |         |
| UDS - Undisturbed Sample | TCB - Tungsten Carbide Bit | CHECKED | A. Vinoth   | WATER TABLE (m)     | 1.30 |         |
| WS - Wash Sample         | DB - Diamond Bit           | DATE    | 12/06/2020  | CASING DEPTH (m)    | 0.00 |         |

Borehole terminated at 8 m depth below E.G.L.  
FIG.2.11 Sub Soil Profile at BH-11 Location

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| GEOMARINE<br>THE SPIRIT OF ENGINEERING |                             | SITE INVESTIGATION RECORD                      |      |                                   |                       |           |             |              |       |                |       | BORE HOLE No. <b>BH-13</b>                                                                        |      |            |        |    |       |                                                                                                                                                                                                       |
|----------------------------------------|-----------------------------|------------------------------------------------|------|-----------------------------------|-----------------------|-----------|-------------|--------------|-------|----------------|-------|---------------------------------------------------------------------------------------------------|------|------------|--------|----|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| PROJECT NAME                           |                             | PROPOSED CONSTRUCTION OF A COMMERCIAL BUILDING |      |                                   |                       |           |             |              |       |                |       | SHEET 1 OF 1                                                                                      |      |            |        |    |       |                                                                                                                                                                                                       |
| LOCATION                               |                             | Perumal Nagar, Radial Road, Pallavaram         |      | MACHINE No.                       |                       |           |             | CHAINAGE (m) |       |                |       | DIA OF BORE HOLE 150mm <input checked="" type="checkbox"/> NX <input checked="" type="checkbox"/> |      |            |        |    |       |                                                                                                                                                                                                       |
| STRUCTURE                              |                             | 2B + G + 11 Upper Floors                       |      | DRILLING METHOD                   |                       | Rotary    |             | CO-ORDINATES |       | N -            |       | BORE START DATE 12/06/2020                                                                        |      |            |        |    |       |                                                                                                                                                                                                       |
| JOB CODE                               |                             | GT-2081                                        |      | FLUSHING MEDIUM                   |                       | Bentonite |             | E -          |       |                |       | BORE END DATE 12/06/2020                                                                          |      |            |        |    |       |                                                                                                                                                                                                       |
| TOTAL DRILL DAYS                       |                             | 1                                              |      |                                   |                       |           |             |              |       |                |       |                                                                                                   |      |            |        |    |       |                                                                                                                                                                                                       |
| Depth below E.G.L. (m)                 | Drilling progress per metre |                                                |      | Type of Drill Bit (SC / TCB / DB) | Core Details          |           | SPT Details |              |       | Sample Details |       |                                                                                                   |      | Layer Data |        |    |       |                                                                                                                                                                                                       |
|                                        | Date                        | Time                                           |      |                                   | Total Core Recovery % | R Q D %   | Blows/cm    |              |       | SPT 'N' Value  | Depth | No.                                                                                               | Type | RL (m)     | Legend | No | Depth | Geotechnical Description                                                                                                                                                                              |
|                                        |                             | Hr.                                            | Min. |                                   |                       |           | 0-15        | 15-30        | 30-45 |                |       |                                                                                                   |      |            |        |    |       |                                                                                                                                                                                                       |
|                                        |                             |                                                |      |                                   |                       |           |             |              |       |                |       |                                                                                                   |      |            |        |    |       |                                                                                                                                                                                                       |
| 1                                      | 10                          | 22                                             | To   | SC                                | -                     | -         | 5           | 7            | 8     | 15             | 1.00  | 1                                                                                                 | SS   | -1.0       |        |    |       | Grey, Greyish Brown, Moist, Poorly Graded, Fine to Medium Grains, Medium Dense, Clayey Silty SAND (SC)                                                                                                |
| 2                                      | 10                          | 50                                             | To   | SC                                | -                     | -         | 11          | 26           | 31    | 57             | 1.45  | 2                                                                                                 | SS   | -2.0       |        | L1 | 2.0   | Brown, Greyish Brown, Moist, Poorly Graded, Fine to Coarse Sand Fraction With Gravels, Very Dense, Residual SOIL - Grade VI Weathering (Descent from Hypersthene Granite)                             |
| 3                                      | 11                          | 08                                             | To   | SC                                | -                     | -         |             |              |       | >100           | 2.00  | 2                                                                                                 | SS   | -2.0       |        | L2 | 3.0   | Grey, Bluish Grey, Brownish Grey at Fractures, Highly Fractured, Medium to Coarse Grains Texture, Highly to Moderately Weathered Rock - Grade IV to III Weathering (Descent from Hypersthene Granite) |
| 4                                      | 11                          | 13                                             | To   | SC                                | -                     | -         |             |              |       | >100           | 2.45  | 3                                                                                                 | WS   | -3.0       |        | L2 | 3.0   | Grey, Bluish Grey, Brownish Grey at Fractures, Highly Fractured, Medium to Coarse Grains Texture, Highly to Moderately Weathered Rock - Grade IV to III Weathering (Descent from Hypersthene Granite) |
| 5                                      | 11                          | 26                                             | To   | DB                                | 23                    | 12        |             |              |       |                | 3.00  | 3                                                                                                 | WS   | -3.0       |        | L2 | 3.0   | Grey, Bluish Grey, Brownish Grey at Fractures, Highly Fractured, Medium to Coarse Grains Texture, Highly to Moderately Weathered Rock - Grade IV to III Weathering (Descent from Hypersthene Granite) |
| 6                                      | 12                          | 35                                             | To   | DB                                | 9                     | 0         |             |              |       |                | 4.00  | 4                                                                                                 | CS   | -4.0       |        | L3 | 5.0   | Note: The borehole is terminated at 5.0m depth due to Mechanical Breakdown of the Drilling Rig and Covid Lockdown Issue.                                                                              |
| 7                                      | 13                          | 25                                             | To   | DB                                | 9                     | 0         |             |              |       |                | 5.00  | 5                                                                                                 | CS   | -5.0       |        | L3 | 5.0   |                                                                                                                                                                                                       |
| 8                                      | 14                          | 10                                             | To   | DB                                | 9                     | 0         |             |              |       |                |       |                                                                                                   |      |            |        |    |       |                                                                                                                                                                                                       |
| 9                                      |                             |                                                |      |                                   |                       |           |             |              |       |                |       |                                                                                                   |      |            |        |    |       |                                                                                                                                                                                                       |
| 10                                     |                             |                                                |      |                                   |                       |           |             |              |       |                |       |                                                                                                   |      |            |        |    |       |                                                                                                                                                                                                       |

|                          |                            |         |             |                      |      |         |
|--------------------------|----------------------------|---------|-------------|----------------------|------|---------|
| CS - Core Sample         | DS - Disturbed Sample      | LOGGED  | S. Tysonraj | PROJECT SITE DETAILS |      | REMARKS |
| SS - Split Spoon Sample  | SC - Soil Cutter           | DATE    | 12/06/2020  | GROUND LEVEL (m)     | 0.00 |         |
| UDS - Undisturbed Sample | TCB - Tungsten Carbide Bit | CHECKED | A. Vinoth   | WATER TABLE (m)      | 1.20 |         |
| WS - Wash Sample         | DB - Diamond Bit           | DATE    | 15/06/2020  | CASING DEPTH (m)     | 0.00 |         |

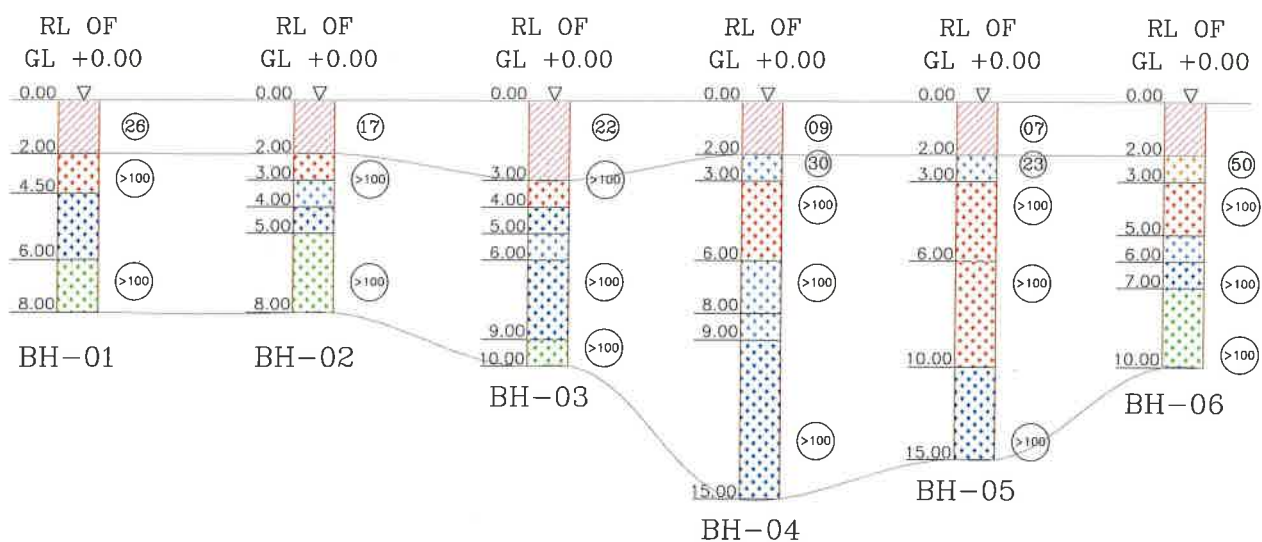
Borehole terminated at 5 m depth below E.G.L.

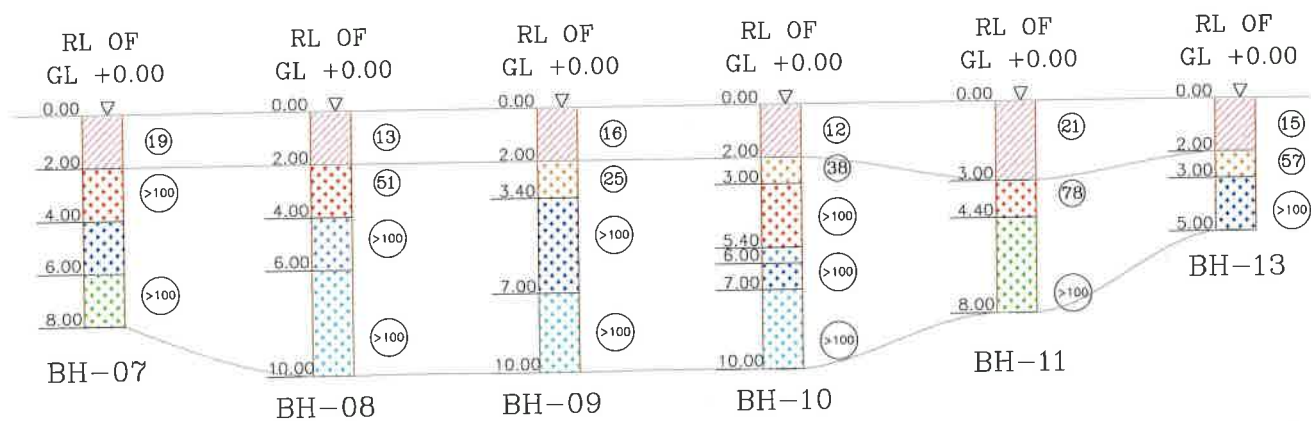
FIG.2.12 Sub Soil Profile at BH-13 Location

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K. J. J.

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### LEGEND

|  |                                     |  |                                     |
|--|-------------------------------------|--|-------------------------------------|
|  | CLAYEY SILTY SAND (SC)              |  | COMPLETELY WEATHERED ROCK(GRADE-04) |
|  | SLIGHTLY WEATHERED ROCK(GRADE-01)   |  | COMPLETELY WEATHERED ROCK(GRADE-05) |
|  | COMPLETELY WEATHERED ROCK(GRADE-02) |  | COMPLETELY WEATHERED ROCK(GRADE-06) |
|  | COMPLETELY WEATHERED ROCK(GRADE-03) |  |                                     |

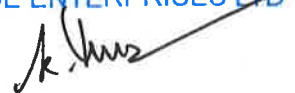
FIG.No.2.14 CROSS SECTIONAL VARIATION OF SUB SOIL PROFILE THROUGH BH-07 TO BH-13

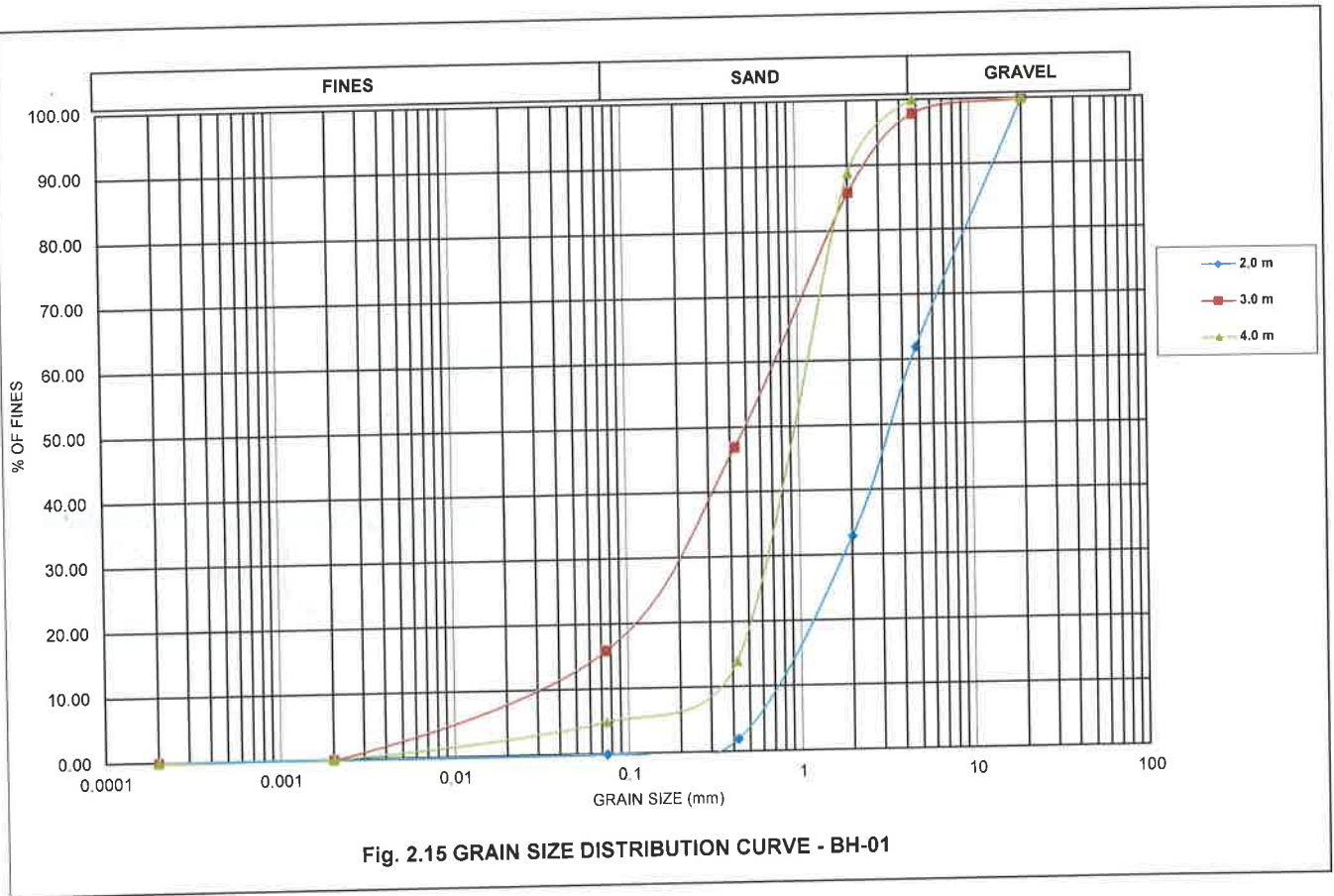
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## LABORATORY TEST RESULTS

For BRIGADE ENTERPRISES LTD

  
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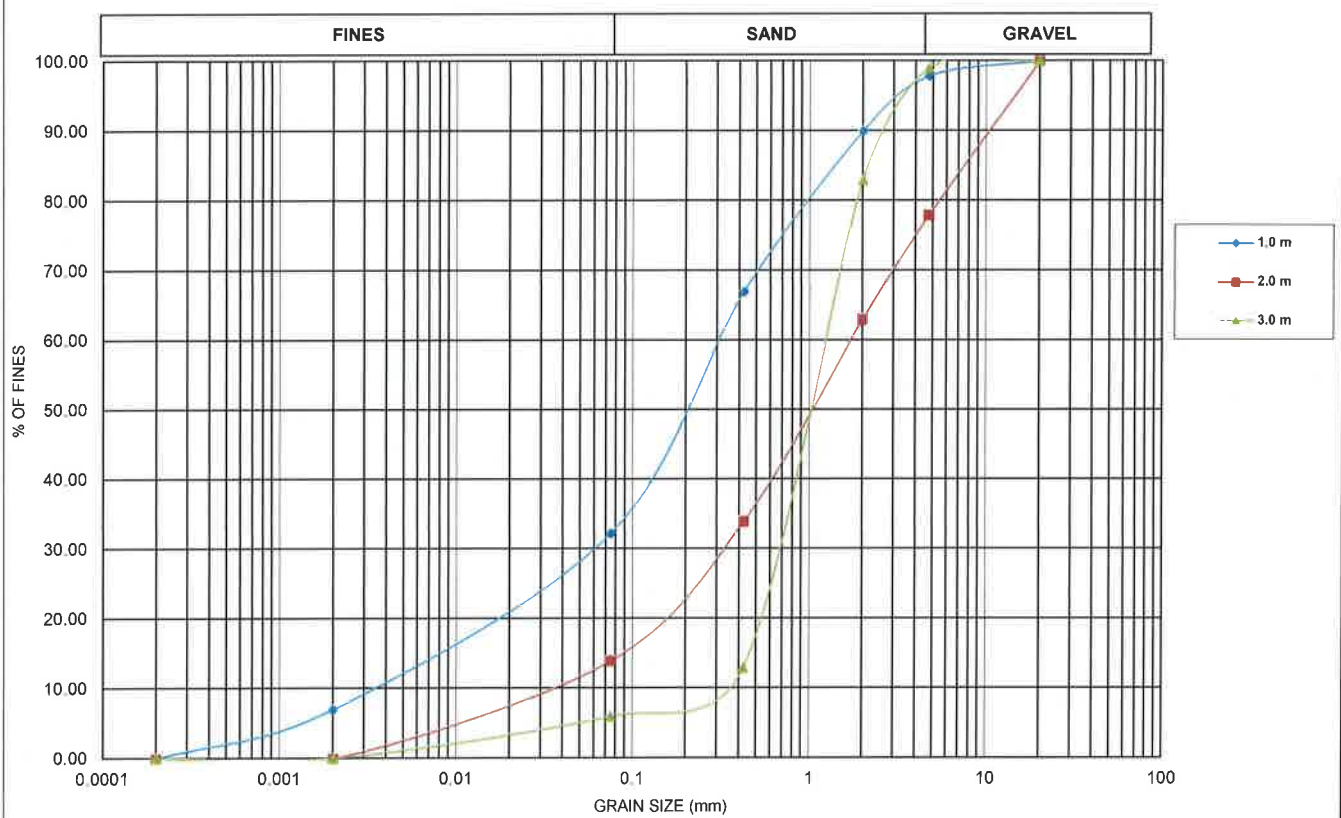


Fig. 2.16 GRAIN SIZE DISTRIBUTION CURVE - BH-02

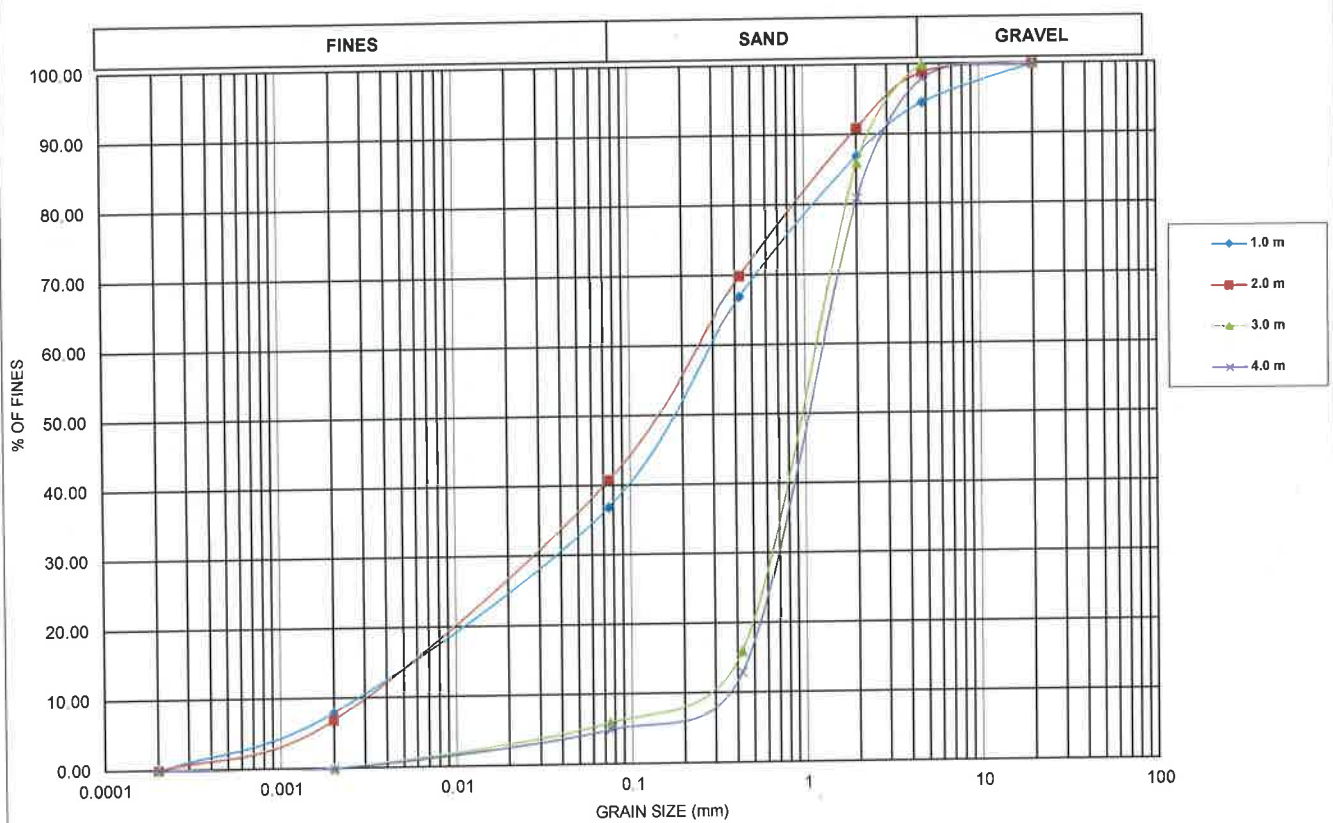
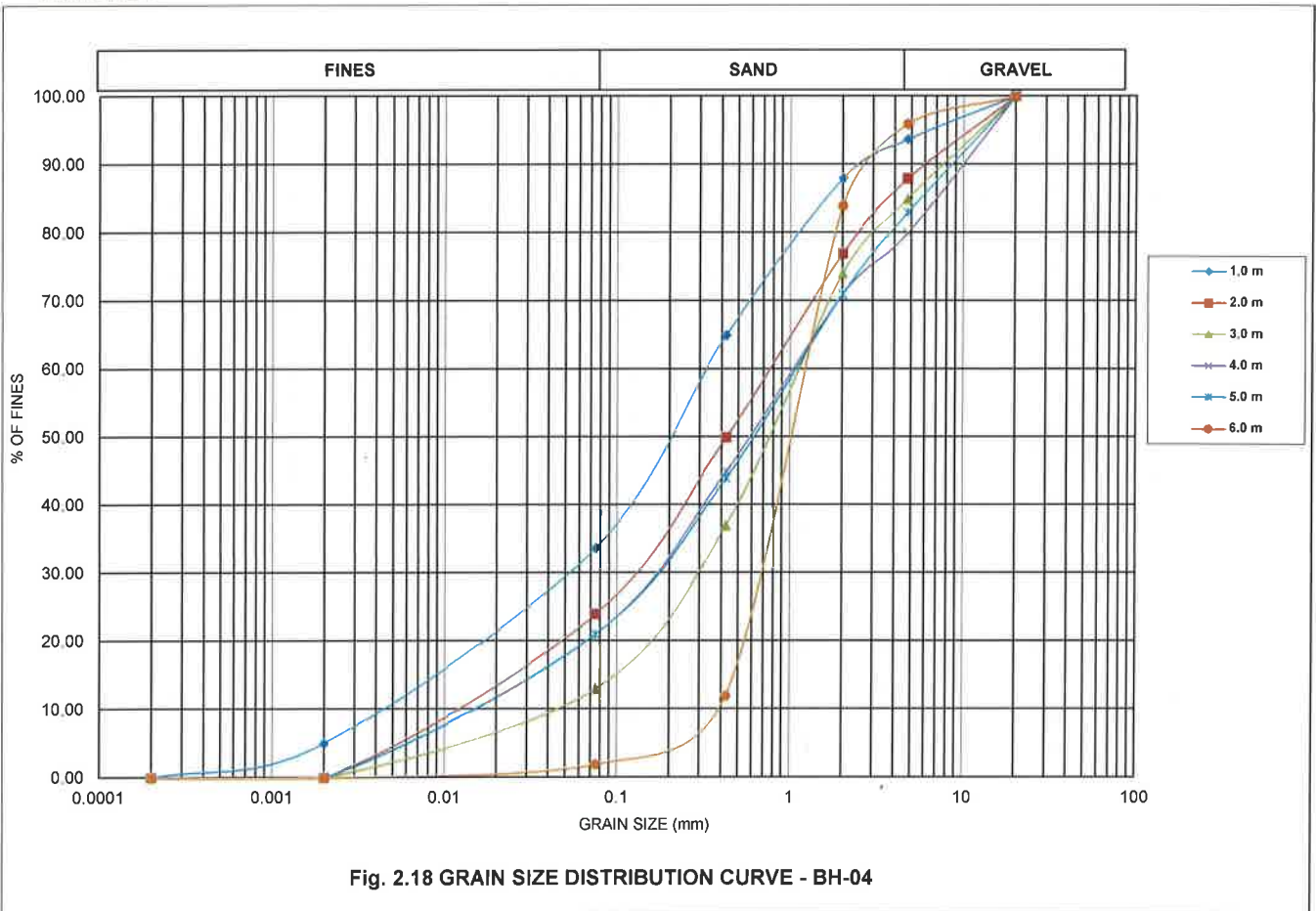


Fig. 2.17 GRAIN SIZE DISTRIBUTION CURVE - BH-03



*[Signature]*

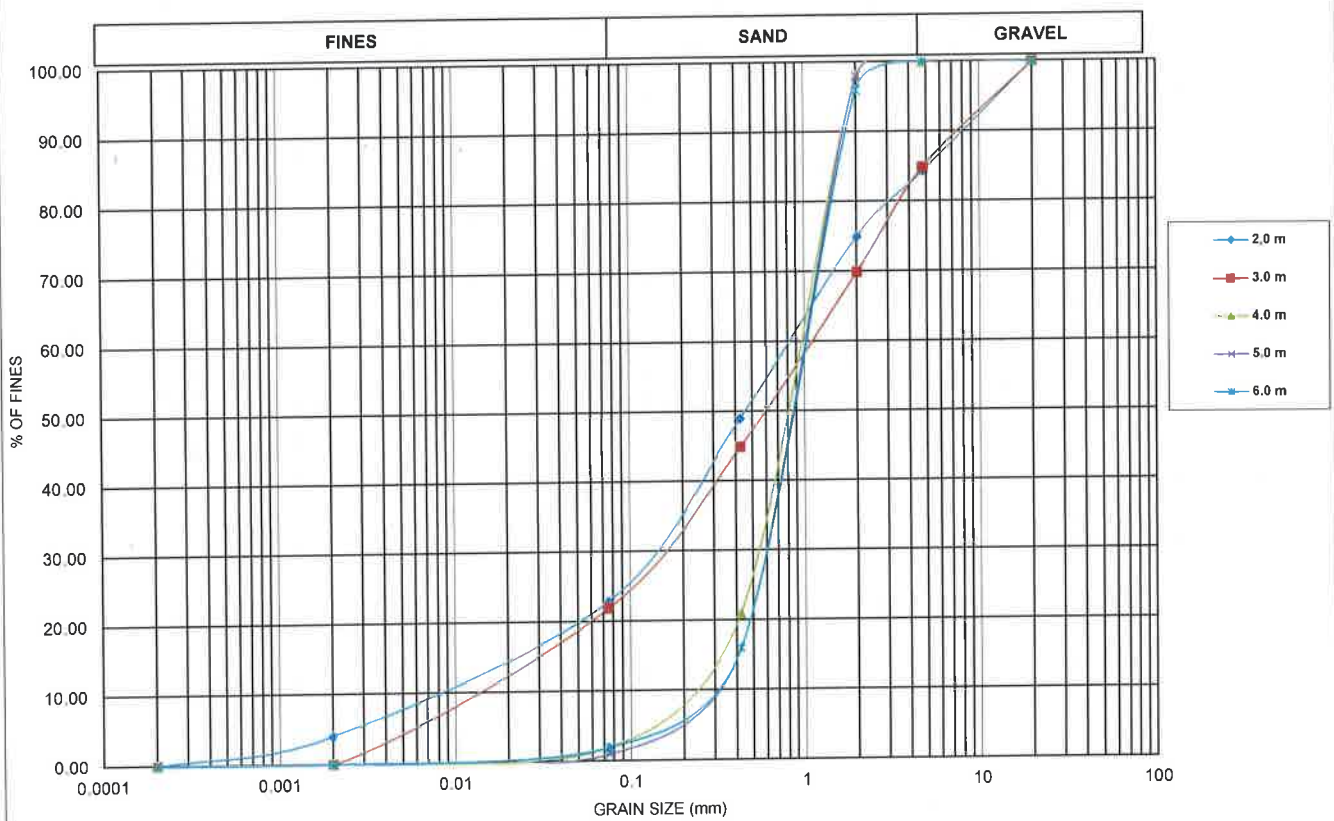


Fig. 2.19 GRAIN SIZE DISTRIBUTION CURVE - BH-05

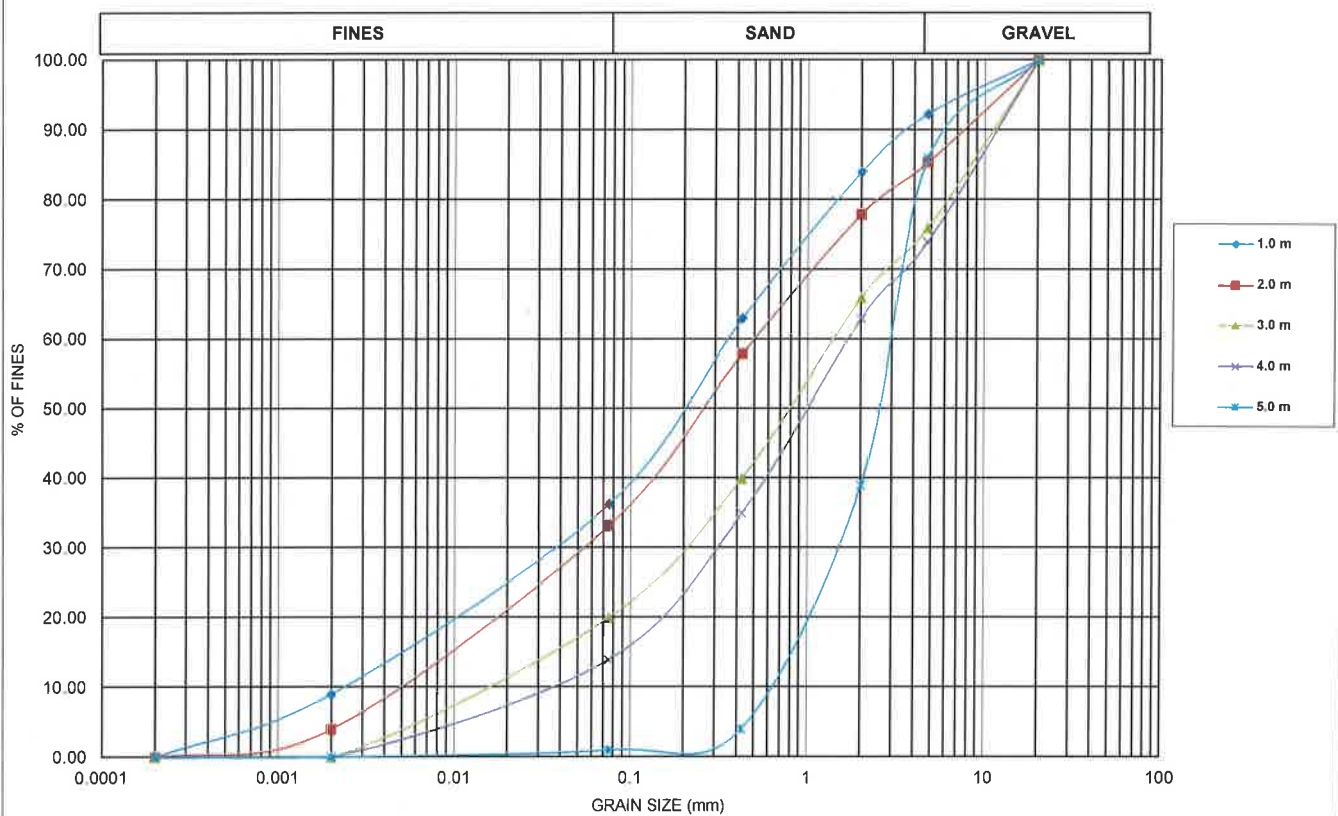


Fig. 2.20 GRAIN SIZE DISTRIBUTION CURVE - BH-06

*[Signature]*

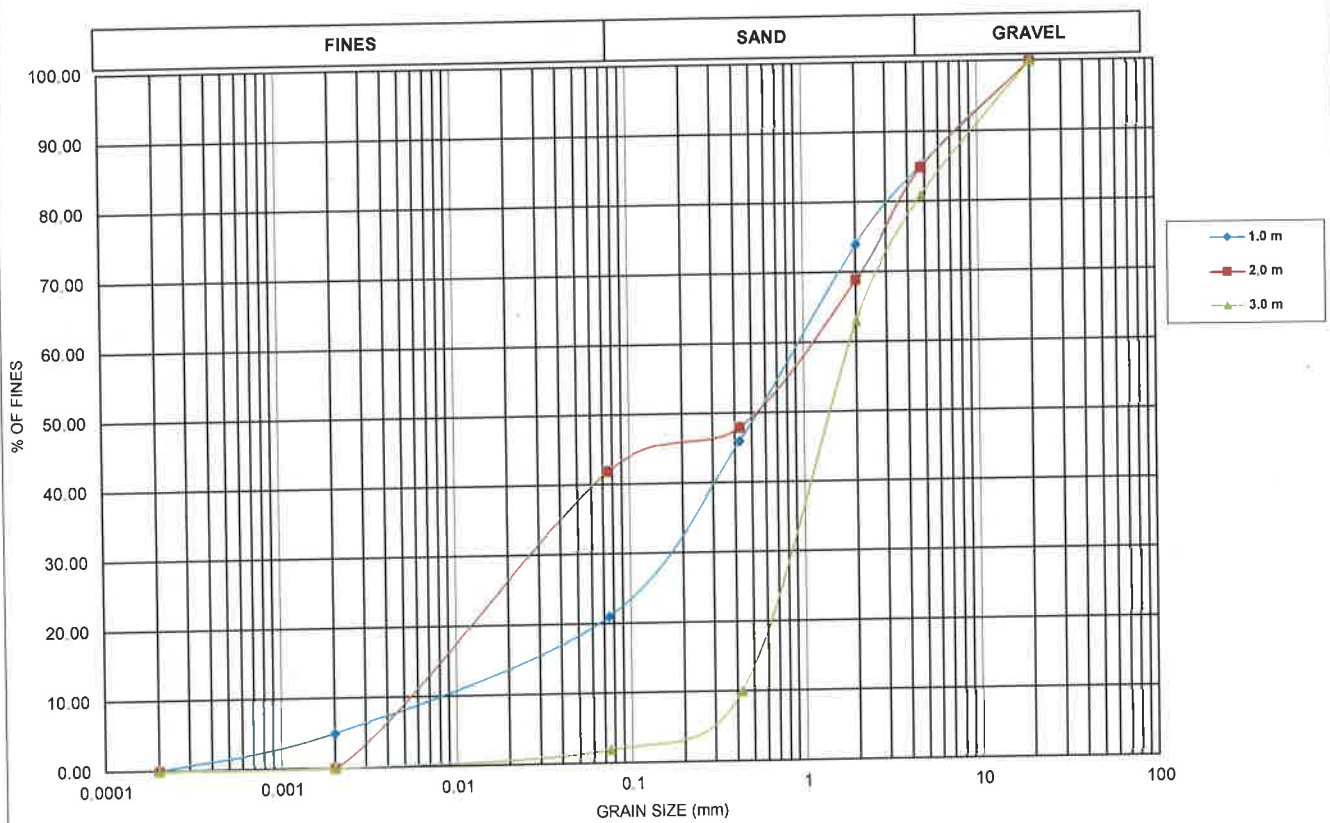


Fig. 2.21 GRAIN SIZE DISTRIBUTION CURVE - BH-07

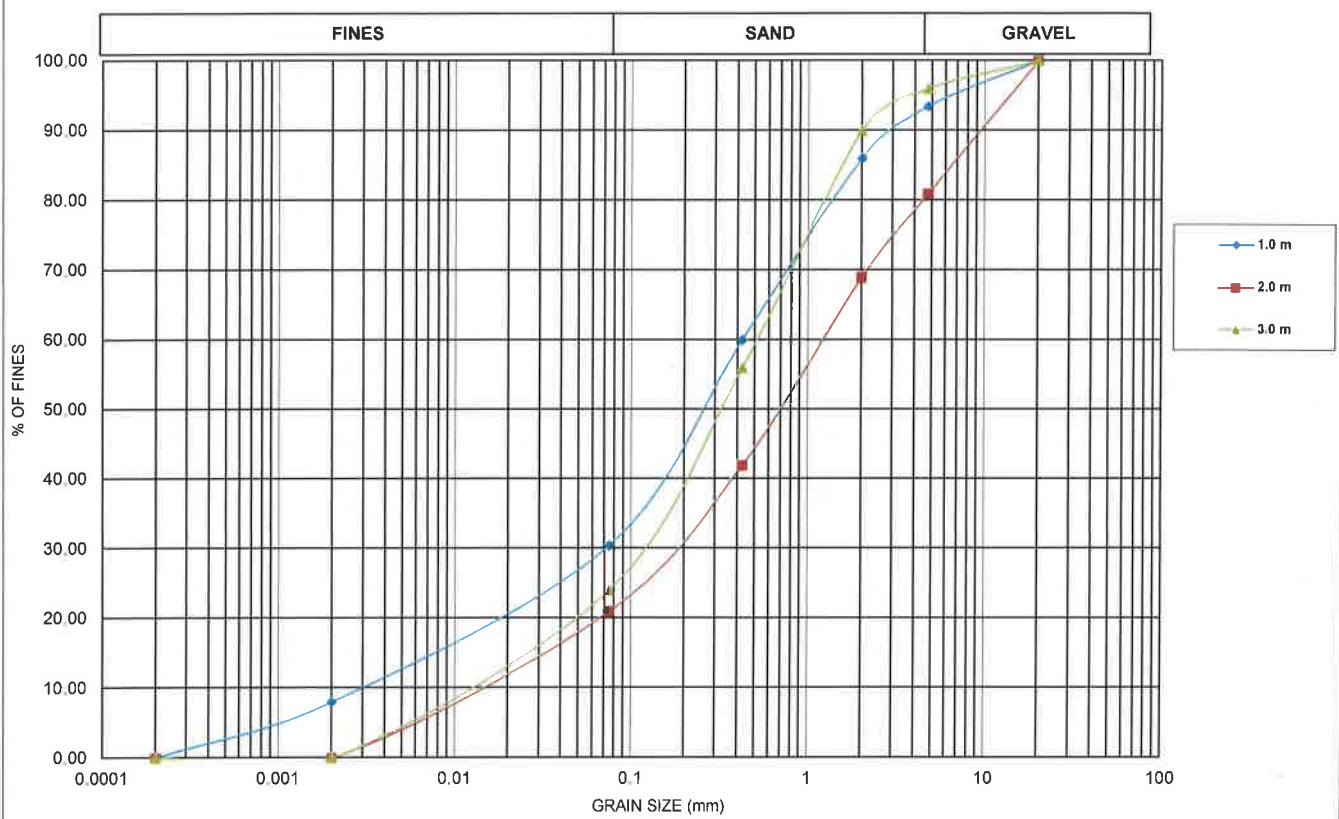


Fig. 2.22 GRAIN SIZE DISTRIBUTION CURVE - BH-08

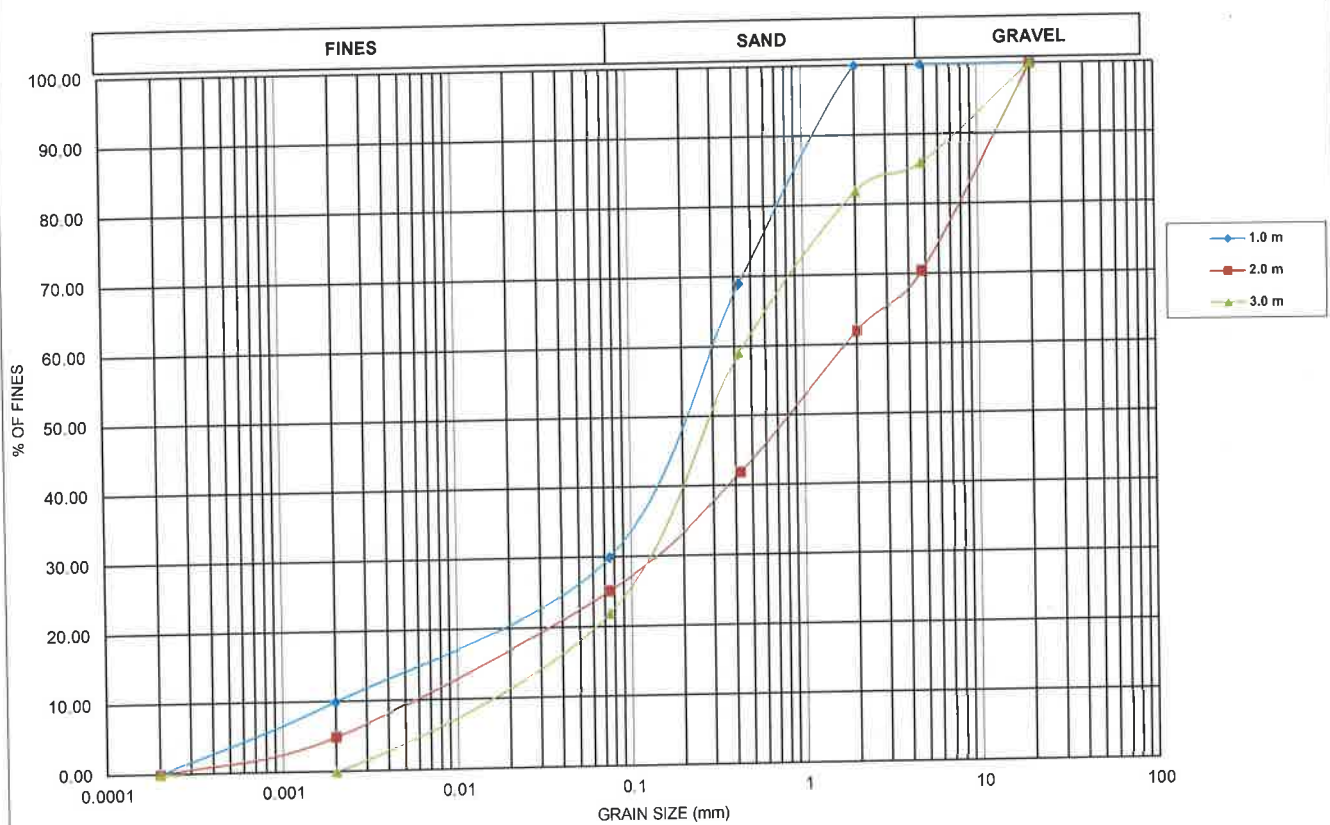


Fig. 2.23 GRAIN SIZE DISTRIBUTION CURVE - BH-09

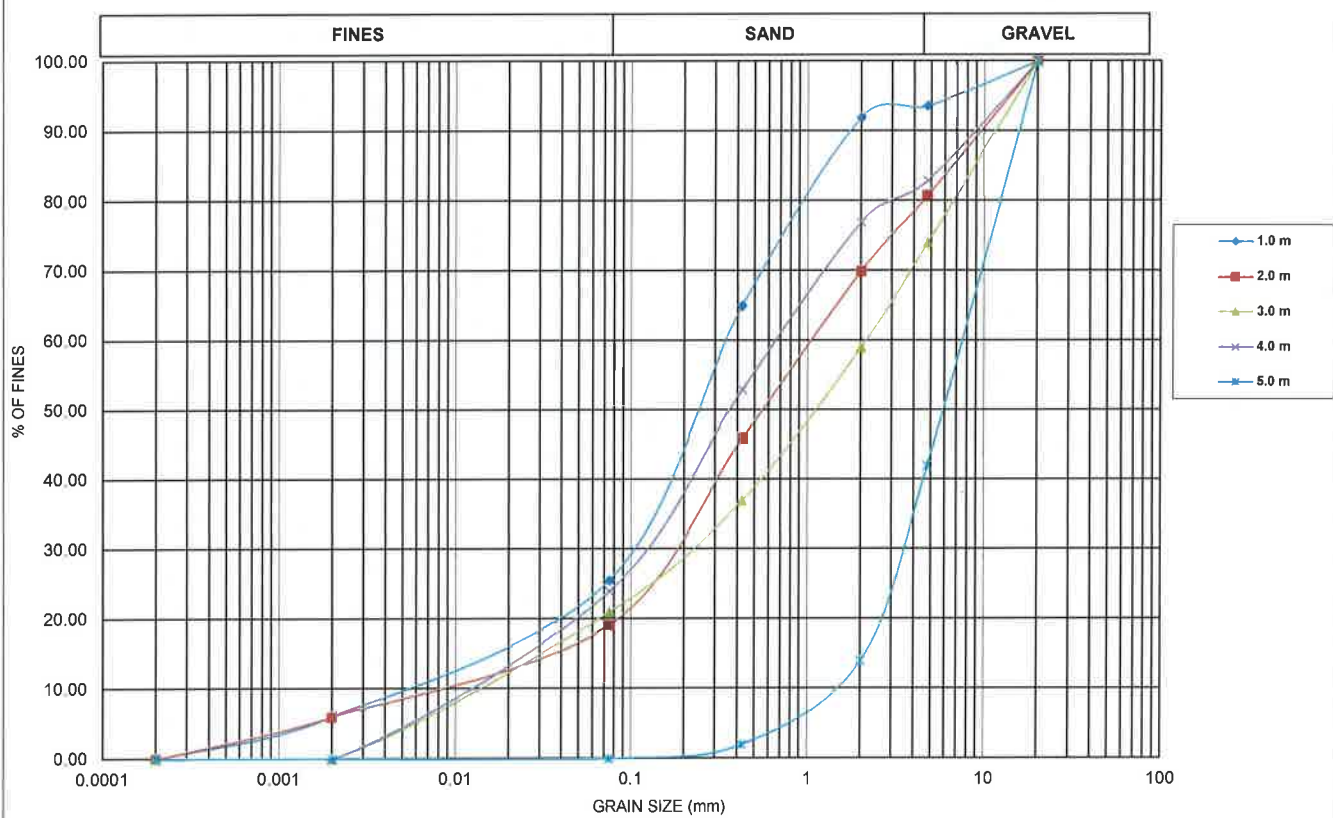
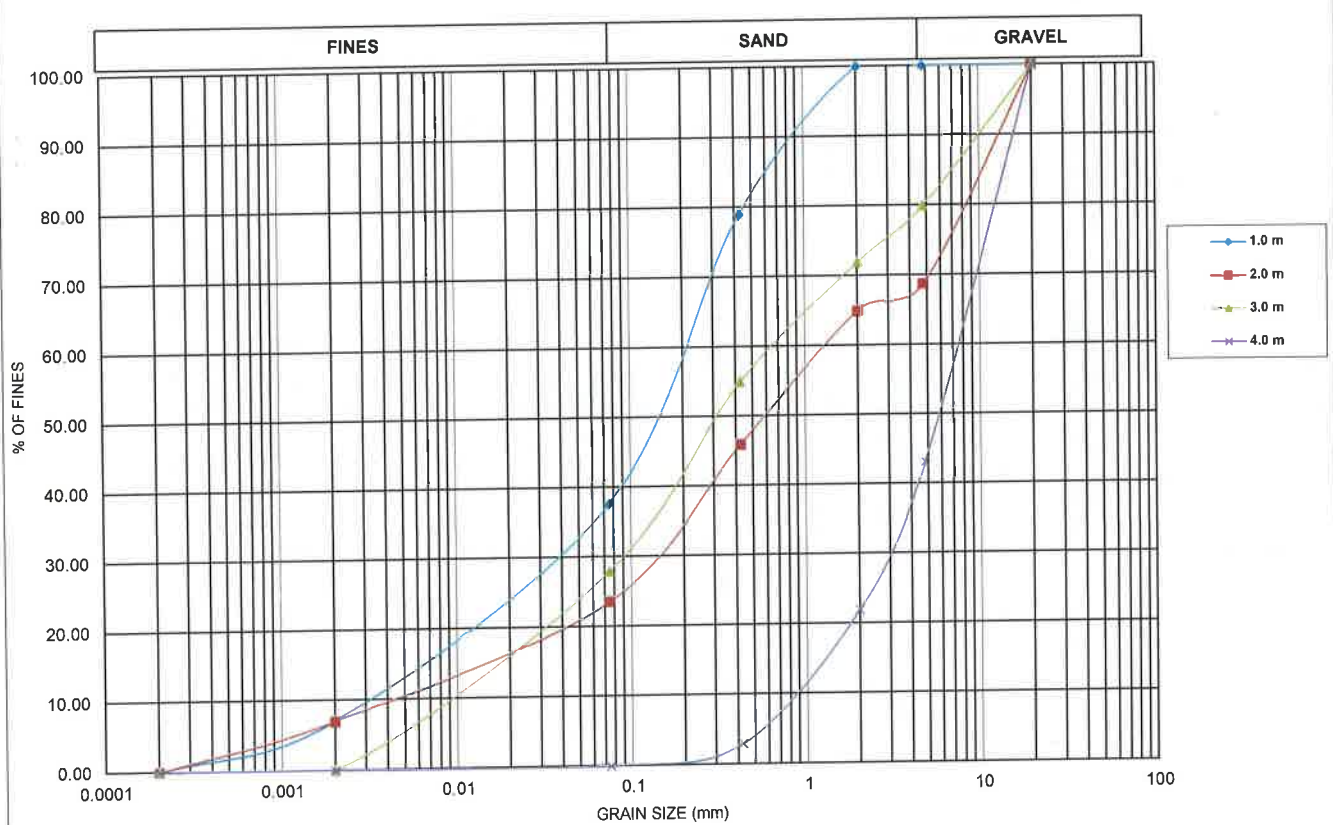
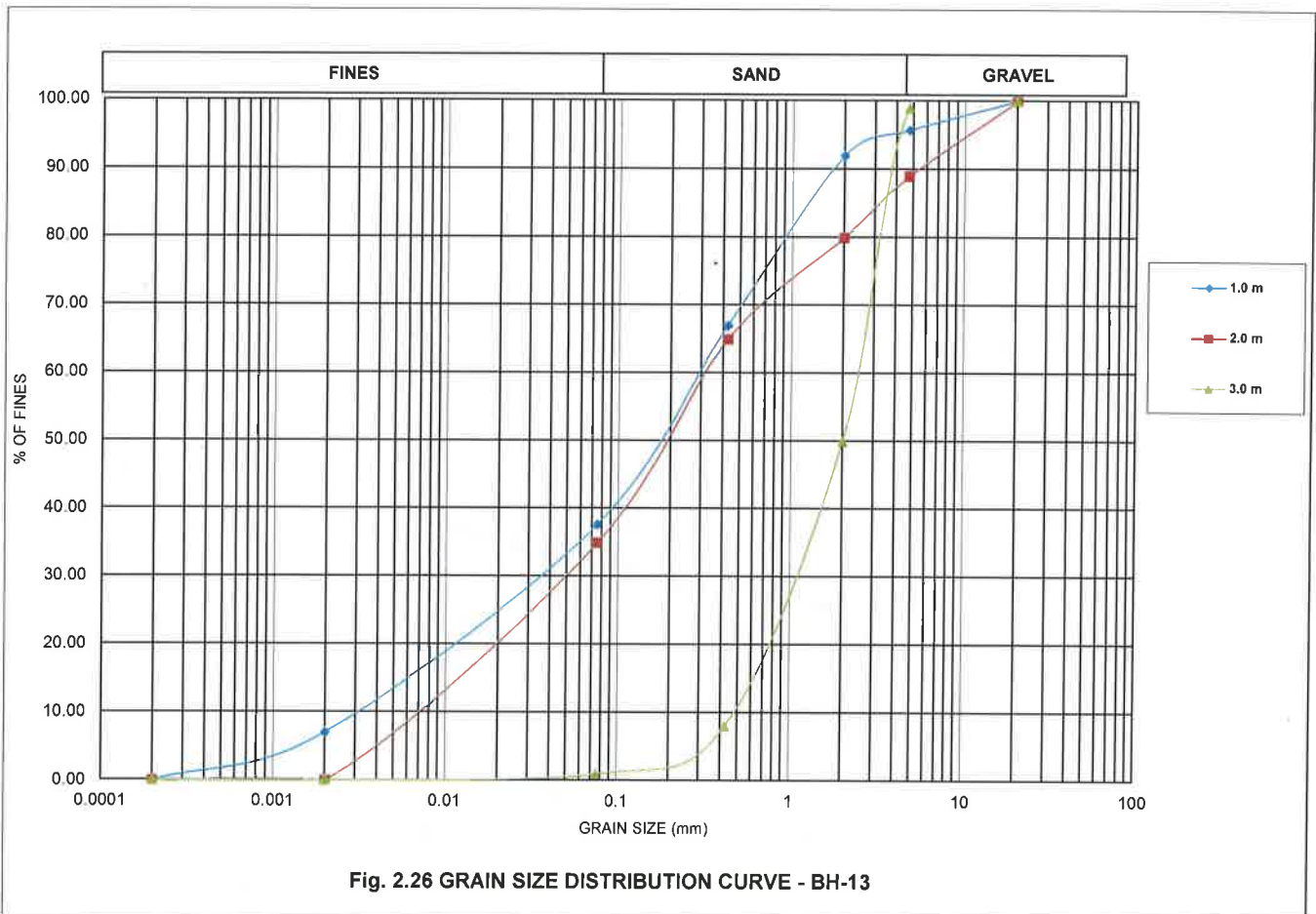


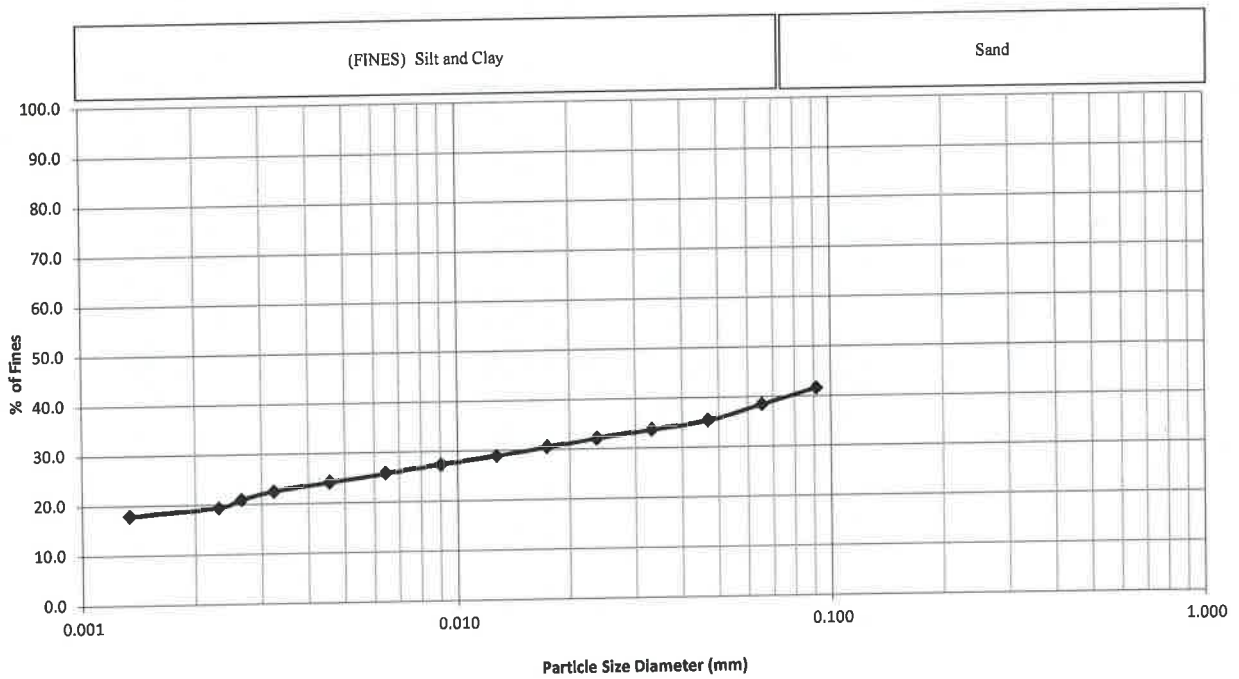
Fig. 2.24 GRAIN SIZE DISTRIBUTION CURVE - BH-10



**Fig. 2.25 GRAIN SIZE DISTRIBUTION CURVE - BH-11**

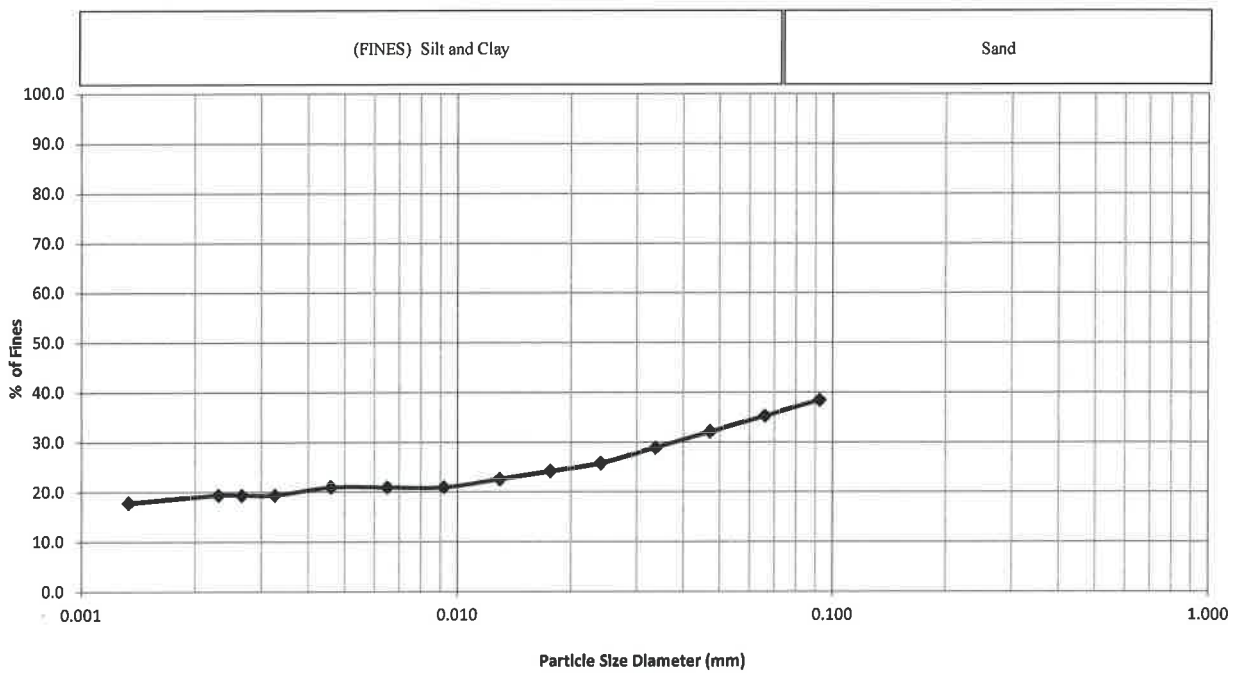


◆ Bore Hole No: 2 Depth: 1.0m



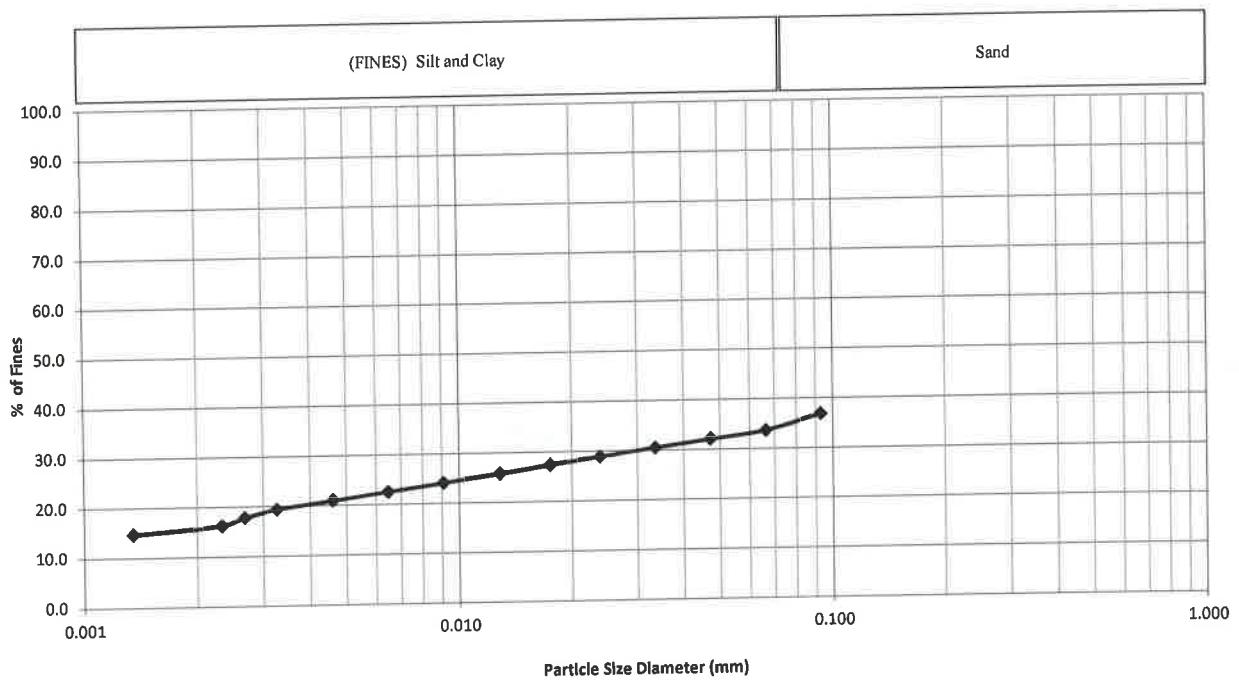
**Fig 2.27 Hydrometer Analysis Master Curve**

◆ Bore Hole No: 3 Depth: 1.0m



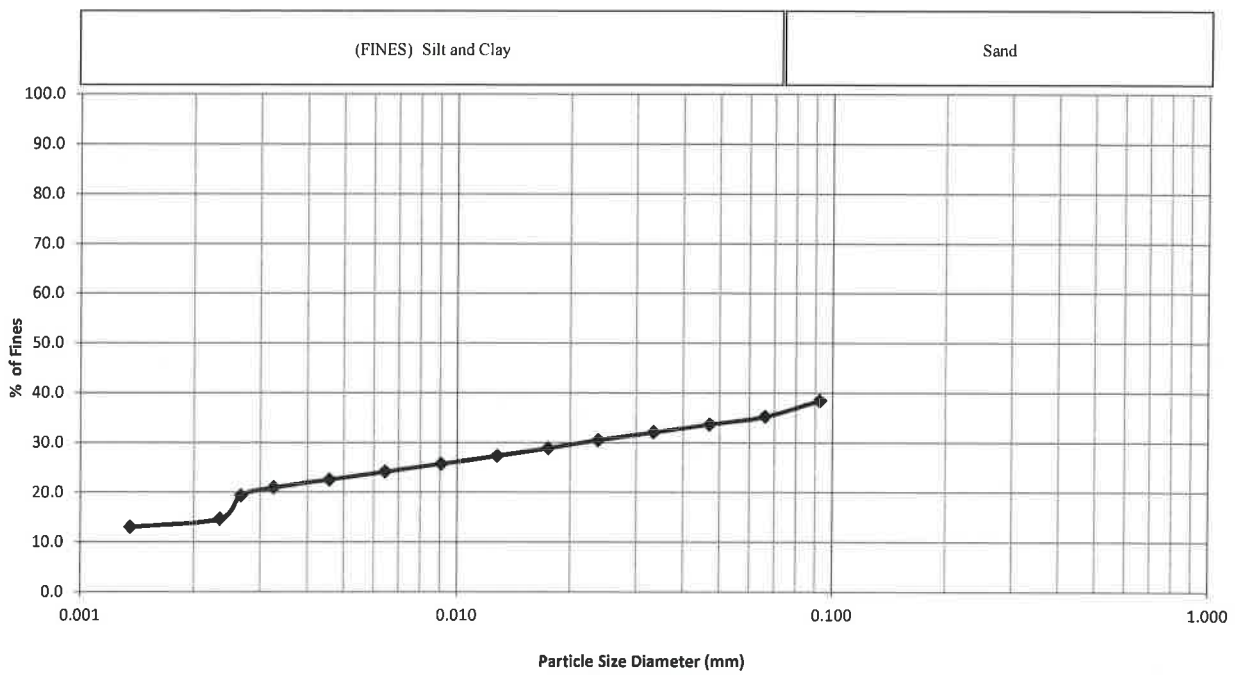
**Fig 2.28 Hydrometer Analysis Master Curve**

—◆— Bore Hole No: 3 Depth: 2.0m



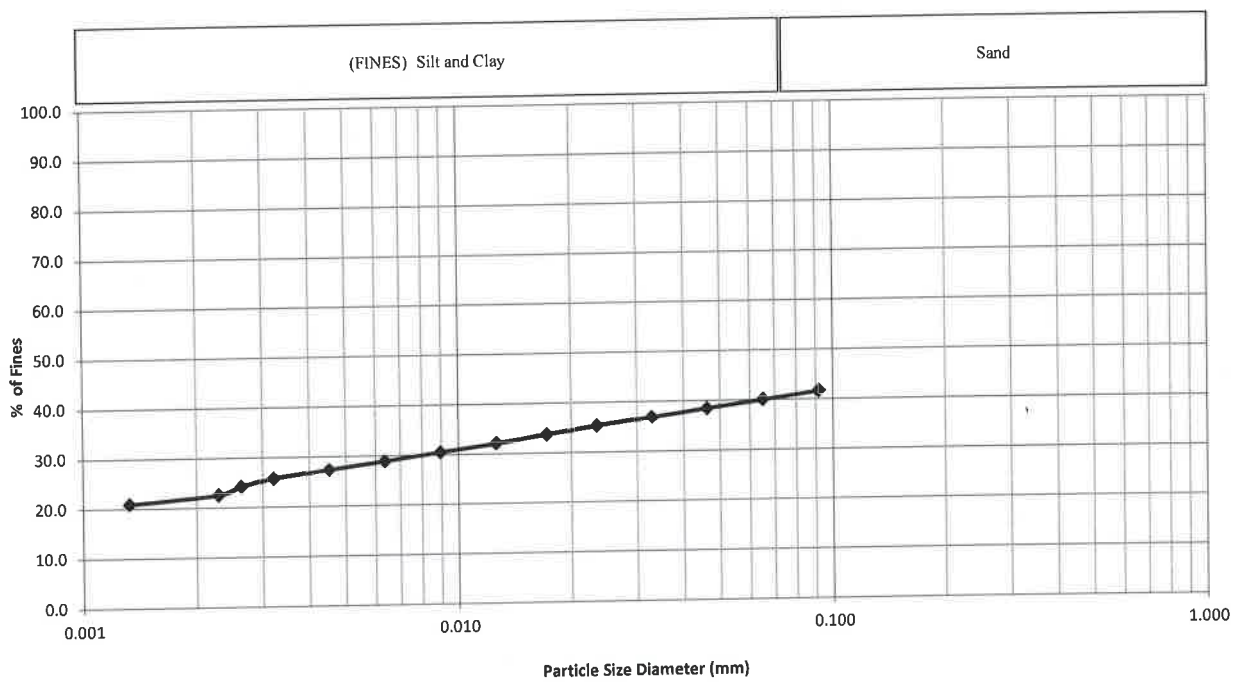
**Fig 2.29 Hydrometer Analysis Master Curve**

—●— Bore Hole No: 4 Depth: 1.0m



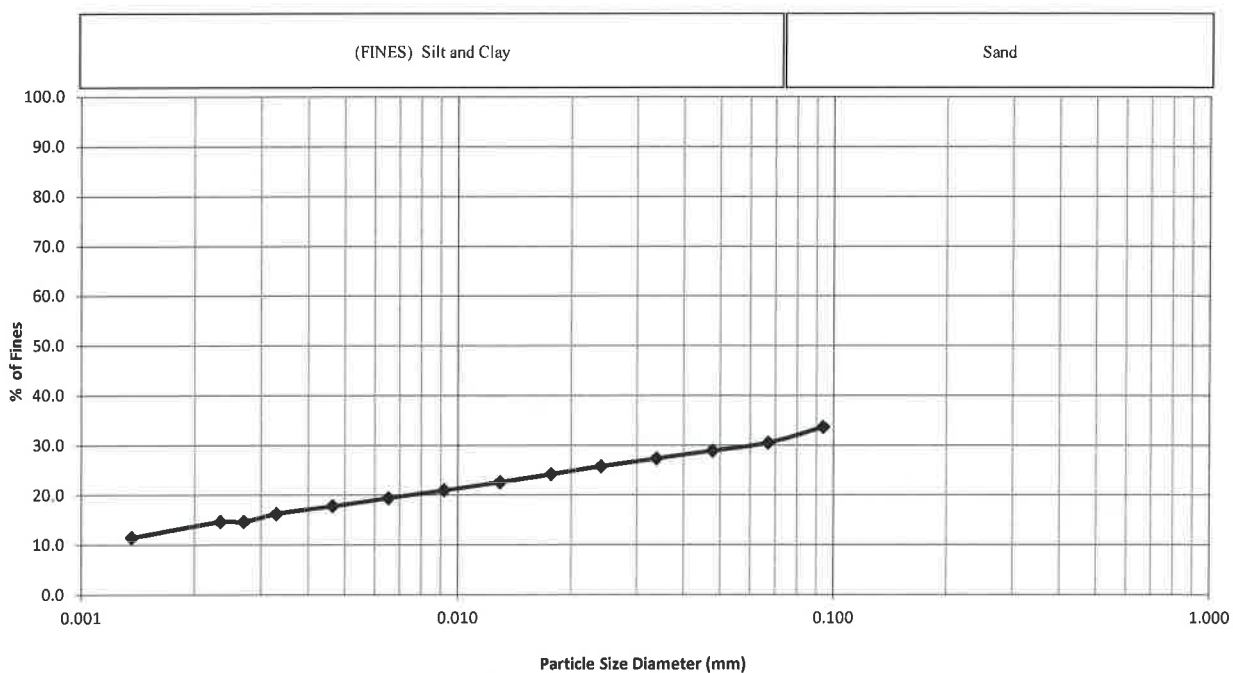
**Fig 2.30 Hydrometer Analysis Master Curve**

—◆— Bore Hole No: 5 Depth: 1.0m



**Fig 2.31 Hydrometer Analysis Master Curve**

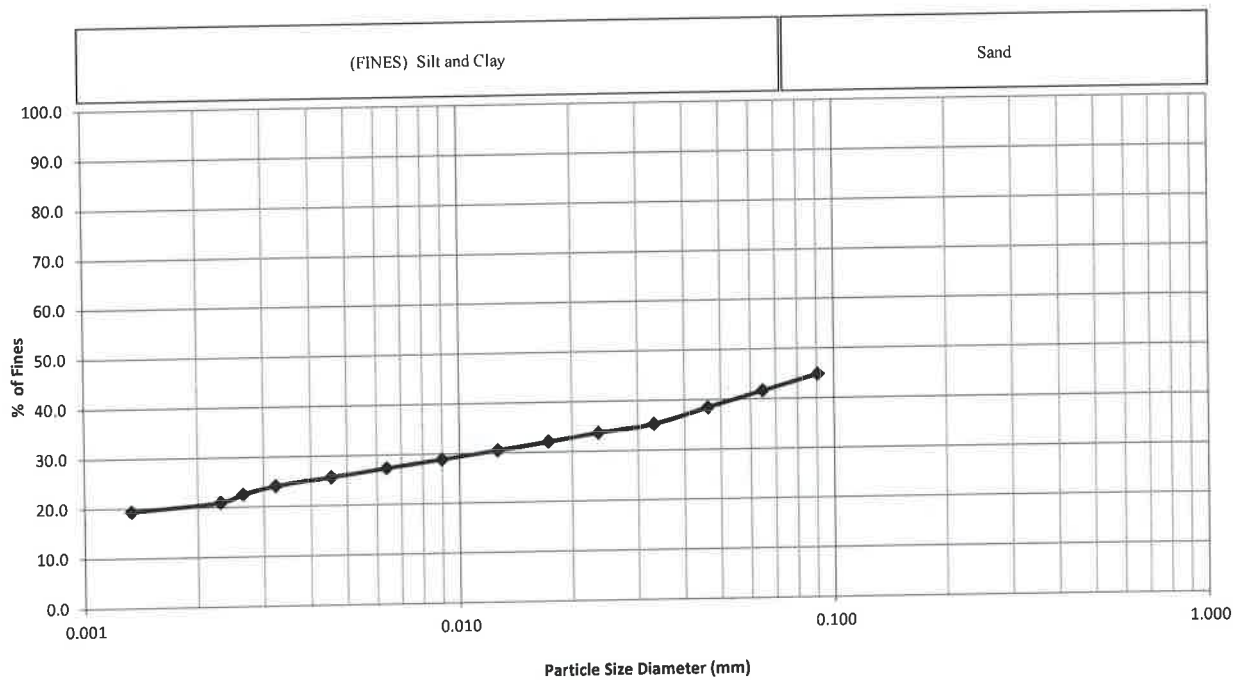
—●— Bore Hole No: 5 Depth: 2.0m



**Fig 2.32 Hydrometer Analysis Master Curve**

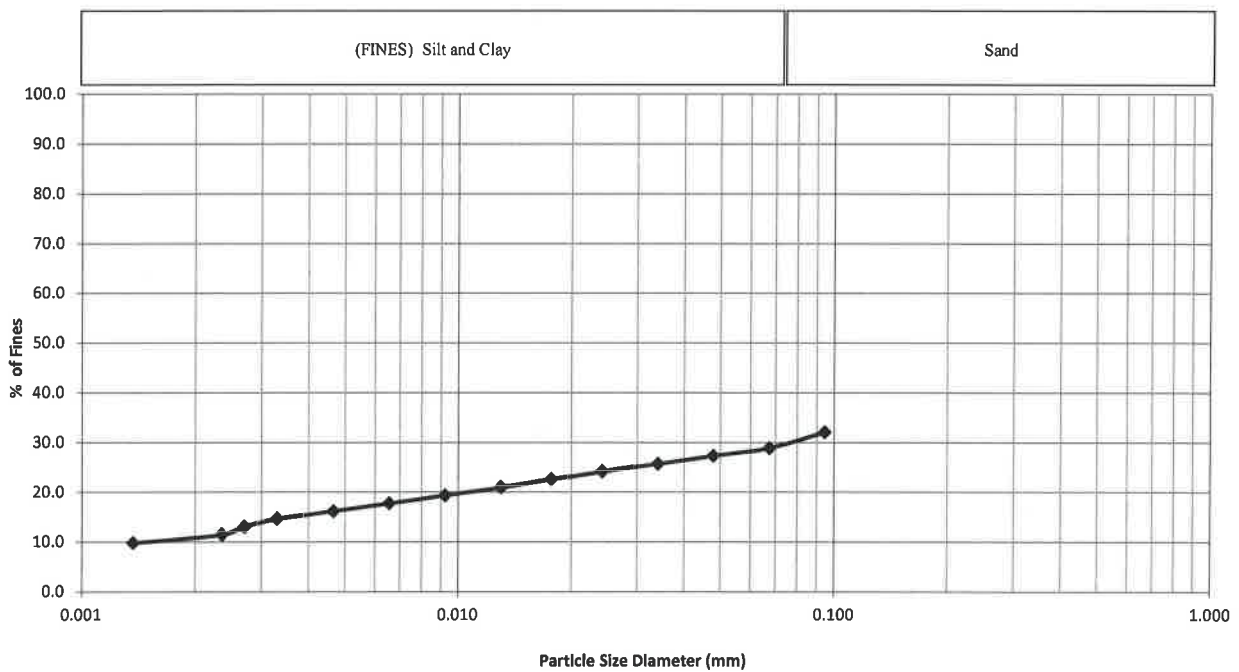
*[Handwritten Signature]*

—●— Bore Hole No: 6 Depth: 1.0m



**Fig 2.33 Hydrometer Analysis Master Curve**

◆ Bore Hole No: 6 Depth: 2.0m

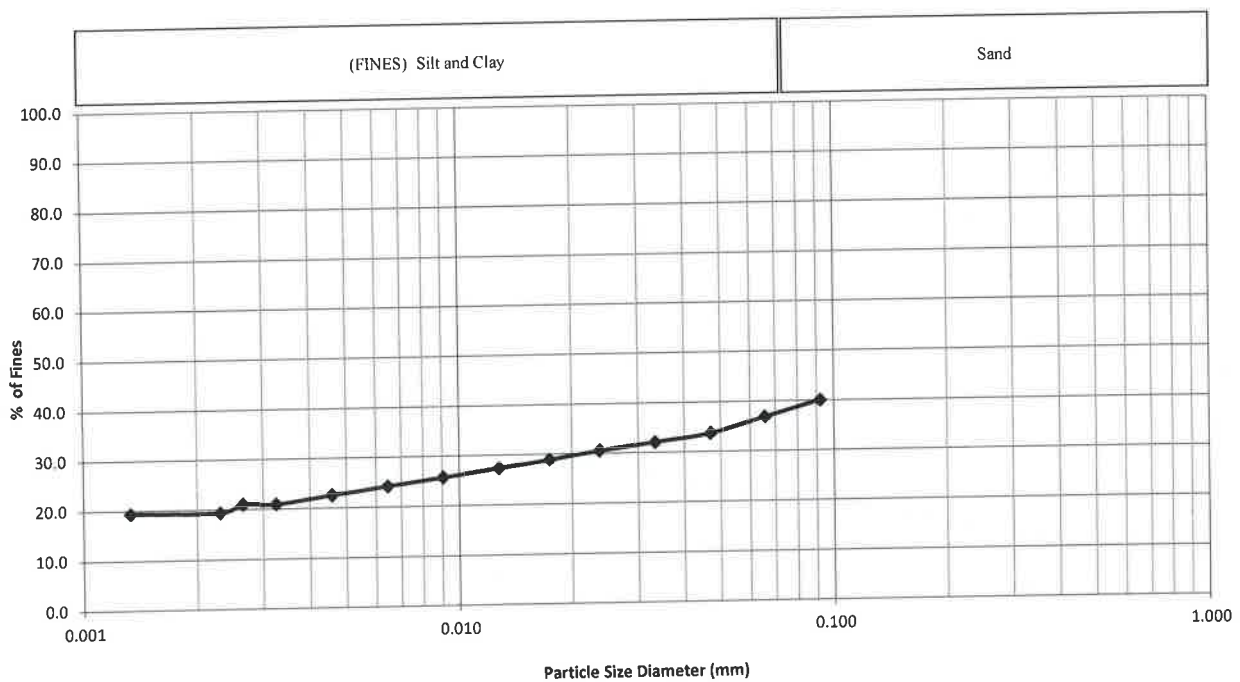


**Fig 2.34 Hydrometer Analysis Master Curve**

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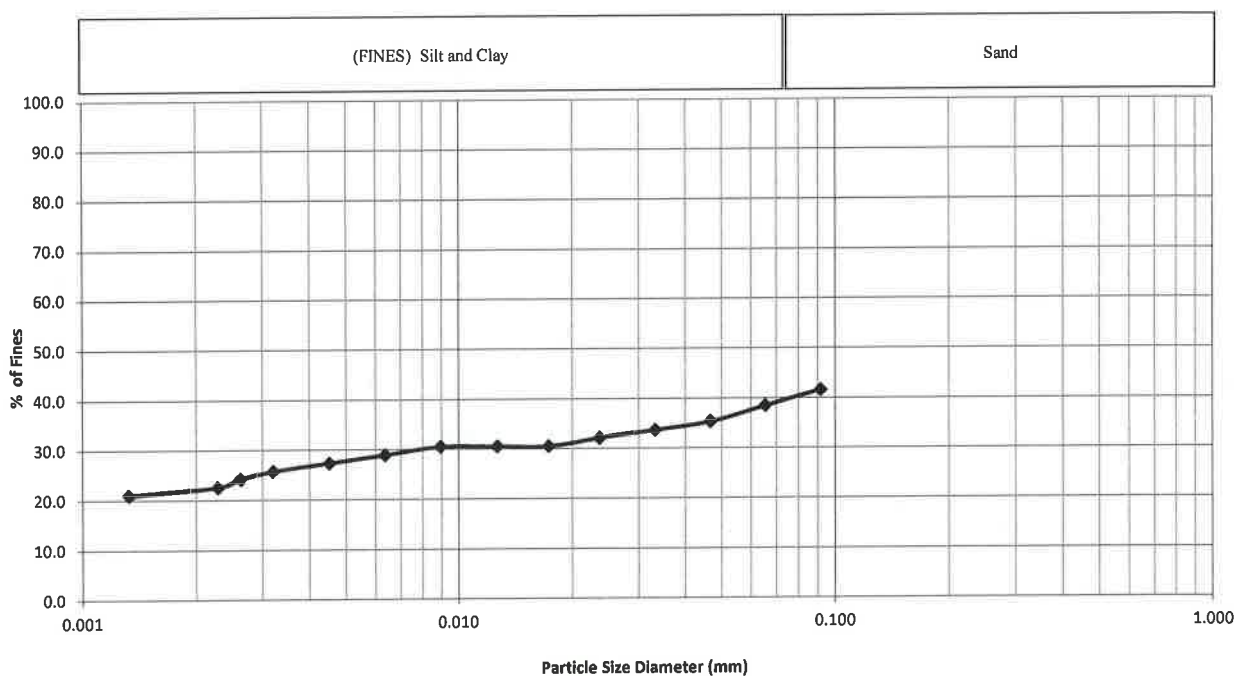
*A. Huis*  
Authorised Signatory

◆ Bore Hole No: 7 Depth: 1.0m



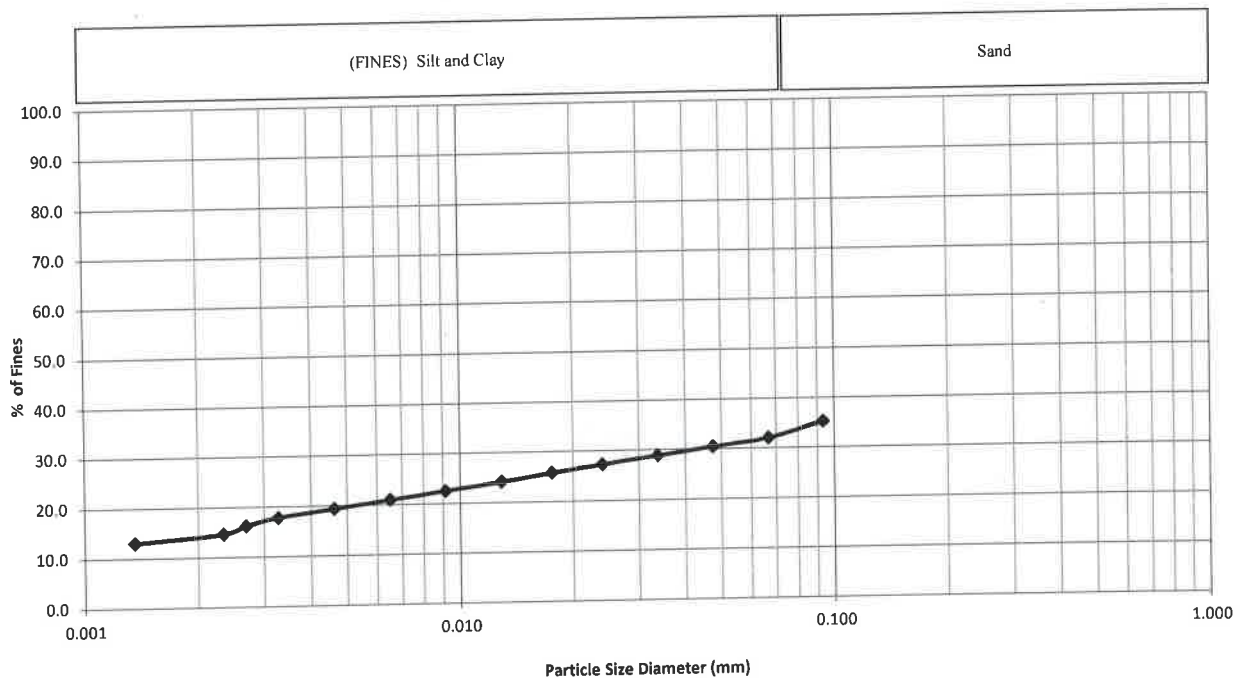
**Fig 2.35 Hydrometer Analysis Master Curve**

◆ Bore Hole No: 8 Depth: 1.0m



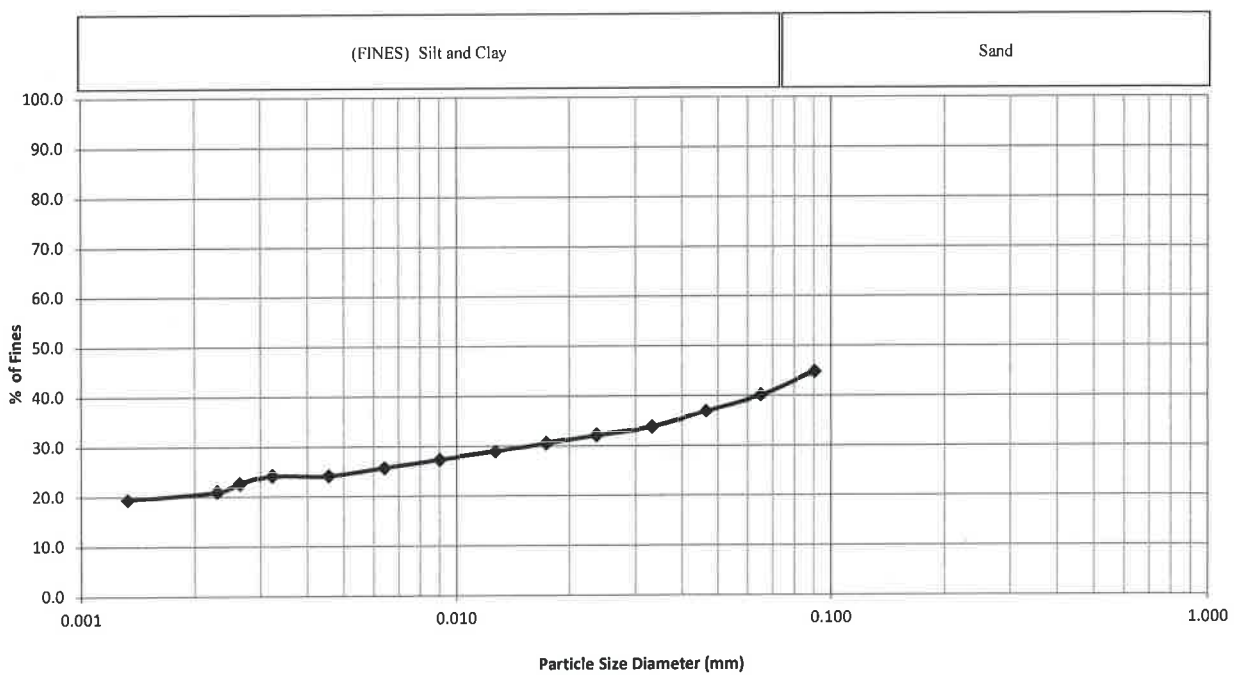
**Fig 2.36 Hydrometer Analysis Master Curve**

◆ Bore Hole No: 9 Depth: 2.0m



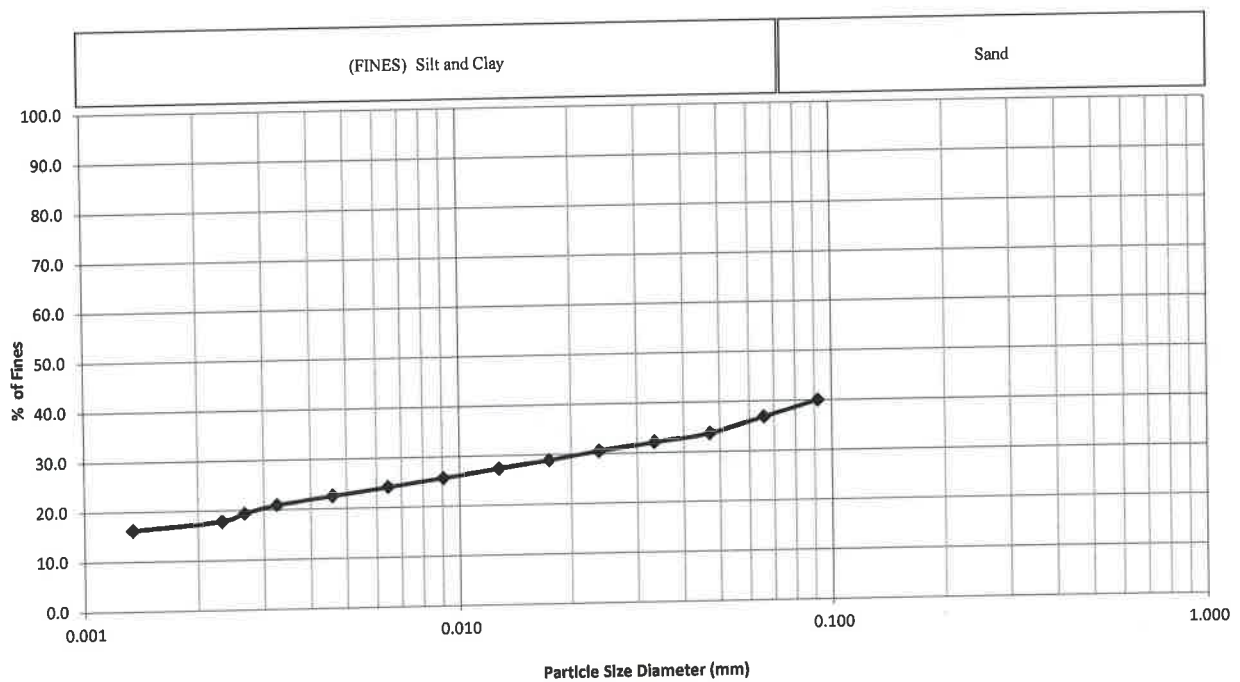
**Fig 2.37 Hydrometer Analysis Master Curve**

—◆— Bore Hole No: 10 Depth: 1.0m



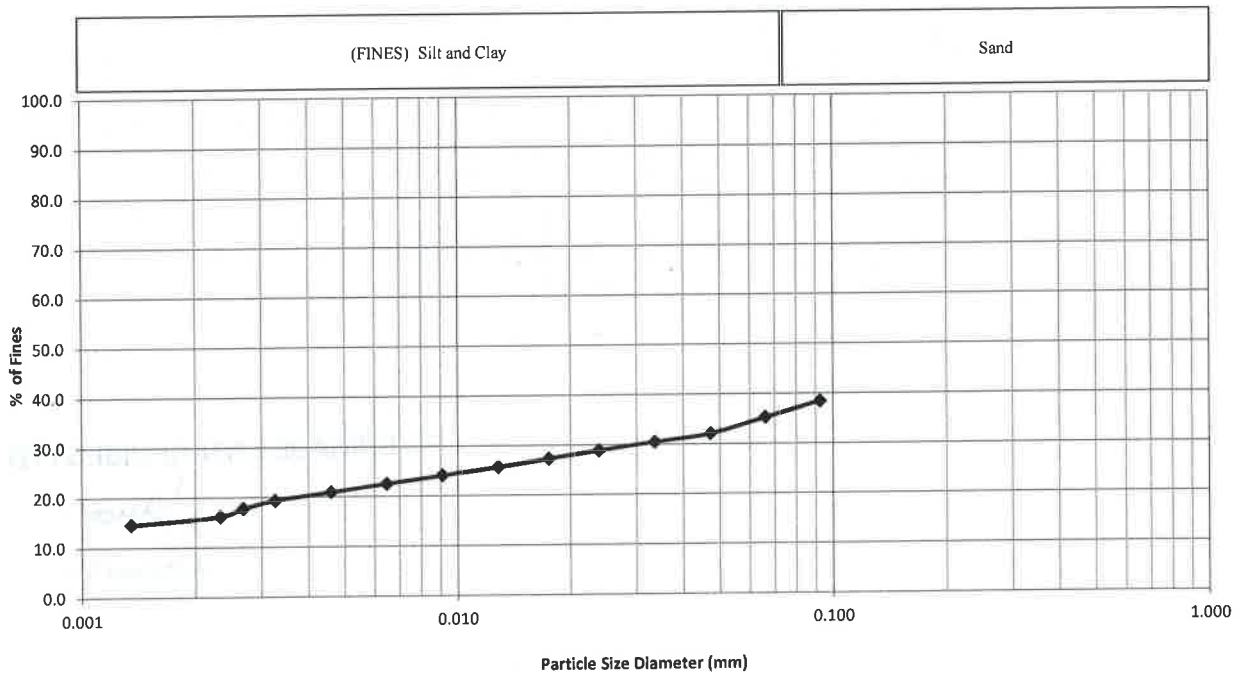
**Fig 2.38 Hydrometer Analysis Master Curve**

◆ Bore Hole No: 11 Depth: 1.0m



**Fig 2.39 Hydrometer Analysis Master Curve**

◆ Bore Hole No: 13 Depth: 1.0m



**Fig 2.40 Hydrometer Analysis Master Curve**

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



Name & Address of the Customer  
Sample Description  
Source of Sample  
Sample Condition  
Test Method  
Sample Receipt Date

M/s Brigade Enterprises Limited, Chennai  
Soil Sample  
Customer Supplied- Borehole No. BH-01  
Satisfactory  
As per Bureau of Indian Standards  
06/06/2020

Customer Reference  
Period of Testing  
Sample Identification Number  
Test Report No.  
Report Date  
Test Report Pages

Email Confirmation  
06/08/2020 to 08/06/2020  
SS/GMC/062020/209/BH01  
GT-2081/BH-01  
24/06/2020  
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**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)                                                  |                                                                 |            |            |          |          |          |                       |                                           |               | IS-Notation |         |               |               |
|------------------|-----------------|----------------|------------------------------------------------------------------|--------------------------------------------------------------|---------------------------------------------------------------|-----------------------------------------|----------------------------------------------|-----------------------------------------------------------------|---------------------------------------------------------------------|-------------|-------------------------------------|-------------|----------------------------------------------------------------------|-----------------------------------------------------------------|------------|------------|----------|----------|----------|-----------------------|-------------------------------------------|---------------|-------------|---------|---------------|---------------|
|                  |                 |                | Moisture Content (%)<br>AS PER IS 2720 (P-41) -<br>1973, RA-2015 | LIQUID LIMIT (%)<br>AS PER IS 2720 (P-41) -<br>1985, RA-2015 | PLASTIC LIMIT (%)<br>AS PER IS 2720 (P-41) -<br>1985, RA-2015 | Plasticity Index<br>( $I_p = LL - PL$ ) | Consistency Index<br>( $I_c = LL - NMCF_p$ ) | SHRINKAGE LIMIT (%)<br>AS PER IS 2720 (P-VI) -<br>1972, RA-2011 | FREE SWELL INDEX<br>(%)<br>AS PER IS 2720 (P-XL) -<br>1977, RA-2011 | Consistency | Position With Respect<br>to A-Aline | IS-Notation | SPECIFIC GRAVITY<br>AS PER IS 2720 (P-III,<br>SEC-1) - 1980, RA-2010 | GRAIN SIZE ANALYSIS<br>AS PER IS 2720 (P-IV) - 1985,<br>RA-2015 |            |            |          |          |          | $C_u = D_{60}/D_{10}$ | $C_c = D_{30}^2 / (D_{10} \times D_{60})$ |               |             |         |               |               |
|                  |                 |                |                                                                  |                                                              |                                                               |                                         |                                              |                                                                 |                                                                     |             |                                     |             |                                                                      | Gravel (%)                                                      | Coarse (%) | Medium (%) | Fine (%) | Silt (%) | Clay (%) |                       |                                           | $D_{10}$ (mm) |             |         | $D_{30}$ (mm) | $D_{60}$ (mm) |
|                  |                 |                |                                                                  |                                                              |                                                               |                                         |                                              |                                                                 |                                                                     |             |                                     |             |                                                                      |                                                                 |            |            |          |          |          |                       |                                           |               |             |         |               |               |
|                  |                 |                |                                                                  |                                                              |                                                               |                                         |                                              |                                                                 |                                                                     |             |                                     |             |                                                                      |                                                                 |            |            |          |          |          |                       |                                           |               |             |         |               |               |
| 2.0              | >100            | WS             | -                                                                | -                                                            | -                                                             | -                                       | -                                            | -                                                               | -                                                                   | -           | CG>50%                              | -           | -                                                                    | 38                                                              | 29         | 31         | 2        | 0.0      | 0.0      | -                     | -                                         | -             | -           | V Dense | <50%          | SP            |
| 3.0              | >100            | SS             | -                                                                | -                                                            | -                                                             | -                                       | -                                            | -                                                               | -                                                                   | -           | CG>50%                              | -           | -                                                                    | 2                                                               | 12         | 39         | 31       | 16.0     | 0.0      | -                     | -                                         | -             | -           | V Dense | <50%          | SM            |
| 4.0              | >100            | WS             | -                                                                | -                                                            | -                                                             | -                                       | -                                            | -                                                               | -                                                                   | -           | CG>50%                              | -           | -                                                                    | 0                                                               | 11         | 75         | 9        | 5.0      | 0.0      | -                     | -                                         | -             | -           | V Dense | <50%          | SP-SM         |

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Authorised Signatory

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- (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

A VINOTH  
(Technical Manager)

For BRIGADE ENTERPRISES LTD

Authorised Signatory

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



Name & Address of the Customer  
Sample Description  
Source of Sample  
Sample Condition  
Test Method  
Sample Receipt Date

M/s Brigade Enterprises Limited, Chennai  
Soil Sample  
Customer Supplied- Borehole No. BH-02  
Satisfactory  
As per Bureau of Indian Standards  
11/06/2020

Customer Reference  
Period of Testing  
Sample Identification Number  
Test Report No.  
Report Date  
Test Report Pages

Email Confirmation  
11/06/2020 to 15/06/2020  
SS/GMC/062020/209/BH02  
GT-2081/BH-02  
24/06/2020  
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**Table-2.2 Laboratory Classification of Soil Samples from BH-02**

| 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 (%)<br>AS PER IS 2720 (P-4) -<br>1973, RA-2015 | LIQUID LIMIT (%)<br>AS PER IS 2720 (P-V) -<br>1985, RA-2015 | PLASTIC LIMIT (%)<br>AS PER IS 2720 (P-V) -<br>1985, RA-2015 | Plasticity Index<br>(I <sub>p</sub> = LL-PL) | Consistency Index<br>(I <sub>c</sub> = LL-NMIC/I <sub>p</sub> ) | SHRINKAGE LIMIT (%)<br>AS PER IS 2720 (P-V) -<br>1972, RA-2011 | FREE SWELL INDEX<br>(%)<br>AS PER IS 2720 (P-XL) -<br>1977, RA-2011 | Consistency | Position With Respect<br>to A-Aline | IS-Notation | SPECIFIC GRAVITY<br>AS PER IS 2720 (P-III)<br>SEC-1) - 1980, RA-2010 | GRAIN SIZE ANALYSIS<br>AS PER IS 2720 (P-IV) - 1985,<br>RA-2015 |            |            |          |          |          | Uniformity Co-Efficient<br>C <sub>u</sub> =D <sub>60</sub> /D <sub>10</sub> | Co-Efficient of Curvature<br>C <sub>c</sub> =D <sub>30</sub> <sup>2</sup> /(D <sub>10</sub> ×D <sub>60</sub> ) | Relative Density | IS-Notation          |                      |                      |        |      |
|                                                                |               |                |                                                                 |                                                             |                                                              |                                              |                                                                 |                                                                |                                                                     |             |                                     |             |                                                                      | Gravel (%)                                                      | Coarse (%) | Medium (%) | Fine (%) | Silt (%) | Clay (%) |                                                                             |                                                                                                                |                  | D <sub>10</sub> (mm) | D <sub>30</sub> (mm) | D <sub>60</sub> (mm) | Gravel | Sand |
|                                                                |               |                |                                                                 |                                                             |                                                              |                                              |                                                                 |                                                                |                                                                     |             |                                     |             |                                                                      |                                                                 |            |            |          |          |          |                                                                             |                                                                                                                |                  |                      |                      |                      |        |      |
| 1.0                                                            | 17            | SS             | 20.0                                                            | 37.0                                                        | 21.0                                                         | 16.0                                         | 1.1                                                             | 15.8                                                           | 62.5                                                                | CG>50%      | Above                               | -           | -                                                                    | 2                                                               | 8          | 23         | 30       | 30.0     | 7.0      | -                                                                           | -                                                                                                              | -                | M Dense              | <50%                 | SC                   |        |      |
| 2.0                                                            | >100          | SS             | -                                                               | -                                                           | -                                                            | -                                            | -                                                               | -                                                              | -                                                                   | CG>50%      | -                                   | -           | -                                                                    | 22                                                              | 15         | 29         | 20       | 14.0     | 0.0      | -                                                                           | -                                                                                                              | -                | V Dense              | <50%                 | SM                   |        |      |
| 3.0                                                            | >100          | WS             | -                                                               | -                                                           | -                                                            | -                                            | -                                                               | -                                                              | -                                                                   | CG>50%      | -                                   | -           | -                                                                    | 1                                                               | 16         | 70         | 7        | 6.0      | 0.0      | -                                                                           | -                                                                                                              | -                | V Dense              | <50%                 | SP-SM                |        |      |

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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)

For BRIGADE ENTERPRISES LTD

*A. Vinoth*  
Authorised Signatory

## LABORATORY TEST REPORT

GEO MARINE CONSULTANTS PVT LTD- GEOTECHNICAL LABORATORY  
NO.11 2<sup>nd</sup> MAIN ROAD, KANNAPA NAGAR EXTN,  
KOTTIVAKKAM, CHENNAI



Name & Address of the Customer  
Sample Description  
Source of Sample  
Sample Condition  
Test Method  
Sample Receipt Date

M/s Brigade Enterprises Limited, Chennai  
Soil Sample  
Customer Supplied- Borehole No BH-03  
Satisfactory  
As per Bureau of Indian Standards  
11/06/2020

Customer Reference  
Period of Testing  
Sample Identification Number  
Test Report No.  
Report Date  
Test Report Pages

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11/06/2020 to 15/06/2020  
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GT-2081/BH-03  
24/06/2020  
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Table-2.3 Laboratory Classification of Soil Samples from BH-03

| Sample Depth (m) | SPT - "N" Value | Type of Sample | Fine Grained (FG)                                                |                                                             |                                                              |                                         |                                              |                                                                 |                                                                     |             |                                    |             | Coarse Grained (CG)                                                  |            |            |            |          |          |          |               |               |               |                                                  |                                                                        |        |       |  | IS-Notation |  |
|------------------|-----------------|----------------|------------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------------|-----------------------------------------|----------------------------------------------|-----------------------------------------------------------------|---------------------------------------------------------------------|-------------|------------------------------------|-------------|----------------------------------------------------------------------|------------|------------|------------|----------|----------|----------|---------------|---------------|---------------|--------------------------------------------------|------------------------------------------------------------------------|--------|-------|--|-------------|--|
|                  |                 |                |                                                                  |                                                             |                                                              |                                         |                                              |                                                                 |                                                                     |             |                                    |             | GRAIN SIZE ANALYSIS<br>AS PER IS 2720 (P-IV) - 1985,<br>RA-2015      |            |            |            |          |          |          |               |               |               |                                                  |                                                                        |        |       |  |             |  |
|                  |                 |                |                                                                  |                                                             |                                                              |                                         |                                              |                                                                 |                                                                     |             |                                    |             |                                                                      |            |            |            |          |          |          |               |               |               |                                                  |                                                                        |        |       |  |             |  |
|                  |                 |                | Moisture Content (%)<br>AS PER IS 2720 (P-II) -<br>1973, RA-2015 | LIQUID LIMIT (%)<br>AS PER IS 2720 (P-V) -<br>1985, RA-2015 | PLASTIC LIMIT (%)<br>AS PER IS 2720 (P-V) -<br>1985, RA-2015 | Plasticity Index<br>( $I_p = LL - PL$ ) | Consistency Index<br>( $I_c = LL - NMC/10$ ) | SHRINKAGE LIMIT (%)<br>AS PER IS 2720 (P-VI) -<br>1972, RA-2011 | FREE SWELL INDEX<br>(%)<br>AS PER IS 2720 (P-XL) -<br>1977, RA-2011 | Consistency | Position With Respect<br>to A-Line | IS-Notation | SPECIFIC GRAVITY<br>AS PER IS 2720 (P-III,<br>SEC-1) - 1980, RA-2010 | Gravel (%) | Coarse (%) | Medium (%) | Fine (%) | Silt (%) | Clay (%) | $D_{10}$ (mm) | $D_{30}$ (mm) | $D_{60}$ (mm) | Uniformity Co-Efficient<br>$C_u = D_{60}/D_{10}$ | Co-Efficient of Curvature<br>$C_c = D_{30}^2 / (D_{10} \times D_{60})$ |        |       |  |             |  |
|                  |                 |                |                                                                  |                                                             |                                                              |                                         |                                              |                                                                 |                                                                     |             |                                    |             |                                                                      |            |            |            |          |          |          |               |               |               |                                                  | Relative Density                                                       | Gravel | Sand  |  |             |  |
| 1.0              | 14              | SS             | 21.0                                                             | 44.3                                                        | 20.3                                                         | 24.0                                    | 1.0                                          | 14.0                                                            | 44.4                                                                | CG>50%      | Above                              | -           | -                                                                    | 5          | 8          | 20         | 25       | 34.0     | 8.0      | -             | -             | -             | -                                                | M Dense                                                                | <50%   | SC    |  |             |  |
| 2.0              | 20              | SS             | 21.9                                                             | 37.2                                                        | 23.8                                                         | 13.4                                    | 1.1                                          | 17.3                                                            | 20.0                                                                | CG>50%      | Above                              | -           | -                                                                    | 1          | 8          | 21         | 25       | 38.0     | 7.0      | -             | -             | -             | -                                                | M Dense                                                                | <50%   | SC    |  |             |  |
| 3.0              | >100            | WS             | -                                                                | -                                                           | -                                                            | -                                       | -                                            | -                                                               | -                                                                   | CG>50%      | -                                  | -           | -                                                                    | 0          | 14         | 70         | 10       | 6.0      | 0.0      | -             | -             | -             | -                                                | V Dense                                                                | <50%   | SP-SM |  |             |  |
| 4.0              | >100            | WS             | -                                                                | -                                                           | -                                                            | -                                       | -                                            | -                                                               | -                                                                   | CG>50%      | -                                  | -           | -                                                                    | 2          | 17         | 68         | 8        | 5.0      | 0.0      | -             | -             | -             | -                                                | V Dense                                                                | <50%   | SP-SM |  |             |  |

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Authorised Signatory

A VINOTH  
(Technical Manager)

## 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

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



Name & Address of the Customer  
Sample Description  
Source of Sample  
Sample Condition  
Test Method  
Sample Receipt Date

M/s Brigade Enterprises Limited, Chennai  
Soil Sample  
Customer Supplied- Borehole No. BH-04  
Satisfactory  
As per Bureau of Indian Standards  
06/06/2020

Customer Reference  
Period of Testing  
Sample Identification Number  
Test Report No.  
Report Date  
Test Report Pages

Email Confirmation  
06/06/2020 to 08/06/2020  
SS/GMC/062020/209/BH04  
GT-2081/BH-04  
24/06/2020  
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**Table-2.4 Laboratory Classification of Soil Samples from BH-04**

| 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 (%)<br>AS PER IS 2720 (P-IV) -<br>1973, RA-2015 | LIQUID LIMIT (%)<br>AS PER IS 2720 (P-V)-<br>1985, RA-2015 | PLASTIC LIMIT (%)<br>AS PER IS 2720 (P-V) -<br>1985, RA-2015 | Plasticity Index<br>(Ip= LL-PL) | Consistency Index<br>(Ic=LL-WC/CL)<br>% | SHRINKAGE LIMIT (%)<br>AS PER IS 2720 (P-W) -<br>1972, RA-2011 | FREE SWELL INDEX<br>(%)<br>AS PER IS 2720 (P-XL) -<br>1977, RA-2011 | Consistency | Position With Respect<br>to A-Line | IS-Notation | SPECIFIC GRAVITY,<br>AS PER IS 2720 (P-III,<br>SEC-1) - 1980, RA-2010 | GRAIN SIZE ANALYSIS<br>AS PER IS 2720 (P-IV) - 1985,<br>RA-2015 |            |            |          |          |          | Coarse Grained (CG)  |                      |                      |                                                                            | Relative Density | IS-Notation                                                                                                  |        |      |
|                                                                |                |                |                                                                  |                                                            |                                                              |                                 |                                         |                                                                |                                                                     |             |                                    |             |                                                                       | Gravel (%)                                                      | Coarse (%) | Medium (%) | Fine (%) | Silt (%) | Clay (%) | D <sub>10</sub> (mm) | D <sub>30</sub> (mm) | D <sub>60</sub> (mm) | Uniformly Co-Efficient<br>C <sub>u</sub> =D <sub>60</sub> /D <sub>10</sub> |                  | Co-Efficient of Curvature<br>C <sub>c</sub> =D <sub>30</sub> <sup>2</sup> /D <sub>10</sub> x D <sub>60</sub> | Gravel | Sand |
|                                                                |                |                |                                                                  |                                                            |                                                              |                                 |                                         |                                                                |                                                                     |             |                                    |             |                                                                       |                                                                 |            |            |          |          |          |                      |                      |                      |                                                                            |                  |                                                                                                              |        |      |
| 1.0                                                            | 9              | SS             | 19.0                                                             | 33.8                                                       | 17.9                                                         | 15.9                            | 0.9                                     | 16.0                                                           | 82.5                                                                | CG>50%      | Above                              | -           | 6                                                                     | 6                                                               | 23         | 28         | 32.0     | 5.0      | -        | -                    | -                    | -                    | -                                                                          | -                | Loose                                                                                                        | <50%   | SC   |
| 2.0                                                            | 30             | SS             | -                                                                | -                                                          | -                                                            | -                               | -                                       | -                                                              | -                                                                   | CG>50%      | -                                  | -           | 12                                                                    | 11                                                              | 27         | 26         | 24.0     | 0.0      | -        | -                    | -                    | -                    | -                                                                          | -                | M Dense                                                                                                      | <50%   | SM   |
| 3.0                                                            | 103            | SS             | -                                                                | -                                                          | -                                                            | -                               | -                                       | -                                                              | -                                                                   | CG>50%      | -                                  | -           | 15                                                                    | 11                                                              | 37         | 24         | 13.0     | 0.0      | -        | -                    | -                    | -                    | -                                                                          | -                | V Dense                                                                                                      | <50%   | SM   |
| 4.0                                                            | >100           | SS             | -                                                                | -                                                          | -                                                            | -                               | -                                       | -                                                              | -                                                                   | CG>50%      | -                                  | -           | 20                                                                    | 9                                                               | 26         | 24         | 21.0     | 0.0      | -        | -                    | -                    | -                    | -                                                                          | -                | V Dense                                                                                                      | <50%   | SM   |
| 5.0                                                            | >100           | SS             | -                                                                | -                                                          | -                                                            | -                               | -                                       | -                                                              | -                                                                   | CG>50%      | -                                  | -           | 17                                                                    | 12                                                              | 27         | 23         | 21.0     | 0.0      | -        | -                    | -                    | -                    | -                                                                          | -                | V Dense                                                                                                      | <50%   | SM   |
| 6.0                                                            | >100           | WS             | -                                                                | -                                                          | -                                                            | -                               | -                                       | -                                                              | -                                                                   | CG>50%      | -                                  | -           | 4                                                                     | 12                                                              | 72         | 10         | 2.0      | 0.0      | -        | -                    | -                    | -                    | -                                                                          | -                | V Dense                                                                                                      | <50%   | SP   |

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Authorised Signatory

A VINOTH  
(Technical Manager)

For BRIGADE ENTERPRISES LTD

*[Signature]*  
Authorised Signatory

**LABORATORY TEST REPORT**

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



Name & Address of the Customer  
Sample Description  
Source of Sample  
Sample Condition  
Test Method  
Sample Receipt Date

M/s Brigade Enterprises Limited, Chennai  
Soil Sample  
Customer Supplied- Borehole No. BH-05  
Satisfactory  
As per Bureau of Indian Standards  
06/06/2020

Customer Reference  
Period of Testing  
Sample Identification Number  
Test Report No.  
Report Date  
Test Report Pages

Email Confirmation  
06/06/2020 to 08/06/2020  
SS/GMC/062020/209/BH05  
GT-2081/BH-05  
24/06/2020  
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**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)                                             |            |            |          |          |          |               |               |               |                                                  | IS-Notation                                                            |                  |        |
|------------------|---------------|----------------|-----------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------------|-----------------------------------------|-----------------------------------------------|----------------------------------------------------------------|---------------------------------------------------------------------|-------------|--------------------------------------|-------------|-----------------------------------------------------------------|------------|------------|----------|----------|----------|---------------|---------------|---------------|--------------------------------------------------|------------------------------------------------------------------------|------------------|--------|
|                  |               |                |                                                                 |                                                             |                                                              |                                         |                                               |                                                                |                                                                     |             |                                      |             | GRAIN SIZE ANALYSIS<br>AS PER IS 2720 (P-IV) - 1985,<br>RA-2015 |            |            |          |          |          |               |               |               |                                                  |                                                                        |                  |        |
|                  |               |                | Moisture Content (%)<br>AS PER IS 2720 (P-4) -<br>1973, RA-2015 | LIQUID LIMIT (%)<br>AS PER IS 2720 (P-V) -<br>1985, RA-2015 | PLASTIC LIMIT (%)<br>AS PER IS 2720 (P-V) -<br>1985, RA-2015 | Plasticity Index<br>( $I_p = LL - PL$ ) | Consistency Index<br>( $I_c = LL - WN/CI_u$ ) | SHRINKAGE LIMIT (%)<br>AS PER IS 2720 (P-V) -<br>1972, RA-2011 | FREE SWELL INDEX<br>(%)<br>AS PER IS 2720 (P-XL) -<br>1977, RA-2011 | Consistency | Position With Respect<br>to A-Alline | IS-Notation | Gravel (%)                                                      | Coarse (%) | Medium (%) | Fine (%) | Silt (%) | Clay (%) | $D_{10}$ (mm) | $D_{30}$ (mm) | $D_{60}$ (mm) | Uniformity Co-Efficient<br>$C_u = D_{60}/D_{10}$ | Co-Efficient of Curvature<br>$C_c = D_{30}^2 / (D_{10} \times D_{60})$ | Relative Density |        |
|                  |               |                |                                                                 |                                                             |                                                              |                                         |                                               |                                                                |                                                                     |             |                                      |             |                                                                 |            |            |          |          |          |               |               |               |                                                  |                                                                        |                  | Gravel |
| 1.0              | 7             | SS             | 25.0                                                            | 39.0                                                        | 18.0                                                         | 21.0                                    | 0.7                                           | 14.0                                                           | 55.6                                                                | M Stiff     | Above                                | CL          | -                                                               | -          | -          | 77.0     | 23.0     | -        | -             | -             | -             | -                                                | FG-50%                                                                 | FG>50%           | FG>50% |
| 2.0              | 23            | SS             | 14.9                                                            | 26.6                                                        | 17.0                                                         | 9.6                                     | 1.2                                           | 18.0                                                           | 37.5                                                                | CG>50%      | Above                                | -           | 15                                                              | 10         | 26         | 23       | 22.0     | 4.0      | -             | -             | -             | M Dense                                          | <50%                                                                   | SC               |        |
| 3.0              | 95            | SS             | -                                                               | -                                                           | -                                                            | -                                       | -                                             | -                                                              | -                                                                   | CG>50%      | -                                    | -           | 15                                                              | 15         | 25         | 23       | 22.0     | 0.0      | -             | -             | -             | V Dense                                          | <50%                                                                   | SM               |        |
| 4.0              | 80            | SS             | -                                                               | -                                                           | -                                                            | -                                       | -                                             | -                                                              | -                                                                   | CG>50%      | -                                    | -           | 0                                                               | 2          | 77         | 19       | 2.0      | 0.0      | -             | -             | -             | V Dense                                          | <50%                                                                   | SP               |        |
| 5.0              | >100          | WS             | -                                                               | -                                                           | -                                                            | -                                       | -                                             | -                                                              | -                                                                   | CG>50%      | -                                    | -           | 0                                                               | 2          | 82         | 15       | 1.0      | 0.0      | -             | -             | -             | V Dense                                          | <50%                                                                   | SP               |        |
| 6.0              | >100          | WS             | -                                                               | -                                                           | -                                                            | -                                       | -                                             | -                                                              | -                                                                   | CG>50%      | -                                    | -           | 0                                                               | 4          | 80         | 14       | 2.0      | 0.0      | -             | -             | -             | V Dense                                          | <50%                                                                   | SP               |        |

# **LABORATORY TEST REPORT** **GEOMARINE CONSULTANTS PVT LTD- GEOTECHNICAL LABORATORY** **NO.11 2<sup>nd</sup> MAIN ROAD, KANNAPA NAGAR EXTN,** **KOTTIVAKKAM, CHENNAI**



Name & Address of the Customer  
Sample Description  
Source of Sample  
Sample Condition  
Test Method  
Sample Receipt Date

M/s Brigade Enterprises Limited, Chennai  
Soil Sample  
Customer Supplied- Borehole No. BH-06  
Satisfactory  
As per Bureau of Indian Standards  
06/06/2020

Customer Reference  
Period of Testing  
Sample Identification Number  
Test Report No.  
Report Date  
Test Report Pages

Email Confirmation  
06/06/2020 to 08/06/2020  
SS/GMC/062020/209/BH05  
GT-2081/BH-06  
24/06/2020  
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 (%)<br>AS PER IS 2720 (P-IV) -<br>1973, RA-2015 | LIQUID LIMIT (%)<br>AS PER IS 2720 (P-V) -<br>1985, RA-2015 | PLASTIC LIMIT (%)<br>AS PER IS 2720 (P-V) -<br>1985, RA-2015 | Plasticity Index<br>(I <sub>p</sub> = LL-PL) | Consistency Index<br>(I <sub>c</sub> = LL-NM <sub>LC</sub> /I <sub>L</sub> ) | SHRINKAGE LIMIT (%)<br>AS PER IS 2720 (P-V) -<br>1972, RA-2011 | FREE SWELL INDEX<br>(%)<br>AS PER IS 2720 (P-XL) -<br>1977, RA-2015 | Consistency | Position With Respect<br>to A-Aline | IS-Notation | SPECIFIC GRAVITY<br>AS PER IS 2720 (P-III)<br>SEC-1) - 1980, RA-2010 | GRAIN SIZE ANALYSIS<br>AS PER IS 2720 (P-IV) - 1985,<br>RA-2015 |            |            |          |          |          | D <sub>10</sub> (mm) | D <sub>30</sub> (mm) | D <sub>60</sub> (mm) | Uniformity Co-Efficient<br>C <sub>u</sub> =D <sub>60</sub> /D <sub>10</sub> | Co-Efficient of Curvature<br>C <sub>c</sub> =D <sub>30</sub> <sup>2</sup> /D <sub>10</sub> × D <sub>60</sub> | Relative Density | IS-Notation |      |
|                  |                 |                |                                                                  |                                                             |                                                              |                                              |                                                                              |                                                                |                                                                     |             |                                     |             |                                                                      | Gravel (%)                                                      | Coarse (%) | Medium (%) | Fine (%) | Silt (%) | Clay (%) |                      |                      |                      |                                                                             |                                                                                                              |                  | Gravel      | Sand |
|                  |                 |                |                                                                  |                                                             |                                                              |                                              |                                                                              |                                                                |                                                                     |             |                                     |             |                                                                      |                                                                 |            |            |          |          |          |                      |                      |                      |                                                                             |                                                                                                              |                  |             |      |
| 1.0              | -               | UDS            | 13.6                                                             | 48.8                                                        | 21.9                                                         | 26.9                                         | 1.3                                                                          | 15.0                                                           | 20.0                                                                | CG>50%      | Above                               | -           | -                                                                    | 7                                                               | 9          | 21         | 21       | 33.0     | 9.0      | -                    | -                    | -                    | -                                                                           | -                                                                                                            | V Dense          | <50%        | SC   |
| 2.0              | 50              | SS             | 11.0                                                             | 25.3                                                        | 16.0                                                         | 9.3                                          | 1.5                                                                          | 19.0                                                           | 10.0                                                                | CG>50%      | Above                               | -           | -                                                                    | 14                                                              | 8          | 20         | 22       | 32.0     | 4.0      | -                    | -                    | -                    | -                                                                           | -                                                                                                            | Dense            | <50%        | SC   |
| 3.0              | >100            | SS             | -                                                                | -                                                           | -                                                            | -                                            | -                                                                            | -                                                              | -                                                                   | CG>50%      | -                                   | -           | -                                                                    | 24                                                              | 10         | 26         | 20       | 20.0     | 0.0      | -                    | -                    | -                    | -                                                                           | -                                                                                                            | V Dense          | <50%        | SM   |
| 4.0              | >100            | SS             | -                                                                | -                                                           | -                                                            | -                                            | -                                                                            | -                                                              | -                                                                   | CG>50%      | -                                   | -           | -                                                                    | 26                                                              | 11         | 28         | 21       | 14.0     | 0.0      | -                    | -                    | -                    | -                                                                           | -                                                                                                            | V Dense          | <50%        | SM   |
| 5.0              | >100            | WS             | -                                                                | -                                                           | -                                                            | -                                            | -                                                                            | -                                                              | -                                                                   | CG>50%      | -                                   | -           | -                                                                    | 14                                                              | 47         | 35         | 3        | 1.0      | 0.0      | -                    | -                    | -                    | -                                                                           | -                                                                                                            | V Dense          | <50%        | SP   |

\*\* END OF REPORT \*\*

**Terms and Conditions**

- The test results furnished corresponds to the sample received
- 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
- Any correction in this reports invalidates the reports

Authorised Signatory

A. VINOTH  
(Technical Manager)

For **BRIGADE ENTERPRISES LTD**

*(Signature)*

Authorised Signatory

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



Name & Address of the Customer  
Sample Description  
Source of Sample  
Sample Condition  
Test Method  
Sample Receipt Date

M/s Brigade Enterprises Limited, Chennai  
Soil Sample  
Customer Supplied- Borehole No. BH-07  
Satisfactory  
As per Bureau of Indian Standards  
14/06/2020

Customer Reference  
Period of Testing  
Sample Identification Number  
Test Report No.  
Report Date  
Test Report Pages

Email Confirmation  
15/06/2020 to 19/06/2020  
SS/GMC/062020/226/BH07  
GT-2081/BH-07  
24/06/2020  
One Page

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

| Test Method         |                |                | Table 2.7 Laboratory Classification of Soil Samples from BH-07  |                                                             |                                                              |                                         |                                              |                                                                 |                                                                     |             |                                      |             | Test Report Pages                                                   |            |            |            |          |          |          |               |               |               | One Page                                         |                                                                        |                  |         |      |    |
|---------------------|----------------|----------------|-----------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------------|-----------------------------------------|----------------------------------------------|-----------------------------------------------------------------|---------------------------------------------------------------------|-------------|--------------------------------------|-------------|---------------------------------------------------------------------|------------|------------|------------|----------|----------|----------|---------------|---------------|---------------|--------------------------------------------------|------------------------------------------------------------------------|------------------|---------|------|----|
| Sample Receipt Date |                |                | 14/06/2020                                                      |                                                             |                                                              |                                         |                                              |                                                                 |                                                                     |             |                                      |             |                                                                     |            |            |            |          |          |          |               |               |               |                                                  |                                                                        |                  |         |      |    |
| Sample Depth (m)    | SPT- "N" Value | Type of Sample | Fine Grained (FG)                                               |                                                             |                                                              |                                         |                                              |                                                                 |                                                                     |             |                                      |             | Coarse Grained (CG)                                                 |            |            |            |          |          |          |               |               |               | IS-Notation                                      |                                                                        |                  |         |      |    |
|                     |                |                |                                                                 |                                                             |                                                              |                                         |                                              |                                                                 |                                                                     |             |                                      |             | GRAIN SIZE ANALYSIS<br>AS PER IS 2720 (P-IV) - 1985,<br>RA-2015     |            |            |            |          |          |          |               |               |               |                                                  |                                                                        |                  |         |      |    |
|                     |                |                | Moisture Content (%)<br>AS PER IS 2720 (P-4) -<br>1973, RA-2015 | LIQUID LIMIT (%)<br>AS PER IS 2720 (P-V) -<br>1985, RA-2015 | PLASTIC LIMIT (%)<br>AS PER IS 2720 (P-V) -<br>1985, RA-2015 | Plasticity Index<br>( $I_p = LL - PL$ ) | Consistency Index<br>( $I_c = LL - NMCH_L$ ) | SHRINKAGE LIMIT (%)<br>AS PER IS 2720 (P-10) -<br>1972, RA-2011 | FREE SWELL INDEX<br>(%)<br>AS PER IS 2720 (P-XL) -<br>1977, RA-2011 | Consistency | Position With Respect<br>to A-Alline | IS-Notation | SPECIFIC GRAVITY<br>AS PER IS 2720 (P-4),<br>SEC-1) - 1980, RA-2010 | Gravel (%) | Coarse (%) | Medium (%) | Fine (%) | Silt (%) | Clay (%) | $D_{10}$ (mm) | $D_{30}$ (mm) | $D_{60}$ (mm) | Uniformity Co-Efficient<br>$C_u = D_{60}/D_{10}$ | Co-Efficient of Curvature<br>$C_c = D_{30}^2 / (D_{10} \times D_{60})$ | Relative Density | Gravel  | Sand |    |
| 1.0                 | 19             | SS             | 11.7                                                            | 39.0                                                        | 20.0                                                         |                                         | 19.0                                         | 1.4                                                             | 17.0                                                                |             | 93.3                                 | CG>50%      | Above                                                               | -          | -          | -          | 14       | 12       | 26       | 21            | 20.0          | 5.0           | -                                                | -                                                                      | -                | M Dense | <50% | SC |
| 2.0                 | >100           | SS             |                                                                 |                                                             |                                                              |                                         |                                              |                                                                 |                                                                     |             |                                      | CG>50%      |                                                                     |            |            |            | 15       | 16       | 21       | 6             | 42.0          | 0.0           | -                                                | -                                                                      | -                | V Dense | <50% | SM |
| 3.0                 | >100           | WS             |                                                                 |                                                             |                                                              |                                         |                                              |                                                                 |                                                                     |             |                                      | CG>50%      |                                                                     |            |            |            | 19       | 18       | 53       | 8             | 2.0           | 0.0           | -                                                | -                                                                      | -                | V Dense | <50% | SP |

\*\* END OF REPORT \*\*

Authorised Signatory

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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

A VINOTH  
(Technical Manager)

For BRIGADE ENTERPRISES LTD

Authorised Signatory

**LABORATORY TEST REPORT**

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



|                                |                                          |                              |                          |
|--------------------------------|------------------------------------------|------------------------------|--------------------------|
| Name & Address of the Customer | M/s Brigade Enterprises Limited, Chennai | Customer Reference           | Email Confirmation       |
| Sample Description             | Soil Sample                              | Period of Testing            | 15/06/2020 to 19/06/2020 |
| Source of Sample               | Customer Supplied- Borehole No. BH-08    | Sample Identification Number | SS/GMC/062020/226/BH08   |
| Sample Condition               | Satisfactory                             | Test Report No.              | GT-2081/BH-08            |
| Test Method                    | As per Bureau of Indian Standards        | Report Date                  | 24/06/2020               |
| Sample Receipt Date            | 14/06/2020                               | 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 (%)<br>AS PER IS 2720 (P-II) - 1973, RA-2015 | LIQUID LIMIT (%)<br>AS PER IS 2720 (P-I) - 1985, RA-2015 | PLASTIC LIMIT (%)<br>AS PER IS 2720 (P-VI) - 1985, RA-2015 | Plasticity Index<br>( $I_p = LL - PL$ ) | Consistency Index<br>( $I_c = LL - NMCI_L$ ) | SHRINKAGE LIMIT (%)<br>AS PER IS 2720 (P-VI) - 1972, RA-2011 | FREE SWELL INDEX (%)<br>AS PER IS 2720 (P-XL) - 1977, RA-2011 | Consistency | Position With Respect to A-Aline | IS-Notation | SPECIFIC GRAVITY<br>AS PER IS 2720 (P-III, SEC-1) - 1980, RA-2010 | GRAIN SIZE ANALYSIS<br>AS PER IS 2720 (P-IV) - 1985, RA-2015 |            |            |          |          |          | Uniformity Co-Efficient<br>$C_u = D_{60}/D_{10}$ | Co-Efficient of Curvature<br>$C_c = D_{30}^2 / (D_{10} \times D_{60})$ | Relative Density | IS-Notation   |               |               |        |      |
|                  |                 |                |                                                               |                                                          |                                                            |                                         |                                              |                                                              |                                                               |             |                                  |             |                                                                   | Gravel (%)                                                   | Coarse (%) | Medium (%) | Fine (%) | Silt (%) | Clay (%) |                                                  |                                                                        |                  | $D_{10}$ (mm) | $D_{30}$ (mm) | $D_{60}$ (mm) | Gravel | Sand |
|                  |                 |                |                                                               |                                                          |                                                            |                                         |                                              |                                                              |                                                               |             |                                  |             |                                                                   |                                                              |            |            |          |          |          |                                                  |                                                                        |                  |               |               |               |        |      |
| 1.0              | 13              | SS             | 20.6                                                          | 43.0                                                     | 19.0                                                       | 24.0                                    | 0.9                                          | 15.0                                                         | 31.6                                                          | CG>50%      | Above                            | -           | 6                                                                 | 8                                                            | 26         | 24         | 28.0     | 8.0      | -        | -                                                | -                                                                      | -                | M Dense       | <50%          | SC            |        |      |
| 2.0              | 45              | SS             | -                                                             | -                                                        | -                                                          | -                                       | -                                            | -                                                            | -                                                             | CG>50%      | -                                | -           | 19                                                                | 12                                                           | 27         | 21         | 21.0     | 0.0      | -        | -                                                | -                                                                      | -                | Dense         | <50%          | SM            |        |      |
| 3.0              | 56              | SS             | -                                                             | -                                                        | -                                                          | -                                       | -                                            | -                                                            | -                                                             | CG>50%      | -                                | -           | 4                                                                 | 6                                                            | 34         | 32         | 24.0     | 0.0      | -        | -                                                | -                                                                      | -                | V Dense       | <50%          | SM            |        |      |

**\*\* END OF REPORT\*\***

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- (3) Any correction in this reports invalidates the reports

Authorised Signatory

A VINOTH  
(Technical Manager)

For **BRIGADE ENTERPRISES LTD**

  
Authorised Signatory

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



Name & Address of the Customer  
Sample Description  
Source of Sample  
Sample Condition  
Test Method  
Sample Receipt Date

M/s Brigade Enterprises Limited, Chennai  
Soil Sample  
Customer Supplied- Borehole No. BH-09  
Satisfactory  
As per Bureau of Indian Standards  
14/06/2020

Customer Reference  
Period of Testing  
Sample Identification Number  
Test Report No.  
Report Date  
Test Report Pages

Email Confirmation  
15/06/2020 to 19/06/2020  
SS/GMC/062020/226/BH09  
GT-2081/BH-09  
24/06/2020  
One Page

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

| Test Method                                                    | Sample Receipt Date |                |                                                                   |                                                              |                                                               |                                         |                                           |                                                                 |                                                                     |             | 24/06/2020                          |             |                                                                      |            |            |            |          |          |          |               | 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)                                                  |            |            |            |          |          |          |               |                   |               | IS-Notation                                      |                                                                        |                  |        |      |  |  |  |          |  |  |  |  |  |  |  |  |  |
|                                                                |                     |                | GRAIN SIZE ANALYSIS<br>AS PER IS 2720 (P-IV) - 1985,<br>RA-2015   |                                                              |                                                               |                                         |                                           |                                                                 |                                                                     |             |                                     |             | GRAIN SIZE ANALYSIS<br>AS PER IS 2720 (P-IV) - 1985,<br>RA-2015      |            |            |            |          |          |          |               |                   |               |                                                  |                                                                        |                  |        |      |  |  |  |          |  |  |  |  |  |  |  |  |  |
|                                                                |                     |                | Moisture Content (%)<br>AS PER IS 2720 (P-III) -<br>1973, RA-2015 | LIQUID LIMIT (%)<br>AS PER IS 2720 (P-VI) -<br>1985, RA-2015 | PLASTIC LIMIT (%)<br>AS PER IS 2720 (P-VI) -<br>1985, RA-2015 | Plasticity Index<br>( $I_p = LL - PL$ ) | Consistency Index<br>( $I_c = LL - ALC$ ) | SHRINKAGE LIMIT (%)<br>AS PER IS 2720 (P-VI) -<br>1972, RA-2011 | FREE SWELL INDEX<br>(%)<br>AS PER IS 2720 (P-XL) -<br>1977, RA-2011 | Consistency | Position With Respect<br>to A-Aline | IS-Notation | SPECIFIC GRAVITY<br>AS PER IS 2720 (P-III,<br>SEC-1) - 1980, RA-2010 | Gravel (%) | Coarse (%) | Medium (%) | Fine (%) | Silt (%) | Clay (%) | $D_{10}$ (mm) | $D_{30}$ (mm)     | $D_{60}$ (mm) | Uniformity Co-Efficient<br>$C_u = D_{60}/D_{10}$ | Co-Efficient of Curvature<br>$C_c = D_{30}^2 / (D_{10} \times D_{60})$ | Relative Density | Gravel | Sand |  |  |  |          |  |  |  |  |  |  |  |  |  |
| 1.0                                                            | 16                  | SS             | 16.5                                                              | 43.0                                                         | 22.0                                                          | 21.0                                    | 1.3                                       | 15.0                                                            | 62.5                                                                | CG>50%      | Above                               | -           | -                                                                    | -          | 0          | 0          | 31       | 32       | 27.0     | 10.0          | -                 | -             | -                                                | -                                                                      | M Dense          | <50%   | SC   |  |  |  |          |  |  |  |  |  |  |  |  |  |
| 2.0                                                            | 25                  | SS             | 19.0                                                              | 33.0                                                         | 15.0                                                          | 18.0                                    | 0.8                                       | 17.0                                                            | 42.1                                                                | CG>50%      | Above                               | -           | -                                                                    | -          | 28         | 10         | 20       | 13       | 24.0     | 5.0           | -                 | -             | -                                                | -                                                                      | M Dense          | <50%   | SC   |  |  |  |          |  |  |  |  |  |  |  |  |  |
| 3.0                                                            | >100                | SS             | -                                                                 | -                                                            | -                                                             | -                                       | -                                         | -                                                               | -                                                                   | CG>50%      | -                                   | -           | -                                                                    | -          | 14         | 4          | 23       | 37       | 22.0     | 0.0           | -                 | -             | -                                                | -                                                                      | V Dense          | <50%   | SM   |  |  |  |          |  |  |  |  |  |  |  |  |  |

\*\* END OF REPORT \*\*

Authorised Signatory

A VINOTH  
(Technical Manager)

Terms and Conditions

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- (3) Any correction in this reports invalidates the reports.

For **BRIGADE ENTERPRISES LTD**

Authorised Signatory

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



|                                             |                                          |                                       |                          |
|---------------------------------------------|------------------------------------------|---------------------------------------|--------------------------|
| <b>Name &amp; Address of the Customer</b> : | M/s Brigade Enterprises Limited, Chennai | <b>Customer Reference</b> :           | Email Confirmation       |
| <b>Sample Description</b> :                 | Soil Sample                              | <b>Period of Testing</b> :            | 11/06/2020 to 15/06/2020 |
| <b>Source of Sample</b> :                   | Customer Supplied- Borehole No. BH-10    | <b>Sample Identification Number</b> : | SS/GMC/062020/209/BH10   |
| <b>Sample Condition</b> :                   | Satisfactory                             | <b>Test Report No.</b> :              | GT-2081/BH-10            |
| <b>Test Method</b> :                        | As per Bureau of Indian Standards        | <b>Report Date</b> :                  | 24/06/2020               |
| <b>Sample Receipt Date</b> :                | 11/06/2020                               | <b>Test Report Pages</b> :            | One Page                 |

| Sample Depth (m) |      | SPT- "N" Value | Type of Sample | Fine Grained (FG)                                                |                                                             |                                                              |                                              |                                                               |                                                                 |                                                                     |             |                                      |             | SPECIFIC GRAVITY<br>AS PER IS 2720 (P-III),<br>SEC-1) - 1980, RA-2010 | Coarse Grained (CG)                                             |            |          |          |          |                      |                                                                             |                                                                                                      |                  |                      |                      |      |
|------------------|------|----------------|----------------|------------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------|-----------------------------------------------------------------|---------------------------------------------------------------------|-------------|--------------------------------------|-------------|-----------------------------------------------------------------------|-----------------------------------------------------------------|------------|----------|----------|----------|----------------------|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|------------------|----------------------|----------------------|------|
|                  |      |                |                | Moisture Content (%)<br>AS PER IS 2720 (P-II) -<br>1973, RA-2015 | LIQUID LIMIT (%)<br>AS PER IS 2720 (P-V) -<br>1985, RA-2015 | PLASTIC LIMIT (%)<br>AS PER IS 2720 (P-V) -<br>1985, RA-2015 | Plasticity Index<br>(I <sub>p</sub> = LL-PL) | Consistency Index<br>(I <sub>c</sub> = LL-NMCI <sub>p</sub> ) | SHRINKAGE LIMIT (%)<br>AS PER IS 2720 (P-VI) -<br>1972, RA-2011 | FREE SWELL INDEX<br>(%)<br>AS PER IS 2720 (P-XL) -<br>1977, RA-2011 | Consistency | Position With Respect<br>to A-Alline | IS-Notation |                                                                       | GRAIN SIZE ANALYSIS<br>AS PER IS 2720 (P-IV) - 1985,<br>RA-2015 |            |          |          |          |                      | Uniformity Co-Efficient<br>C <sub>u</sub> =D <sub>60</sub> /D <sub>10</sub> | Co-Efficient of Curvature<br>C <sub>c</sub> = D <sub>30</sub> / (D <sub>10</sub> × D <sub>60</sub> ) | Relative Density | IS-Notation          |                      |      |
|                  |      |                |                |                                                                  |                                                             |                                                              |                                              |                                                               |                                                                 |                                                                     |             |                                      |             | Gravel (%)                                                            | Coarse (%)                                                      | Medium (%) | Fine (%) | Silt (%) | Clay (%) | D <sub>10</sub> (mm) |                                                                             |                                                                                                      |                  | D <sub>30</sub> (mm) | D <sub>60</sub> (mm) |      |
| 1.0              | 12   | SS             | 13.8           | 28.6                                                             | 16.3                                                        | 12.3                                                         | 1.2                                          | 18.9                                                          | 58.0                                                            | CG>50%                                                              | Above       |                                      |             | 6                                                                     | 2                                                               | 27         | 35       | 24.0     | 6.0      |                      |                                                                             |                                                                                                      |                  | M Dense              | <50%                 | SC   |
| 2.0              | 38   | SS             | 16.5           | 30.2                                                             | 18.0                                                        | 12.2                                                         | 1.1                                          | 19.6                                                          | 29.0                                                            | CG>50%                                                              | Above       |                                      |             | 18                                                                    | 12                                                              | 24         | 22       | 16.0     | 6.0      |                      |                                                                             |                                                                                                      |                  | Dense                | <50%                 | SC   |
| 3.0              | 66   | SS             |                |                                                                  |                                                             |                                                              |                                              |                                                               |                                                                 | CG>50%                                                              |             |                                      |             | 28                                                                    | 15                                                              | 22         | 16       | 21.0     | 0.0      |                      |                                                                             |                                                                                                      |                  | V Dense              | <50%                 | SM   |
| 4.0              | >100 | SS             |                |                                                                  |                                                             |                                                              |                                              |                                                               |                                                                 | CG>50%                                                              |             |                                      |             | 17                                                                    | 6                                                               | 24         | 29       | 24.0     | 0.0      |                      |                                                                             |                                                                                                      |                  | V Dense              | <50%                 | SM   |
| 5.0              | >100 | WS             |                |                                                                  |                                                             |                                                              |                                              |                                                               |                                                                 | CG>50%                                                              |             |                                      |             | 58                                                                    | 28                                                              | 12         | 2        | 0.0      | 0.0      |                      |                                                                             |                                                                                                      |                  | V Dense              | GP                   | <50% |

\*\* END OF REPORT\*\*

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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

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A VINOTH  
(Technical Manager)

For **BRIGADE ENTERPRISES LTD**

*(Signature)*

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



Name & Address of the Customer  
Sample Description  
Source of Sample  
Sample Condition  
Test Method  
Sample Receipt Date

M/s Brigade Enterprises Limited, Chennai  
Soil Sample  
Customer Supplied- Borehole No. BH-11  
Satisfactory  
As per Bureau of Indian Standards  
11/06/2020

Customer Reference  
Period of Testing  
Sample Identification Number  
Test Report No.  
Report Date  
Test Report Pages

Email Confirmation  
11/06/2020 to 15/06/2020  
SS/GMC/062020/209/BH11  
GT-2081/BH-11  
24/06/2020  
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)                                                  |                                                                 |            |            |          |          |          |                      |                      |                      | IS-Notation |   |                                                                             |                                                                                                               |      |      |
|------------------|----------------|----------------|------------------------------------------------------------------|--------------------------------------------------------------|---------------------------------------------------------------|----------------------------------------------|--------------------------------------------------------------|-----------------------------------------------------------------|----------------------------------------------------------------------|-------------|--------------------------------------|-------------|----------------------------------------------------------------------|-----------------------------------------------------------------|------------|------------|----------|----------|----------|----------------------|----------------------|----------------------|-------------|---|-----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|------|------|
|                  |                |                | Moisture Content (%)<br>AS PER IS 2720 (P-II) -<br>1973, RA-2015 | LIQUID LIMIT (%)<br>AS PER IS 2720 (P-VI) -<br>1985, RA-2015 | PLASTIC LIMIT (%)<br>AS PER IS 2720 (P-VI) -<br>1985, RA-2015 | Plasticity Index<br>(I <sub>p</sub> = LL-PL) | Consistency Index<br>(I <sub>c</sub> =LL-WMCI <sub>p</sub> ) | SHRINKAGE LIMIT (%)<br>AS PER IS 2720 (P-VI) -<br>1972, RA-2011 | FREE SWELL INDEX<br>(%)<br>AS PER IS 2720 (P-XLI) -<br>1977, RA-2011 | Consistency | Position With Respect<br>to A-Alline | IS-Notation | SPECIFIC GRAVITY<br>AS PER IS 2720 (P-III,<br>SEC-1) - 1980, RA-2010 | GRAIN SIZE ANALYSIS<br>AS PER IS 2720 (P-IV) - 1986,<br>RA-2015 |            |            |          |          |          | D <sub>10</sub> (mm) | D <sub>30</sub> (mm) | D <sub>60</sub> (mm) |             |   | Uniformity Co-Efficient<br>C <sub>u</sub> =D <sub>60</sub> /D <sub>10</sub> | Co-Efficient of Curvature<br>C <sub>c</sub> =D <sub>30</sub> <sup>2</sup> /(D <sub>10</sub> D <sub>60</sub> ) |      |      |
|                  |                |                |                                                                  |                                                              |                                                               |                                              |                                                              |                                                                 |                                                                      |             |                                      |             |                                                                      | Gravel (%)                                                      | Coarse (%) | Medium (%) | Fine (%) | Silt (%) | Clay (%) |                      |                      |                      |             |   |                                                                             |                                                                                                               |      |      |
| 1.0              | 12             | SS             | 23.0                                                             | 37.2                                                         | 21.0                                                          | 16.2                                         | 0.9                                                          | 16.0                                                            | 40.0                                                                 | CG>50%      | Above                                | -           | -                                                                    | 0                                                               | 0          | 21         | 37       | 35.0     | 7.0      | -                    | -                    | -                    | -           | - | -                                                                           | M Dense                                                                                                       | <50% | SC   |
| 2.0              | 29             | SS             | 12.2                                                             | 36.9                                                         | 22.0                                                          | 14.8                                         | 1.7                                                          | 17.2                                                            | 27.3                                                                 | CG>50%      | Above                                | -           | -                                                                    | 29                                                              | 6          | 19         | 17       | 22.0     | 7.0      | -                    | -                    | -                    | -           | - | -                                                                           | M Dense                                                                                                       | <50% | SC   |
| 3.0              | 78             | SS             | -                                                                | -                                                            | -                                                             | -                                            | -                                                            | -                                                               | -                                                                    | CG>50%      | -                                    | -           | -                                                                    | 20                                                              | 8          | 17         | 27       | 28.0     | 0.0      | -                    | -                    | -                    | -           | - | -                                                                           | V Dense                                                                                                       | <50% | SM   |
| 4.0              | >100           | WS             | -                                                                | -                                                            | -                                                             | -                                            | -                                                            | -                                                               | -                                                                    | CG>50%      | -                                    | -           | -                                                                    | 57                                                              | 21         | 19         | 3        | 0.0      | 0.0      | -                    | -                    | -                    | -           | - | -                                                                           | V Dense                                                                                                       | GP   | <50% |

\*\* END OF REPORT\*\*

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(Technical Manager)

For BRIGADE ENTERPRISES LTD

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**LABORATORY TEST REPORT**

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



Name & Address of the Customer :  
Sample Description :  
Source of Sample :  
Sample Condition :  
Test Method :  
Sample Receipt Date :

M/s Brigade Enterprises Limited, Chennai  
Soil Sample  
Customer Supplied- Borehole No. BH-13  
Satisfactory  
As per Bureau of Indian Standards  
14/06/2020

Customer Reference :  
Period of Testing :  
Sample Identification Number :  
Test Report No. :  
Report Date :  
Test Report Pages :

Email Confirmation :  
15/06/2020 to 19/06/2020  
SS/GMC/062020/09/BH13  
GT-2081/BH-13  
24/06/2020  
One Page

**Table-2.13 Laboratory Classification of Soil Samples from BH-13**

| Sample Depth (m) | SPT- "N" Value | Type of Sample | Fine Grained (FG)                                               |                                                             |                                                              |                                              |                                                |                                                                 |                                                                     |             |                                      |             | Coarse Grained (CG)                                                  |                                                                 |            |            |          |          |          |                      |                      |                      |                                                                             |                                                                                                      |                  |             |      |    |
|------------------|----------------|----------------|-----------------------------------------------------------------|-------------------------------------------------------------|--------------------------------------------------------------|----------------------------------------------|------------------------------------------------|-----------------------------------------------------------------|---------------------------------------------------------------------|-------------|--------------------------------------|-------------|----------------------------------------------------------------------|-----------------------------------------------------------------|------------|------------|----------|----------|----------|----------------------|----------------------|----------------------|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|------------------|-------------|------|----|
|                  |                |                | Moisture Content (%)<br>AS PER IS 2720 (P-4) -<br>1973, RA-2015 | LIQUID LIMIT (%)<br>AS PER IS 2720 (P-5) -<br>1985, RA-2015 | PLASTIC LIMIT (%)<br>AS PER IS 2720 (P-6) -<br>1985, RA-2015 | Plasticity Index<br>(I <sub>p</sub> = LL-PL) | Consistency Index<br>(I <sub>c</sub> =LL-NMCL) | SHRINKAGE LIMIT (%)<br>AS PER IS 2720 (P-40) -<br>1972, RA-2011 | FREE SWELL INDEX<br>(%)<br>AS PER IS 2720 (P-XL) -<br>1977, RA-2011 | Consistency | Position With Respect<br>to A-Alline | IS-Notation | SPECIFIC GRAVITY<br>AS PER IS 2720 (P-II),<br>SEC-1) - 1980, RA-2010 | GRAIN SIZE ANALYSIS<br>AS PER IS 2720 (P-IV) - 1985,<br>RA-2015 |            |            |          |          |          | D <sub>10</sub> (mm) | D <sub>30</sub> (mm) | D <sub>60</sub> (mm) | Uniformity Co-Efficient<br>C <sub>u</sub> =D <sub>60</sub> /D <sub>10</sub> | Co-Efficient of Curvature<br>C <sub>c</sub> = D <sub>30</sub> / (D <sub>10</sub> x D <sub>60</sub> ) | Relative Density | IS-Notation |      |    |
|                  |                |                |                                                                 |                                                             |                                                              |                                              |                                                |                                                                 |                                                                     |             |                                      |             |                                                                      | Gravel (%)                                                      | Coarse (%) | Medium (%) | Fine (%) | Silt (%) | Clay (%) |                      |                      |                      |                                                                             |                                                                                                      |                  | Gravel      | Sand |    |
|                  |                |                |                                                                 |                                                             |                                                              |                                              |                                                |                                                                 |                                                                     |             |                                      |             |                                                                      |                                                                 |            |            |          |          |          |                      |                      |                      |                                                                             |                                                                                                      |                  |             |      |    |
|                  |                |                |                                                                 |                                                             |                                                              |                                              |                                                |                                                                 |                                                                     |             |                                      |             |                                                                      |                                                                 |            |            |          |          |          |                      |                      |                      |                                                                             |                                                                                                      |                  |             |      |    |
| 1.0              | 15             | SS             | 16.1                                                            | 39.0                                                        | 15.0                                                         | 24.0                                         | 1.0                                            | 16.0                                                            | 50.0                                                                | CG>50%      | Above                                | -           | -                                                                    | 4                                                               | 4          | 25         | 25       | 35.0     | 7.0      | -                    | -                    | -                    | -                                                                           | -                                                                                                    | -                | M Dense     | <50% | SC |
| 2.0              | 57             | SS             | -                                                               | -                                                           | -                                                            | -                                            | -                                              | -                                                               | 11.0                                                                | CG>50%      | -                                    | -           | -                                                                    | 11                                                              | 9          | 15         | 30       | 35.0     | 0.0      | -                    | -                    | -                    | -                                                                           | -                                                                                                    | -                | V Dense     | <50% | SM |
| 3.0              | >100           | SS             | -                                                               | -                                                           | -                                                            | -                                            | -                                              | -                                                               | -                                                                   | CG>50%      | -                                    | -           | -                                                                    | 1                                                               | 49         | 42         | 7        | 1.0      | 0.0      | -                    | -                    | -                    | -                                                                           | -                                                                                                    | -                | V Dense     | <50% | SP |

\*\* END OF REPORT\*\*

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| Table-2.13 Results of Chemical Analysis |              |                     |      |                  |                  |                     |      |                  |                  |
|-----------------------------------------|--------------|---------------------|------|------------------|------------------|---------------------|------|------------------|------------------|
| SL No.                                  | Bore HoleNo. | Water               |      |                  |                  | Soil (2:1)          |      |                  |                  |
|                                         |              | Depth of Sample (m) | pH   | Chlorides (mg/l) | Sulphates (mg/l) | Depth of Sample (m) | pH   | Chlorides (mg/l) | Sulphates (mg/l) |
| 1                                       | BH-01        | 1.2                 | 7.41 | 1403             | 386              | 3.0                 | 7.28 | 239              | 185              |
| 2                                       | BH-03        | 1.1                 | 7.39 | 1325             | 393              | 2.0                 | 7.25 | 255              | 203              |
| 3                                       | BH-05        | 1.0                 | 7.39 | 1354             | 329              | 2.0                 | 7.25 | 251              | 189              |
| 4                                       | BH-07        | 1.1                 | 7.42 | 1347             | 348              | 1.0                 | 7.24 | 195              | 153              |
| 5                                       | BH-09        | 1.2                 | 7.40 | 1786             | 327              | 1.0                 | 7.24 | 205              | 128              |
| 6                                       | BH-11        | 1.3                 | 7.39 | 1289             | 388              | 2.0                 | 7.25 | 211              | 135              |
| 4                                       | BH-13        | 1.2                 | 7.42 | 1305             | 355              | 1.0                 | 7.23 | 265              | 148              |

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## **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:**

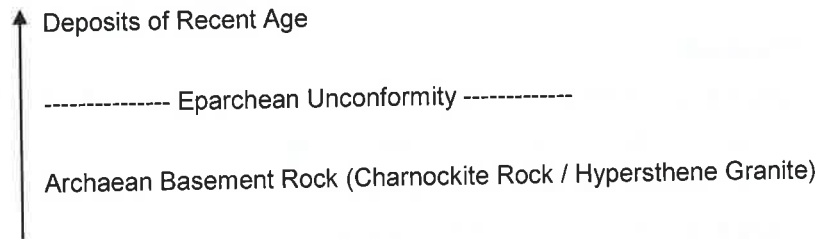
Chennai district is underlain by various geological formations from ancient Archaean to the Recent Alluvium. The geological formations of the district can be grouped into three units, namely

- 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)



In the present investigation site, the formation in the top 2.0m to 3.0m is recent deposit predominantly consisting of clayey sand formation (or silty sand with clay binder) which rest on the Archean formation of hypersthene granite (Charnockite rock)

### 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: |                |           |           |                           | 1             | 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 <sup>3</sup> | Shear Parameters      |          |
|                         | Top. R.L.      | Bot. R.L. | Thickness |                           |               |                                 |                  |             |                       | (C <sub>u</sub> ) kPa | (φ) Deg. |
| 1                       | 0.00           | 2.00      | 2.00      | Clayey Silty Sand         | Brownish Grey | 26                              | Medium Dense     | -           | 19                    | -                     | 34.8     |
| 2                       | 2.00           | 4.50      | 2.50      | Completely Weathered Rock | Brown         | >100                            | Very Dense       | -           | 21                    | -                     | 42.5     |
| 3                       | 4.50           | 6.00      | 1.50      | Moderately Weathered Rock | Grey          | CRR 27 % To 83 %, RQD 0 % 34 %  |                  |             |                       |                       |          |
| 4                       | 6.00           | 8.00      | 2.00      | Slightly Weathered Rock   | Grey          | CRR 82 % To 95 %, RQD 70 % 76 % |                  |             |                       |                       |          |

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| REFERENCE BORE HOLE-BH: |                |           |           |                           | 2             | 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. R.L.      | Bot. R.L. | Thickness |                           |               |                                 |                  |             |           | (C <sub>u</sub> ) kPa | (φ) Deg. |
| 1                       | 0.00           | 2.00      | 2.00      | Clayey Silty Sand         | Brownish Grey | 17                              | Medium Dense     | -           | 18        | -                     | 32.1     |
| 2                       | 2.00           | 3.00      | 1.00      | Completely Weathered Rock | Brown         | >100                            | Very Dense       | -           | 21        | -                     | 42.5     |
| 3                       | 3.00           | 4.00      | 1.00      | Highly Weathered Rock     | Grey          | CRR 8 %, RQD 0 %                |                  |             |           |                       |          |
| 4                       | 4.00           | 5.00      | 1.00      | Moderately Weathered Rock | Grey          | CRR 70 %, RQD 43 %              |                  |             |           |                       |          |
| 5                       | 5.00           | 8.00      | 3.00      | Slightly Weathered Rock   | Grey          | CRR 52 % To 92 %, RQD 52 % 92 % |                  |             |           |                       |          |

| REFERENCE BORE HOLE-BH: |                |           |           | 3                         | 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 <sup>3</sup> | Shear Parameters      |          |
|                         | Top. R.L.      | Bot. R.L. | Thickness |                           |                       |                                 |                  |             |                       | (C <sub>u</sub> ) kPa | (φ) Deg. |
| 1                       | 0.00           | 3.00      | 3.00      | Clayey Silty Sand         | Brownish Grey         | 22                              | Medium Dense     | -           | 18.5                  | -                     | 33.6     |
| 2                       | 3.00           | 4.00      | 1.00      | Completely Weathered Rock | Grey                  | >100                            | Very Dense       | -           | 21                    | -                     | 42.5     |
| 3                       | 4.00           | 5.00      | 1.00      | Highly Weathered Rock     | Grey                  | CRR 23 %, RQD 10 %              |                  |             |                       |                       |          |
| 4                       | 5.00           | 6.00      | 1.00      | Moderately Weathered Rock | Grey                  | CRR 3 %, RQD 0 %                |                  |             |                       |                       |          |
| 5                       | 6.00           | 9.00      | 3.00      | Moderately Weathered Rock | Grey                  | CRR 35 % To 65 %, RQD 11 % 49 % |                  |             |                       |                       |          |
| 6                       | 9.00           | 10.00     | 1.00      | Slightly Weathered Rock   | Grey                  | CRR 100 %, RQD 44 %             |                  |             |                       |                       |          |

| REFERENCE BORE HOLE-BH: |                |           |           |                           | 4             | 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. R.L.      | Bot. R.L. | Thickness |                           |               |                                |                  |             |           | (C <sub>u</sub> ) kPa | (φ) Deg. |
| 1                       | 0.00           | 2.00      | 2.00      | Clayey Silty Sand         | Brownish Grey | 9                              | Loose            | -           | 14.5      | -                     | 29.8     |
| 2                       | 2.00           | 3.00      | 1.00      | Completely Weathered Rock | Grey          | 30                             | Medium Dense     | -           | 19        | -                     | 36       |
| 3                       | 3.00           | 6.00      | 3.00      | Highly Weathered Rock     | Grey          | >100                           | Very Dense       | -           | 21        | -                     | 42.5     |
| 4                       | 6.00           | 8.00      | 2.00      | Highly Weathered Rock     | Grey          | CRR 5 % To 13 %, RQD 0 %       |                  |             |           |                       |          |
| 5                       | 8.00           | 15.00     | 7.00      | Moderately Weathered Rock | Grey          | CRR 16 % To 74 %, RQD 0 % 20 % |                  |             |           |                       |          |

| REFERENCE BORE HOLE-BH: |                |           |             |                           | 5             | 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 <sup>3</sup> | Shear Parameters      |          |
|                         | Top. R.L.      | Bot. R.L. | Thicknesses |                           |               |                                |                  |              |                       | (C <sub>u</sub> ) kPa | (φ) Deg. |
| 1                       | 0.00           | 2.00      | 2.00        | Sandy Silty Clay          | Pale Grey     | 7                              | -                | Medium Stiff | 16                    | 47                    | -        |
| 2                       | 2.00           | 3.00      | 1.00        | Clayey Silty Sand         | Brownish Grey | 23                             | Medium Dense     | -            | 18.5                  | -                     | 33.9     |
| 3                       | 3.00           | 6.00      | 3.00        | Completely Weathered Rock | Grey          | >100                           | Very Dense       | -            | 21                    | -                     | 42.5     |
| 4                       | 6.00           | 10.00     | 4.00        | Highly Weathered Rock     | Grey          | CRR 3 % To 13 %, RQD 0 %       |                  |              |                       |                       |          |
| 5                       | 10.00          | 13.50     | 3.50        | Moderately Weathered Rock | Grey          | CRR 23 % To 63 %, RQD 0 % 17 % |                  |              |                       |                       |          |

| REFERENCE BORE HOLE-BH: |                |           |               |                           | 6             | 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 <sup>3</sup> | Shear Parameters      |          |
|                         | Top. R.L.      | Bot. R.L. | Thicknes<br>s |                           |               |                                    |                  |             |                       | (C <sub>u</sub> ) kPa | (φ) Deg. |
| 1                       | 0.00           | 2.00      | 2.00          | Clayey Silty Sand         | Brownish Grey | -                                  | -                | -           | -                     | -                     | -        |
| 2                       | 2.00           | 3.00      | 1.00          | Residual Soil             | Brownish Grey | 50                                 | Dense            | -           | 20.5                  | -                     | 41       |
| 3                       | 3.00           | 5.00      | 2.00          | Completely Weathered Rock | Greyish Brown | >100                               | Very Dense       | -           | 21                    | -                     | 42.5     |
| 4                       | 5.00           | 6.00      | 1.00          | Highly Weathered Rock     | Grey          | CRR 11 %, RQD 0 %                  |                  |             |                       |                       |          |
| 5                       | 6.00           | 7.00      | 1.00          | Moderately Weathered Rock | Grey          | CRR 41 %, RQD 12 %                 |                  |             |                       |                       |          |
| 6                       | 7.00           | 10.00     | 3.00          | Slightly Weathered Rock   | Grey          | CRR 61 % to 92 %, RQD 61 % to 90 % |                  |             |                       |                       |          |

| REFERENCE BORE HOLE-BH: |                |           |             |                           | 7             | 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 <sup>3</sup> | Shear Parameters      |          |
|                         | Top. R.L.      | Bot. R.L. | Thicknesses |                           |               |                                    |                  |             |                       | (C <sub>u</sub> ) kPa | (φ) Deg. |
| 1                       | 0.00           | 2.00      | 2.00        | Clayey Silty Sand         | Brownish Grey | 19                                 | Medium Dense     | -           | 18                    | -                     | 32.7     |
| 2                       | 2.00           | 4.00      | 2.00        | Completely Weathered Rock | Grey          | >100                               | Very Dense       | -           | 21                    | -                     | 42.5     |
| 3                       | 4.00           | 6.00      | 2.00        | Moderately Weathered Rock | Grey          | CRR 63 % to 89 %, RQD 55 % to 58 % |                  |             |                       |                       |          |
| 4                       | 6.00           | 8.00      | 2.00        | Slightly Weathered Rock   | Grey          | CRR 92 % to 95 %, RQD 79 % to 81 % |                  |             |                       |                       |          |

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| REFERENCE BORE HOLE-BH: |                |           |           |                           | 8             | 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. R.L.      | Bot. R.L. | Thickness |                           |               |                                    |                  |             |           | (C <sub>u</sub> ) kPa | (φ) Deg. |
| 1                       | 0.00           | 2.00      | 2.00      | Clayey Silty Sand         | Brownish Grey | 13                                 | Medium Dense     | -           | 16.5      | -                     | 30.9     |
| 2                       | 2.00           | 4.00      | 2.00      | Completely Weathered Rock | Greyish Brown | 51                                 | Very Dense       | -           | 20.5      | -                     | 41.15    |
| 3                       | 4.00           | 6.00      | 2.00      | Highly Weathered Rock     | Grey          | CRR 10 % to 38 %, RQD 0 % to 12 %  |                  |             |           |                       |          |
| 4                       | 6.00           | 10.00     | 4.00      | Slightly Weathered Rock   | Grey          | CRR 86 % to 90 %, RQD 30 % to 71 % |                  |             |           |                       |          |

| REFERENCE BORE HOLE-BH: |                |           |           |                           | 9             | 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 <sup>3</sup> | Shear Parameters      |          |
|                         | Top. R.L.      | Bot. R.L. | Thickness |                           |               |                                    |                  |             |                       | (C <sub>u</sub> ) kPa | (φ) Deg. |
| 1                       | 0.00           | 2.00      | 2.00      | Clayey Silty Sand         | Brownish Grey | 16                                 | Medium Dense     | -           | 18                    | -                     | 31.8     |
| 2                       | 2.00           | 3.40      | 1.40      | Residual Soil             | Brownish Grey | 25                                 | Medium Dense     | -           | 18.5                  | -                     | 34.5     |
| 3                       | 3.40           | 7.00      | 3.60      | Moderately Weathered Rock | Grey          | CRR 28 % to 46 %, RQD 0 % to 22 %  |                  |             |                       |                       |          |
| 4                       | 7.00           | 10.00     | 3.00      | Slightly Weathered Rock   | Grey          | CRR 81 % to 90 %, RQD 70 % to 79 % |                  |             |                       |                       |          |

| REFERENCE BORE HOLE-BH: |                |           |           |                           | 10            | Ref R.L. of G.L. (m):              |                  |             | 0.00      |                       |          |
|-------------------------|----------------|-----------|-----------|---------------------------|---------------|------------------------------------|------------------|-------------|-----------|-----------------------|----------|
| Layer No.               | Layer Thk. (m) |           |           | Type of Strata            | Colour        | Ave. Design SPT                    | Relative Density | Consistency | (γ) kN/m³ | Shear Parameters      |          |
|                         | Top. R.L.      | Bot. R.L. | Thickness |                           |               |                                    |                  |             |           | (C <sub>u</sub> ) kPa | (φ) Deg. |
| 1                       | 0.00           | 2.00      | 2.00      | Clayey Silty Sand         | Brownish Grey | 12                                 | Medium Dense     | -           | 16        | -                     | 30.6     |
| 2                       | 2.00           | 3.00      | 1.00      | Residual Soil             | Brownish Grey | 38                                 | Dense            | -           | 19.5      | -                     | 38.2     |
| 3                       | 3.00           | 5.40      | 2.40      | Completely Weathered Rock | Greyish Brown | >100                               | Very Dense       | -           | 21        | -                     | 42.5     |
| 4                       | 5.40           | 6.00      | 0.60      | Highly Weathered Rock     | Grey          | CRR 15 %, RQD 0 %                  |                  |             |           |                       |          |
| 5                       | 6.00           | 7.00      | 1.00      | Moderately Weathered Rock | Grey          | CRR 70 %, RQD 54 %                 |                  |             |           |                       |          |
| 6                       | 7.00           | 10.00     | 3.00      | Slightly Weathered Rock   | Grey          | CRR 85 % to 90 %, RQD 36 % to 67 % |                  |             |           |                       |          |

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| 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/m <sup>3</sup> | Shear Parameters      |          |
|                         | Top. R.L.      | Bot. R.L. | Thickness |                           |               |                                    |                  |             |                       | (C <sub>u</sub> ) kPa | (φ) Deg. |
| 1                       | 0.00           | 3.00      | 3.00      | Clayey Silty Sand         | Brownish Grey | 21                                 | Medium Dense     | -           | 18.5                  | -                     | 33.3     |
| 2                       | 3.00           | 4.40      | 1.40      | Completely Weathered Rock | Greyish Brown | >100                               | Very Dense       | -           | 21                    | -                     | 42.5     |
| 3                       | 4.40           | 8.00      | 3.60      | Slightly Weathered Rock   | Grey          | CRR 76 % to 86 %, RQD 63 % to 70 % |                  |             |                       |                       |          |

| REFERENCE BORE HOLE-BH: |                |           |           |                                     | 13            | 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. R.L.      | Bot. R.L. | Thickness |                                     |               |                                  |                  |             |           | (C <sub>u</sub> ) kPa | (φ) Deg. |
| 1                       | 0.00           | 2.00      | 2.00      | Clayey Silty Sand                   | Grey          | 15                               | Medium Dense     | -           | 17.5      | -                     | 31.5     |
| 2                       | 2.00           | 3.00      | 1.00      | Residual Soil                       | Brownish Grey | 57                               | Very Dense       | -           | 20.5      | -                     | 42.05    |
| 3                       | 3.00           | 5.00      | 2.00      | Highly to Moderately Weathered Rock | Grey          | CRR 9 % to 23 %, RQD 0 % to 12 % |                  |             |           |                       |          |

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**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, Colluvial and Aeolian deposits.

#### **Formation Characteristics:**

In the project site, the formation from the existing ground level up to a depth of 2.0m or 3.0m is clayey sand followed by very dense residual soil or completely weathered rock grade-IV or V weathering up to a depth of 5.0m below the existing ground level. However, the formation beyond 5.0m is fractured rock to very strong intact rock up to the borehole investigation depth.

#### **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.

#### **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. "GEOTECHNICAL EARTHQUAKE ENGINEERING" by Steven L. Kramer, University of Washington, Prentice-Hall International Series in Civil Engineering and Engineering Mechanics, 2005, Page77-381.

Seed et al (1975) developed a relationship between cyclic stress ratios (CSR) causing liquefaction and corrected SPT-values  $(N)_{60}$  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-1: 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.

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

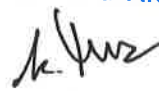
Step-4: Arrive at the CSR value of the deposit by dividing the cyclic shear stress with the effective shear strength.

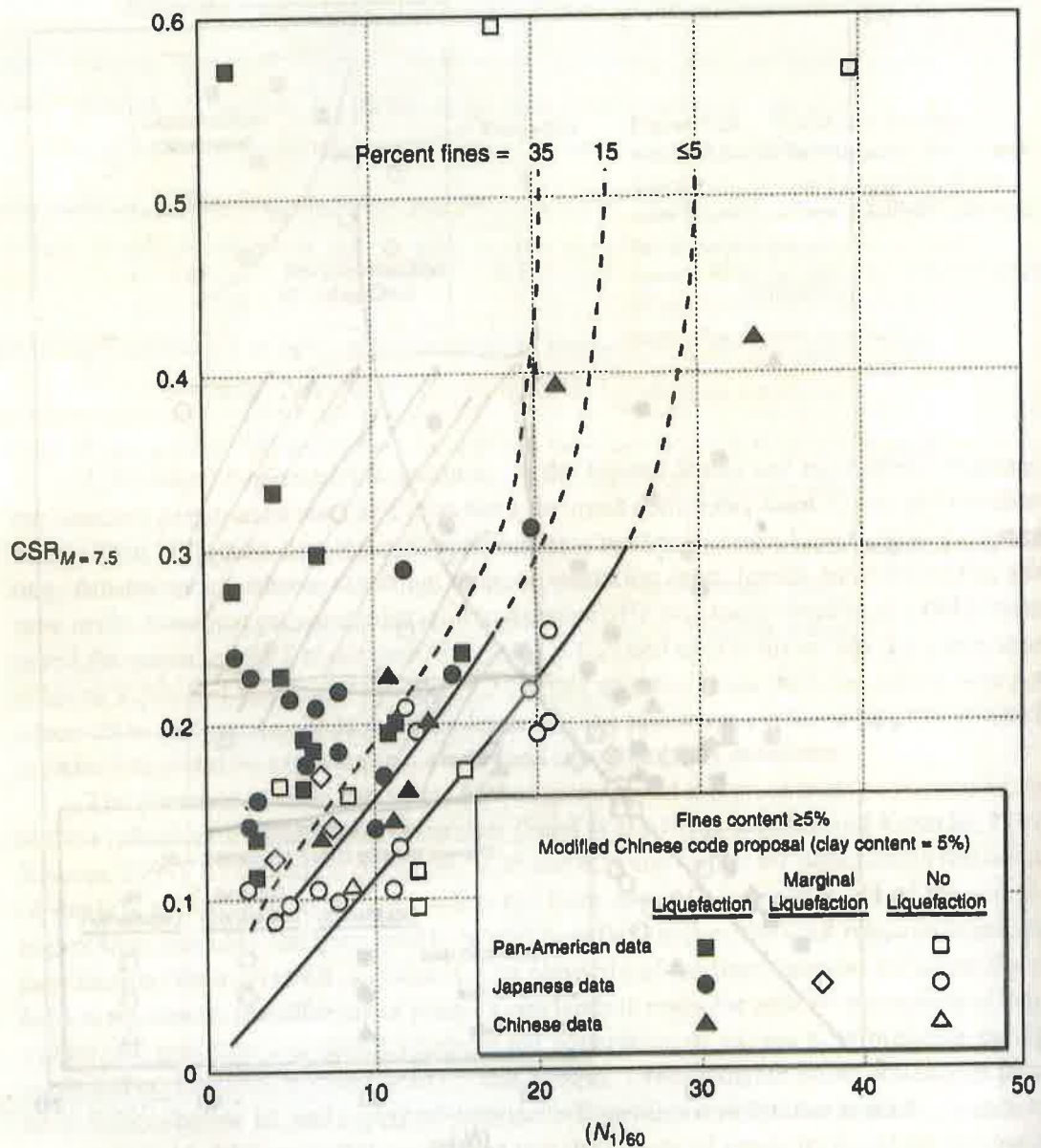
Step-4: Based on the CSR- $N_{160}$  relation from Fig.4.1 and using the magnitude correction factor corresponding to Zone-III ( $M=6$ ), the probable liquefaction/no-liquefaction characterization is arrived at and the details are given below:

| <b>Table 9-2 Magnitude Correction Factors for Cyclic Stress Approach</b> |                     |
|--------------------------------------------------------------------------|---------------------|
| 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                |
| $8\frac{1}{2}$                                                           | 0.80                |

**TABLE-4.1 MAGNITUDE CORRECTION FACTORS FOR CYCLIC STRESS APPROACH**

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**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

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#### **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 exists within the investigation depth.

***"Hence, the sub soil in the project site is not susceptibility to liquefaction".***

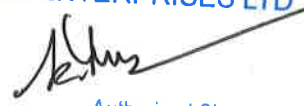
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## FOUNDATION SYSTEM & RECOMMENDATIONS

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## **FOUNDATION SYSTEM, EXCAVATION & DEWATERING METHODOLOGY**

### **5.1 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.

### **5.2 Proposed Structures**

An understanding of the proposed construction and the order of loads on the foundations is needed for choosing the appropriate foundation system. In the present case, the proposed structure is configured with two basement floors and twelve upper floors, and is meant for commercial use. For this kind of structure, the column loads could vary between 7000 kN to 8000 kN.

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

### **5.3 Sub Soil Stratification**

The generalised sub soil profile of the project area is discussed below:

- |                   |   |                                                                                                                                                            |
|-------------------|---|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0.0m to 2.0/ 3.0m | - | Overburden soil of Clayey sand /Sand with Clay Binder & Sandy Clay formations                                                                              |
| 2.0m to 5.0m      | - | Weathered rock formation of Grade – VI & V (Completely Weathered Rock to Residual Soil)                                                                    |
| >5.5m             | - | Layer of Moderately weathered rock formation followed by Very Strong, Intact, Slightly Weathered to Fresh Rock Formation (Grade – III to I Rock Formation) |

### **5.4 Foundation System**

#### **5.4.1 Preamble:**

- It is proposed to construct 2 basement floors, the clear height of basement floor are not available during the time of preparation of this report. Further the project site is about 2.0m lower than the adjacent road level and taking into account of the existing level difference with respect to the adjacent road level the projected assumed depth of foundation excavation could be about 4.5m below the existing ground level.

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#### 5.4.2 Foundation System:

For the kind of proposed construction, the foundation depth (bottom of footing or raft) can be maximum 5.0m below the existing ground level, however it is ideal to restrict the depth of foundation to 4.5m. Beyond 5.0m or 6.0m either controlled blasting or diamond wire saw cutting is required for carrying out the excavation.

For a depth of 4.5m and beyond the recommended allowable safe bearing pressure for Isolated Footing or R.C.C Raft can be 1500 kPa.

Typical computation is presented in the Annexure.

#### Load transfer through bearing stratum and foundation settlement:

The bearing stratum at 4.5m/5.0m is predominantly completely weathered rock and it is modelled as coarse grain soil (very dense granular soil). In the present case, though ground water table is encountered at existing ground level during the period of investigation the sub soil can get saturated but submerged condition doesn't exist as the formation up to the foundation depth is very dense completely weathered rock. However, for the estimation of bearing capacity as a conservative approach submerged condition is considered and the bearing strata is modelled as very dense, coarse grain formation.

Since the formation beyond the foundation depth being rock formation only immediate elastic settlement will take place.

#### 5.5 Excavation:

##### Subsurface formation & Excavatability:

In the project site, the sub soil stratification within the excavation zone is clayey silty sand in the top 2.0m followed by residual soil & completely weathered rock up to a depth of 5.0m below the existing ground level. In the project site, the formation beyond 5.0m is moderately to slightly weathered rock up to the present investigation depth of maximum 15.0m.

Hence based on the above, the basement excavation can be carried out without any shoring/shuttering or nailing protection method.

Based on the formation excavatability, the excavation can be carried out using mechanical excavator like JCB or poclain up to 5.0m depth however at isolated location rock breaker may require beyond 4.0m depth.

However if excavation is planned beyond 5.0m or 6.0m depth either controlled blasting or diamond wire saw cutting may require for carrying out excavation.

Note on Chemical Spitting for excavation: In the present project site, chemical spitting is not feasible based on the following:

- ❖ Ground water seepages prevents the chemical to expand and break the formation
- ❖ High dissolved salt content prevents the efficiency of this technique

##### Excavation Design:

Based on the sub soil formation characteristics up to the investigation depth, for basement and foundation excavation, vertical cut can be adopted even from the existing ground level. Further considering the monsoon rains during the period of foundation construction, it is recommended to cover the surface of the slope with HDPE sheet suitably

anchored at top and toe with either sand bags or 100mm thick P.C.C. of M10 grade for a minimum 1.0m width at toe and ground level.

In order to prevent the surface water entering the excavation zone during the showers it is ideal to construct a shallow ditch 1.0m away from the periphery of the excavation line (at existing ground level around the excavation plan area) and train the water away from the excavation zone. This will prevent the surface water entering the excavation zone and prevent the erosion of the excavation face.

#### **5.6 Excavation ground water lowering:**

Though the water level during the period of investigation exists at 1.0m below the existing ground level, however based on the sub soil characteristics the ground water lowering can be carried out by conventional collection pit pumping system, with water training shallow ditches connecting the collection pit at the bottom of excavation.

**Note:** For the present project site, either multiple well point system or bore wells are not suitable as the relative permeability is very poor for the supply to the borewell.

#### **5.7 Design of Basement slab for uplift**

The lower basement slab can be structural stich slab in between the footing or raft duly design for uplift pressure equal to ground water table considers at existing ground level from the bottom of the slab as the site is geographically located in the low lying area.

Further, the ingress of surface water below the basement slab through the gaps shall be prevented by providing a payment connected to the retaining wall.

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## **RECOMMENDATIONS**

### **6.1 Recommendations for Foundation:**

- ❖ For the kind of sub soil conditions, the foundation system as described in Chapter-5, Section 5.4 can be adopted
- ❖ For the proposed construction, isolated footing with stitch slab or R.C.C Raft can be provided with the bottom of foundation located at a minimum depth of 4.5m from the existing ground level.
- ❖ For a depth of 4.5m and beyond the recommended allowable safe bearing pressure for Isolated Footing or R.C.C Raft can be 1500 kPa.
- ❖ Since the formation at the founding level 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

### **6.2 Recommendations for Excavation and Dewatering**

- ❖ For lowering the ground water table, the scheme discussed in section 5.6, Chapter-5.0 can be adopted
- ❖ For basement excavation, the excavation method as discussed in Section 5.5, Chapter-5.0 can be adopted

### **6.3 Special Recommendations**

- ❖ Since the chloride level in the ground water sample is higher than the permissible limit of 500mg/l, the reinforcement may be either corrosion resistance steel (CRS) or the reinforcement shall be coated with anticorrosion coatings.
- ❖ Since the sulphate level in ground water and soil-water extract is within the permissible limit no special cement is required for the construction hence ordinary Portland cement can be used.
- ❖ The lower basement slab shall be designed for the uplift pressure corresponding to hydrostatic head equal to ground water table at existing ground level can be considered in the design.
- ❖ The present project site fall in seismic zone-III as per IS 1893-P-I and based on the liquefaction analysis the sub soil formation exists at site is non-liquefiable considering the zone-III seismic intensity.
- ❖ Excavated soil is suitable for backfilling purposed.

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- ❖ 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**

**Dr. C.V. PRASAD,**  
**GEO MARINE CONSULTANTS PVT LTD.,**

**For BRIGADE ENTERPRISES LTD**

  
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annexure 2

## ANNEXURE

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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 Square  
Depth of Embedment below the basement floor " $D_e$ " (m): 1.5  
Depth of lowest basement floor below E.G.L " $D_b$ " (m): 3.0  
Depth of Foundation Below E.G.L " $D_f$ " (m): 4.5  
Breadth of Footing " $B$ " (m): 3.0  
Length of Footing " $L$ " (m): 3.0  
B/L 1.00  
Inclination of Vertical Load with the Vertical ( $\alpha$ ) 0.00

**1.2 Soil Data :**

Type of Effective Bearing Strata : Completely Weathered Rock  
Type of Shear Failure: General  
SPT "N" of the Bearing Strata : 100  
Angle of Shearing Resistance 42.50

**1.3 Design Parameters:**

Bulk Density of Soil above the foundation depth ( $\gamma_{bulk}$ ) 21 kN/m<sup>3</sup>  
Water Table Correction Factor ( $w'$ ) 0.50  
Effective overburden pressure at foundation level ( $q$ ) 16.50 kN/m<sup>2</sup>  
Bearing Capacity Factors:  
 $N_c = N/A$   
 $N_q = 99.54$   
 $N_g = 190.59$

Shape Factors:

$S_c = -$   
 $S_q = 1.20$   
 $S_g = 0.80$

Depth Factors :

$D_c = -$   
 $D_q = 1.01$   
 $D_g = 1.01$

Inclination Factor:

$I_c = 1.00$   
 $I_q = 1.00$   
 $I_g = 1.00$

**1.4 Ultimate Bearing Capacity ( $Q_u$ ) :**

$Q_u = q \cdot (N_q - 1) \cdot S_q \cdot D_q \cdot I_q + 0.5 \cdot B \cdot g \cdot N_g \cdot S_g \cdot D_g \cdot I_g \cdot w'$  4380.97 kPa  
(g should be read as gamma)

**1.5 Safe Bearing Capacity ( $Q_{safe}$ ) :**

Factor of Safety (F.S.) : 2.50  
 $Q_{safe} : 1752.39$  kPa  
**Say  $Q_{safe}$  1500 kPa**

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

The immediate elastic settlement ( $S_i$ ) =  $qB(1-m^2)/E_s$

$q$  = bearing pressure 1500.00 kPa  
Poisson's Ratio ( $\mu$ ) 0.20

Modulus of Elasticity ( $E_s$ ) (Ref. Joseph E Bowels, 1996, page 316, Table 5.6, Japanese design standards)

Modulus of Elasticity ( $E_s$ ) 260000

Size of footing considered for maximum settlement (m) 3.00

Influence factor 0.90

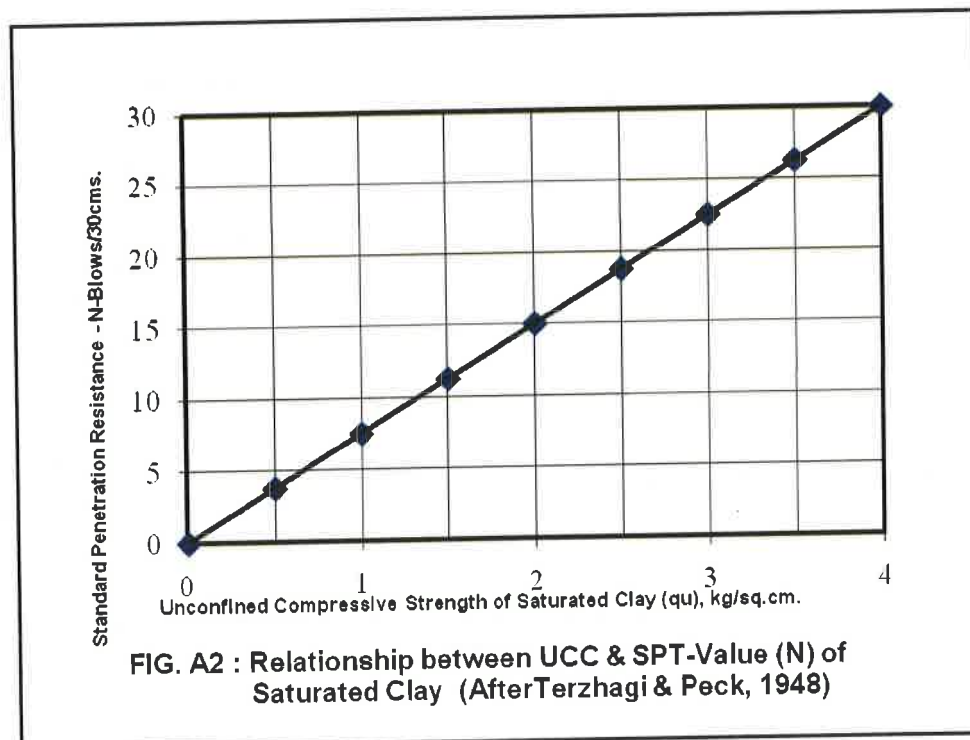
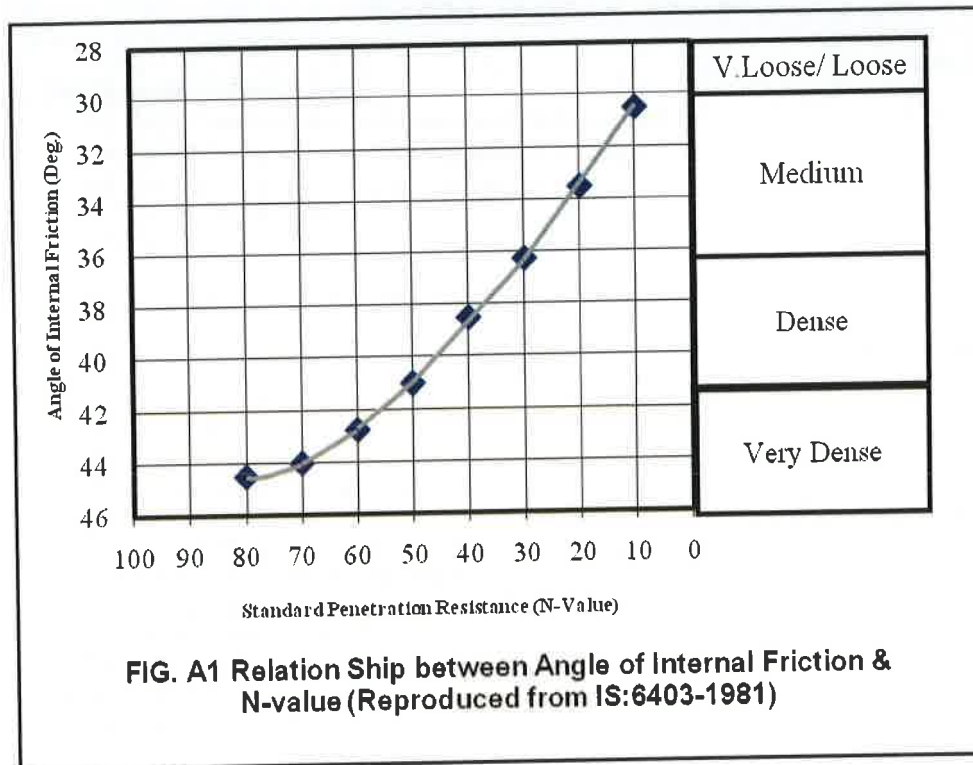
Rigidity Factor 1.00

Elastic Settlement ( $DH_i$ ) 14.95 mm  
**<50 mm**

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*[Signature]*

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## PLATES

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A handwritten signature in black ink, appearing to be 'K. Huss', written over a horizontal line.

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| GEO MARINE<br>THE SPIRIT OF ENGINEERING  |                             | SITE INVESTIGATION RECORD |     |                                   |                       |                  |             |                 |       |                |     | BORE HOLE No. 07    |                                                                                  |
|------------------------------------------|-----------------------------|---------------------------|-----|-----------------------------------|-----------------------|------------------|-------------|-----------------|-------|----------------|-----|---------------------|----------------------------------------------------------------------------------|
| PROJECT NAME                             |                             |                           |     |                                   |                       |                  |             |                 |       |                |     | PAGE No. 1          |                                                                                  |
| LOCATION                                 |                             | MACHINE No.               |     | CHAINAGE (m)                      |                       | DIA OF BORE HOLE |             | BORE START DATE |       | BORE END DATE  |     | TOTAL DRILLING DAYS |                                                                                  |
| STRUCTURE                                |                             | DRILLING METHOD           |     | Rotary                            |                       | CO-ORDINATES     |             | N               |       | E              |     | 3                   |                                                                                  |
| JOB CODE                                 |                             | FLUSHING MEDIUM           |     | Bentonite                         |                       |                  |             |                 |       |                |     |                     |                                                                                  |
| Depth below E.L.L. (m)                   | Drilling progress per metre |                           |     | Type of Drill Bit (SC / TCB / DB) | Core Details          |                  | SPT Details |                 |       | Sample Details |     |                     | Layer Data                                                                       |
|                                          | Date                        | Time                      |     |                                   | Total Core Recovery % | R.Q.D. %         | Blows/cm.   |                 |       | Depth          | No. | Type                |                                                                                  |
|                                          |                             | Mr.                       | Min |                                   |                       |                  | 0-15        | 15-30           | 30-45 |                |     |                     |                                                                                  |
| 1                                        | 11                          | 40                        |     | SC                                |                       |                  | 7           | 12              | 14    | 26             | 1   | SS                  | Brown, medium Dense clayey sand                                                  |
| 2                                        | 12                          | 03                        |     | SC                                |                       |                  | SS          |                 |       | > 100          | 2   | SS                  | V-Dense fine, medium pinkish coarse grain CLAYEY RESIDUAL SOIL                   |
| 3                                        | 2                           | 37                        |     | DB                                |                       |                  | SS          |                 |       | > 100          | 3   | SS                  | V-Dense Brown - pinkish fine medium coarse grain CLAYEY RESIDUAL SOIL            |
| 4                                        | 11                          | 10                        |     | DB                                |                       |                  | SS          |                 |       | > 100          | 4   | WS                  | V-weak Brown - medium to coarse grain completely weather rock                    |
| 5                                        | 12                          | 05                        |     | DB                                | 27                    | 10               |             |                 |       |                | 5   | CS                  | Brown - grey medium to coarse grain moderately weather rock                      |
| 6                                        | 9                           | 58                        |     | DB                                | 83                    | 13               |             |                 |       |                | 6   | CS                  | Grey medium to coarse grain slightly weather rock                                |
| 7                                        | 12                          | 18                        |     | DB                                | 82                    | 70               |             |                 |       |                | 7   | CS                  | Grey strong, medium to coarse grain slightly weather rock (fresh rock)           |
| 8                                        | 3                           | 17                        |     | DB                                | 95                    | 16               |             |                 |       |                | 8   | CS                  | Grey strong, medium to coarse grain slightly weather rock (fresh rock) (GRANITE) |
| Bore hole Terminated at 8.00 meter depth |                             |                           |     |                                   |                       |                  |             |                 |       |                |     |                     |                                                                                  |

|                          |                            |                  |                      |
|--------------------------|----------------------------|------------------|----------------------|
| CS - Core Sample         | DS - Disturbed Sample      | SUPERVISOR NAME  | S. T. S. N. R. A. T. |
| SS - Split Spoon Sample  | SC - Soil Cutter           | SIGNATURE        |                      |
| UDS - Undisturbed Sample | TCB - Tungsten Carbide Bit | DATE             | 05/06/2020           |
| WS - Wash Sample         | DB - Diamond Bit           | CLIENT IN-CHARGE |                      |

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

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| GEOMARINE<br>THE SPIRIT OF ENGINEERING |                             | SITE INVESTIGATION RECORD    |       |                                   |                       |                                     |             |                                    |            |                                    |       | BORE HOLE No. <u>D2</u> |            |           |                                                                                       |
|----------------------------------------|-----------------------------|------------------------------|-------|-----------------------------------|-----------------------|-------------------------------------|-------------|------------------------------------|------------|------------------------------------|-------|-------------------------|------------|-----------|---------------------------------------------------------------------------------------|
| PROJECT NAME<br><u>BRIGADE</u>         |                             |                              |       |                                   |                       |                                     |             |                                    |            |                                    |       | PAGE No. <u>1</u>       |            |           |                                                                                       |
| LOCATION<br><u>Pallavaram</u>          |                             | MACHINE No.                  |       | CHAINAGE (m)                      |                       | BORE START DATE<br><u>6/06/2020</u> |             | DIA OF BORE HOLE<br>150mm<br>100mm |            | BORE END DATE<br><u>10/06/2020</u> |       |                         |            |           |                                                                                       |
| STRUCTURE                              |                             | DRILLING METHOD<br>Rotary    |       | CO-ORDINATES<br>N<br>E            |                       | TOTAL DRILLING DAYS                 |             |                                    |            |                                    |       |                         |            |           |                                                                                       |
| JOB CODE                               |                             | FLUSHING MEDIUM<br>Bentonite |       |                                   |                       |                                     |             |                                    |            |                                    |       |                         |            |           |                                                                                       |
| Depth below E.G.L. (m)                 | Drilling progress per metre |                              |       | Type of Drill Bit (SC / TCB / DB) | Core Details          |                                     | SPT Details |                                    |            | Sample Details                     |       |                         | Layer Data |           |                                                                                       |
|                                        | Date                        | Time                         |       |                                   | Total Core Recovery % | R.Q.D. %                            | Blows/cm.   |                                    |            | SPT 'N' Value                      | Depth | No.                     | Type       | Depth (m) | Geotechnical Description                                                              |
|                                        |                             | Hr.                          | Min   |                                   |                       |                                     | 0-15        | 15-30                              | 30-45      |                                    |       |                         |            |           |                                                                                       |
| 1                                      | 6/06/2020                   | 2.17                         | 2.19  | SC                                |                       |                                     | 3           | 7                                  | 10         | 17                                 | 1     |                         | [SS]       |           | Brown - waxy, v. soft, compact. <u>SANDY CLAY</u>                                     |
| 2                                      | 6/06/2020                   | 4.45                         | 4.50  | SC                                |                       |                                     | 35          | 65                                 | ( $>100$ ) |                                    | 2     |                         | [BS]       |           | V. WEAK, Brown - Pinkish (mix) medium coarser grain <u>COMPLETELY WEATHERED ROCK</u>  |
| 3                                      | 8/06/2020                   | 9.15                         | 9.30  | SC                                |                       |                                     | 58          |                                    | ( $>100$ ) |                                    | 3     |                         | [WS]       |           | <u>COMPLETELY WEATHERED ROCK</u>                                                      |
| 4                                      | 8/06/2020                   | 10.15                        | 10.30 | DB                                | 81.0%                 |                                     |             |                                    |            |                                    | 4     |                         | [CS]       |           | WEAK - moderate, waxy, medium coarser grain <u>MODERATELY WEATHERED FRACTURE ROCK</u> |
| 5                                      | 8/06/2020                   | 11.05                        | 11.20 | DB                                | 70.43%                |                                     |             |                                    |            |                                    | 5     |                         | [CS]       |           | Strong, waxy, medium-coarser grain <u>FRESH HARD ROCK (Uranite)</u>                   |
| 6                                      | 9/06/2020                   | 12.05                        | 12.30 | DB                                | 90.90%                |                                     |             |                                    |            |                                    | 6     |                         | [CS]       |           | <u>HARD ROCK (Uranite)</u>                                                            |
| 7                                      | 9/06/2020                   | 13.05                        | 13.45 | DB                                | 52.52%                |                                     |             |                                    |            |                                    | 7     |                         | [CS]       |           | <u>HARD ROCK (Uranite)</u>                                                            |
| 8                                      | 10/06/2020                  | 11.35                        | 11.25 | DB                                | 92.92%                |                                     |             |                                    |            |                                    | 8     |                         | [CS]       |           | <u>HARD ROCK (Uranite)</u>                                                            |
| 9                                      |                             |                              |       |                                   |                       |                                     |             |                                    |            |                                    |       |                         |            |           |                                                                                       |
| 10                                     |                             |                              |       |                                   |                       |                                     |             |                                    |            |                                    |       |                         |            |           | Borehole terminated at 8m depth                                                       |

|                          |                            |                                           |                      |  |
|--------------------------|----------------------------|-------------------------------------------|----------------------|--|
| CS - Core Sample         | DS - Disturbed Sample      | SUPERVISOR NAME<br><u>K. SIVASANKARAN</u> | PROJECT SITE DETAILS |  |
| SS - Split Spoon Sample  | SC - Soil Cutter           | SIGNATURE<br><u>[Signature]</u>           | GROUND LEVEL (m)     |  |
| UDS - Undisturbed Sample | TCB - Tungsten Carbide Bit | DATE<br><u>6/06/2020</u>                  | WATER TABLE (m)      |  |
| WS - Wash Sample         | DB - Diamond Bit           | CLIENT IN CHARGE<br><u>[Signature]</u>    | CASING DEPTH (m)     |  |

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| GEO MARINE<br>THE SPIRIT OF ENGINEERING    |                                | SITE INVESTIGATION RECORD    |     |                                   |                       |                                    |                |                                    |       |                |       | BORE HOLE No. <u>3</u> |            |                                                                         |                                          |
|--------------------------------------------|--------------------------------|------------------------------|-----|-----------------------------------|-----------------------|------------------------------------|----------------|------------------------------------|-------|----------------|-------|------------------------|------------|-------------------------------------------------------------------------|------------------------------------------|
| PROJECT NAME<br><u>BRIGADIE Pallavaram</u> |                                |                              |     |                                   |                       |                                    |                |                                    |       |                |       | PAGE No. <u>1</u>      |            |                                                                         |                                          |
| LOCATION<br><u>Pallavaram</u>              |                                | MACHINE No.                  |     | CHAINAGE (m)                      |                       | DIA OF BORE HOLE<br>150mm<br>100mm |                | BORE START DATE<br><u>6/6/2020</u> |       |                |       |                        |            |                                                                         |                                          |
| STRUCTURE                                  |                                | DRILLING METHOD<br>Rotary    |     | CO-ORDINATES<br>N<br>E            |                       | BORE END DATE<br><u>10/6/2020</u>  |                |                                    |       |                |       |                        |            |                                                                         |                                          |
| JOB CODE                                   |                                | FLUSHING MEDIUM<br>Bentonite |     |                                   |                       | TOTAL DRILLING DAYS<br><u>4</u>    |                |                                    |       |                |       |                        |            |                                                                         |                                          |
| Depth below E.G.L.<br>(m)                  | Drilling progress<br>per metre |                              |     | Type of Drill Bit (SC / TCB / DB) | Core Details          |                                    | SPT Details    |                                    |       | Sample Details |       |                        | Layer Data |                                                                         |                                          |
|                                            | Date                           | Time                         |     |                                   | Total Core Recovery % | R.Q.D. %                           | Blows/cm.      |                                    |       | SPT 'N' Value  | Depth | No.                    | Type       | Depth (m)                                                               | Geotechnical Description                 |
|                                            |                                | Hr.                          | Min |                                   |                       |                                    | 0-15           | 15-30                              | 30-45 |                |       |                        |            |                                                                         |                                          |
| 1                                          | 8/6/2020                       | 4                            | 47  |                                   |                       |                                    | 4              | 7                                  | 7     | 14             | 1     |                        | SS         |                                                                         | Brown - Grey Stiff Compacted sandy clay  |
| 2                                          |                                | 4                            | 50  | SC                                |                       |                                    | 7              | 12                                 | 18    | 20             | 2     |                        | SS         |                                                                         | Brown - Grey medium Dense Clay with Sand |
| 3                                          |                                | 5                            | 07  | SC                                |                       |                                    | HAMMER REBOUND |                                    |       | 3              |       | WS                     |            | Brown - Pinkish, Medium to coarse grain completely weather rock         |                                          |
| 4                                          |                                | 5                            | 09  | SC                                |                       |                                    | HAMMER REBOUND |                                    |       | 4              |       | WS                     |            | Brown - Pinkish, medium to coarse grain in completely weather rock      |                                          |
| 5                                          | 9/6/2020                       | 10                           | 44  | SC                                |                       |                                    | HAMMER REBOUND |                                    |       | 5              |       | CS                     |            | Grey - medium to coarse grain moderately weather rock                   |                                          |
| 6                                          |                                | 10                           | 54  | SC                                |                       |                                    | HAMMER REBOUND |                                    |       | 6              |       | CS                     |            | Grey - medium to coarse grain highly weather Fracture rock (pinkish) No |                                          |
| 7                                          |                                | 11                           | 17  | DB                                | 237                   | 10%                                |                |                                    |       | 7              |       | CS                     |            | Grey - medium to coarse grain slightly weather rock                     |                                          |
| 8                                          |                                | 11                           | 43  | DB                                | 310                   |                                    |                |                                    |       | 8              |       | CS                     |            | SLIGHTLY weather rock                                                   |                                          |
| 9                                          | 10/6/2020                      | 12                           | 10  | DB                                | 401                   | 41%                                |                |                                    |       | 9              |       | CS                     |            | SLIGHTLY weather rock                                                   |                                          |
| 10                                         |                                | 2                            | 00  | DB                                | 251                   | 25%                                |                |                                    |       | 10             |       | CS                     |            | SLIGHTLY weather rock                                                   |                                          |
| 11                                         |                                | 2                            | 45  | DB                                | 651                   | 41%                                |                |                                    |       |                |       |                        |            | SLIGHTLY weather rock                                                   |                                          |
| 12                                         |                                | 3                            | 08  | DB                                | 1001                  | 44%                                |                |                                    |       |                |       |                        |            | SLIGHTLY weather rock                                                   |                                          |
| 13                                         |                                | 3                            | 40  |                                   |                       |                                    |                |                                    |       |                |       |                        |            | SLIGHTLY weather rock                                                   |                                          |
| 14                                         |                                | 8                            | 52  |                                   |                       |                                    |                |                                    |       |                |       |                        |            | SLIGHTLY weather rock                                                   |                                          |
| 15                                         |                                | 5                            | 26  |                                   |                       |                                    |                |                                    |       |                |       |                        |            | SLIGHTLY weather rock                                                   |                                          |
| 16                                         |                                | 8                            | 50  |                                   |                       |                                    |                |                                    |       |                |       |                        |            | SLIGHTLY weather rock                                                   |                                          |
| 17                                         |                                | 9                            | 50  |                                   |                       |                                    |                |                                    |       |                |       |                        |            | SLIGHTLY weather rock                                                   |                                          |
| 18                                         |                                | 10                           | 45  |                                   |                       |                                    |                |                                    |       |                |       |                        |            | SLIGHTLY weather rock                                                   |                                          |
| 19                                         |                                | 12                           | 10  |                                   |                       |                                    |                |                                    |       |                |       |                        |            | SLIGHTLY weather rock                                                   |                                          |
| 20                                         |                                | 2                            | 15  |                                   |                       |                                    |                |                                    |       |                |       |                        |            | SLIGHTLY weather rock                                                   |                                          |
| 21                                         |                                | 5                            | 10  |                                   |                       |                                    |                |                                    |       |                |       |                        |            | SLIGHTLY weather rock                                                   |                                          |
| 22                                         |                                | 9                            | 00  |                                   |                       |                                    |                |                                    |       |                |       |                        |            | SLIGHTLY weather rock                                                   |                                          |
| 23                                         |                                | 11                           | 00  |                                   |                       |                                    |                |                                    |       |                |       |                        |            | SLIGHTLY weather rock                                                   |                                          |

|                          |                            |                                        |                                 |
|--------------------------|----------------------------|----------------------------------------|---------------------------------|
| DS - Core Sample         | DS - Disturbed Sample      | SUPERVISOR NAME<br><u>S. TISON RAT</u> | PROJECT SITE DETAILS            |
| SS - Split Spoon Sample  | SC - Split Spoon           | DATE<br><u>10/6/2020</u>               | GROUND LEVEL (m)                |
| UDS - Undisturbed Sample | TCB - Tungsten Carbide Bit | CLIENT IN-CHARGE                       | WATER TABLE (m)<br><u>1.007</u> |
| WS - Wash Sample         | DB - Diamond Bit           |                                        | CASING DEPTH (m)                |

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| GEO MARINE<br>THE SPIRIT OF ENGINEERING                                                                                                                                                                                                                              |  | SITE INVESTIGATION RECORD   |  |                                   |  |                |  |                      |  |                           |  | BORE HOLE No. 4 |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----------------------------|--|-----------------------------------|--|----------------|--|----------------------|--|---------------------------|--|-----------------|--|
| PROJECT NAME                                                                                                                                                                                                                                                         |  | BRIGADE (PALLAVARAM)        |  |                                   |  |                |  |                      |  |                           |  | PAGE No. 2      |  |
| LOCATION                                                                                                                                                                                                                                                             |  | MACHINE No.                 |  | DRILLING METHOD                   |  | Rotary         |  | CHAINAGE (m)         |  | DIA OF BORE HOLE          |  |                 |  |
| STRUCTURE                                                                                                                                                                                                                                                            |  | FLUSHING MEDIUM             |  | Bentonite                         |  | CO-ORDINATES   |  | N                    |  | 150mm                     |  |                 |  |
| JOB CODE                                                                                                                                                                                                                                                             |  |                             |  |                                   |  |                |  | E                    |  | 100mm                     |  |                 |  |
|                                                                                                                                                                                                                                                                      |  |                             |  |                                   |  |                |  |                      |  | BORE START DATE 3/06/2020 |  |                 |  |
|                                                                                                                                                                                                                                                                      |  |                             |  |                                   |  |                |  |                      |  | BORE END DATE 4/06/2020   |  |                 |  |
|                                                                                                                                                                                                                                                                      |  |                             |  |                                   |  |                |  |                      |  | TOTAL DRILLING DAYS       |  |                 |  |
| Layer Data                                                                                                                                                                                                                                                           |  |                             |  |                                   |  |                |  |                      |  |                           |  |                 |  |
| Geotechnical Description                                                                                                                                                                                                                                             |  |                             |  |                                   |  |                |  |                      |  |                           |  |                 |  |
| <p>Pinkish-grey (m) x medium-coarse grained MODERATELY WEATHERED ROCK</p> <p>MODERATELY WEATHERED ROCK</p> <p>Greenish, medium-coarse grained SLIGHTLY WEATHERED ROCK</p> <p>Greenish-medium-coarse grained SLIGHTLY WEATHERED ROCK</p> <p>CRP = 74%. RQD = 17%.</p> |  |                             |  |                                   |  |                |  |                      |  |                           |  |                 |  |
| Depth below E.G.L. (m)                                                                                                                                                                                                                                               |  | Drilling progress per metre |  | Core Details                      |  | SPY Details    |  | Sample Details       |  | Layer Data                |  |                 |  |
| Date                                                                                                                                                                                                                                                                 |  | Time                        |  | Type of Drill Bit (SC / TCB / DB) |  | Blows/cm.      |  | SPT 'N' Value        |  | Geotechnical Description  |  |                 |  |
| Hr.                                                                                                                                                                                                                                                                  |  | Min.                        |  | Total Core Recovery %             |  | R.Q.D. %       |  | 0-15 15-30 30-45     |  | Depth (m)                 |  |                 |  |
| 2.15                                                                                                                                                                                                                                                                 |  | 1.00                        |  | DB 35/0%                          |  | 11.5           |  | TCB                  |  | 11.5                      |  |                 |  |
| 3.10                                                                                                                                                                                                                                                                 |  | 4.00                        |  | DB 16/0%                          |  | 13             |  | TCB                  |  | 13                        |  |                 |  |
| 4.08                                                                                                                                                                                                                                                                 |  | 5.00                        |  | DB 65/17%                         |  | 14             |  | TCB                  |  | 14                        |  |                 |  |
| 5.09                                                                                                                                                                                                                                                                 |  | 6.02                        |  | DB 74/17%                         |  | 15             |  | TCB                  |  | 15                        |  |                 |  |
| <p>Boresite terminated at 15m depth</p>                                                                                                                                                                                                                              |  |                             |  |                                   |  |                |  |                      |  |                           |  |                 |  |
| Core Sample                                                                                                                                                                                                                                                          |  | DS - Disturbed Sample       |  | SUPERVISOR NAME                   |  | K. Siva Sankar |  | PROJECT SITE DETAILS |  | GROUND LEVEL (m)          |  |                 |  |
| SS - Split Spoon Sample                                                                                                                                                                                                                                              |  | SC - Split Spoon Sample     |  | SIGNATURE                         |  | 4/06/2020      |  | WATER TABLE (m)      |  | CASING DEPTH (m)          |  |                 |  |
| DB - Diamond Bit                                                                                                                                                                                                                                                     |  | DB - Diamond Bit            |  | CLIENT IN-CHARGE                  |  |                |  |                      |  |                           |  |                 |  |

| GEO MARINE<br>THE SPIRIT OF ENGINEERING |  |  |  |  |  |  |  |  |  | SITE INVESTIGATION RECORD         |  |                       |  |             |  |           |  |                |               | BORE HOLE No. 4                    |     |            |                                                                                  |                          |
|-----------------------------------------|--|--|--|--|--|--|--|--|--|-----------------------------------|--|-----------------------|--|-------------|--|-----------|--|----------------|---------------|------------------------------------|-----|------------|----------------------------------------------------------------------------------|--------------------------|
| PROJECT NAME: BRIGADE Pallavaram        |  |  |  |  |  |  |  |  |  | MACHINE No.                       |  |                       |  |             |  |           |  |                |               | PAGE No. 1                         |     |            |                                                                                  |                          |
| LOCATION: Pallavaram                    |  |  |  |  |  |  |  |  |  | CHAINAGE (m)                      |  |                       |  |             |  |           |  |                |               | DIA OF BORE HOLE<br>150mm<br>100mm |     |            |                                                                                  |                          |
| STRUCTURE                               |  |  |  |  |  |  |  |  |  | DRILLING METHOD: Rotary           |  |                       |  |             |  |           |  |                |               | BORE START DATE: 3/06/2020         |     |            |                                                                                  |                          |
| JOB CODE                                |  |  |  |  |  |  |  |  |  | FLUSHING MEDIUM: Bentonite        |  |                       |  |             |  |           |  |                |               | BORE END DATE: 4/06/2020           |     |            |                                                                                  |                          |
|                                         |  |  |  |  |  |  |  |  |  | CO-ORDINATES<br>N<br>E            |  |                       |  |             |  |           |  |                |               | TOTAL DRILLING DAYS                |     |            |                                                                                  |                          |
| Drilling progress per metre             |  |  |  |  |  |  |  |  |  | Core Details                      |  |                       |  | SPT Details |  |           |  | Sample Details |               |                                    |     | Layer Data |                                                                                  |                          |
| Depth below E.G.L. (m)                  |  |  |  |  |  |  |  |  |  | Type of Drill Bit (SC / TCB / DB) |  | Total Core Recovery % |  | R.O.D. %    |  | Blows/cm. |  |                | SPT 'N' Value | Depth                              | No. | Type       | Depth (m)                                                                        | Geotechnical Description |
| Date                                    |  |  |  |  |  |  |  |  |  | Time                              |  |                       |  |             |  |           |  |                |               |                                    |     |            |                                                                                  |                          |
| Hr.                                     |  |  |  |  |  |  |  |  |  | Min                               |  |                       |  |             |  |           |  |                |               |                                    |     |            |                                                                                  |                          |
| 11:55 AM                                |  |  |  |  |  |  |  |  |  |                                   |  |                       |  |             |  |           |  |                |               |                                    |     |            | Stiff, moist, Brown-greyish (mix) compact SANDY clay                             |                          |
| 11:58                                   |  |  |  |  |  |  |  |  |  |                                   |  |                       |  |             |  |           |  |                |               |                                    |     |            |                                                                                  |                          |
| 12:05                                   |  |  |  |  |  |  |  |  |  |                                   |  |                       |  |             |  |           |  |                |               |                                    |     |            | M. Dense Brown-greyish (mix) Fine-medium coarse grain CLAYEY RESIDUAL SOIL       |                          |
| 12:17                                   |  |  |  |  |  |  |  |  |  |                                   |  |                       |  |             |  |           |  |                |               |                                    |     |            |                                                                                  |                          |
| 12:35                                   |  |  |  |  |  |  |  |  |  |                                   |  |                       |  |             |  |           |  |                |               |                                    |     |            | V. WEAK, Pinkish, medium coarse V grain COMPLETELY WEATHERED ROCK                |                          |
| 12:40                                   |  |  |  |  |  |  |  |  |  |                                   |  |                       |  |             |  |           |  |                |               |                                    |     |            |                                                                                  |                          |
| 2:20                                    |  |  |  |  |  |  |  |  |  |                                   |  |                       |  |             |  |           |  |                |               |                                    |     |            | FINE-medium coarse grain V. WEAK, greyish-brown (mix) COMPLETELY WEATHERED ROCK  |                          |
| 2:24                                    |  |  |  |  |  |  |  |  |  |                                   |  |                       |  |             |  |           |  |                |               |                                    |     |            |                                                                                  |                          |
| 2:40                                    |  |  |  |  |  |  |  |  |  |                                   |  |                       |  |             |  |           |  |                |               |                                    |     |            | COMPLETELY WEATHERED ROCK                                                        |                          |
| 2:47                                    |  |  |  |  |  |  |  |  |  |                                   |  |                       |  |             |  |           |  |                |               |                                    |     |            |                                                                                  |                          |
| 10:40 AM                                |  |  |  |  |  |  |  |  |  |                                   |  |                       |  |             |  |           |  |                |               |                                    |     |            | COMPLETELY WEATHERED ROCK                                                        |                          |
| 11:05 DB                                |  |  |  |  |  |  |  |  |  |                                   |  |                       |  |             |  |           |  |                |               |                                    |     |            |                                                                                  |                          |
| 11:17                                   |  |  |  |  |  |  |  |  |  |                                   |  |                       |  |             |  |           |  |                |               |                                    |     |            | NEAR, greyish-fine-medium coarse grain COMPLETELY HIGHLY WEATHERED FRACTURE ROCK |                          |
| 11:39 DB 51.0%                          |  |  |  |  |  |  |  |  |  |                                   |  |                       |  |             |  |           |  |                |               |                                    |     |            |                                                                                  |                          |
| 11:50                                   |  |  |  |  |  |  |  |  |  |                                   |  |                       |  |             |  |           |  |                |               |                                    |     |            |                                                                                  |                          |
| 12:15 DB 51.0%                          |  |  |  |  |  |  |  |  |  |                                   |  |                       |  |             |  |           |  |                |               |                                    |     |            | HIGHLY WEATHERED FRACTURE ROCK                                                   |                          |
| 12:20                                   |  |  |  |  |  |  |  |  |  |                                   |  |                       |  |             |  |           |  |                |               |                                    |     |            |                                                                                  |                          |
| 12:45 DB 13.0%                          |  |  |  |  |  |  |  |  |  |                                   |  |                       |  |             |  |           |  |                |               |                                    |     |            | WEAK-moderate Pinkish-brown (mix) Moderately Weathered Rock                      |                          |
| 12:50                                   |  |  |  |  |  |  |  |  |  |                                   |  |                       |  |             |  |           |  |                |               |                                    |     |            |                                                                                  |                          |
| 1:15 DB 48.20%                          |  |  |  |  |  |  |  |  |  |                                   |  |                       |  |             |  |           |  |                |               |                                    |     |            | Moderately Weathered rock core = (48% R.O.D = 20%)                               |                          |

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| GEO MARINE<br>THE SPIRIT OF ENGINEERING |                             | SITE INVESTIGATION RECORD |                                   |                       |         |                  |        |                 |                |               |      | BORE HOLE No. 5     |                                                                                           |
|-----------------------------------------|-----------------------------|---------------------------|-----------------------------------|-----------------------|---------|------------------|--------|-----------------|----------------|---------------|------|---------------------|-------------------------------------------------------------------------------------------|
| PROJECT NAME                            |                             | BRIGADE (PALLAVARAM)      |                                   |                       |         |                  |        |                 |                |               |      | PAGE No. 1          |                                                                                           |
| LOCATION                                |                             | MACHINE No.               |                                   | CHAINAGE (m)          |         | DIA OF BORE HOLE |        | BORE START DATE |                | BORE END DATE |      | TOTAL DRILLING DAYS |                                                                                           |
| STRUCTURE                               |                             | DRILLING METHOD           |                                   | Rotary                |         | CO-ORDINATES     |        | N               |                | E             |      |                     |                                                                                           |
| JOB CODE                                |                             | FLUSHING MEDIUM           |                                   | Bentonite             |         |                  |        |                 |                |               |      |                     |                                                                                           |
| Depth below E.L. (m)                    | Drilling progress per metre |                           | Type of Drill Bit (SC / TCB / DB) | Core Details          |         | SPT Details      |        |                 | Sample Details |               |      | Layer Data          |                                                                                           |
|                                         | Date                        | Time                      |                                   | Total Core Recovery % | R.Q.D % | Blows/cm.        |        |                 | Depth          | No.           | Type | Depth (m)           | Geotechnical Description                                                                  |
|                                         |                             |                           |                                   |                       |         | 0-15             | 15-30  | 30-45           |                |               |      |                     |                                                                                           |
| 1                                       | 3/06/2020                   | 11:40                     |                                   |                       |         | 3                | 4      | 3               | 7              | 1             |      |                     | m. stiff, moist, greyish-white (mix) compact. SANDY CLAY                                  |
| 2                                       |                             | 11:45                     |                                   |                       |         | 4                | 10     | 13              | 23             | 2             |      |                     | m. dense, Brown, fine-medium grain CLAYEY SAND                                            |
| 3                                       |                             | 12:05                     |                                   |                       |         | 5                | 3      | 58              | 95             | 3             |      |                     | v. dense, greyish-brown (mix) fine-medium coarse grain CLAYEY RESIDUAL SOIL               |
| 4                                       |                             | 12:10                     |                                   |                       |         | 8                | 25     | 55              | 80             | 4             |      |                     | CLAYEY RESIDUAL SOIL                                                                      |
| 5                                       |                             | 12:30                     |                                   |                       |         | 25               | 58     | (x100)          | 11cm           | 5             |      |                     | v. weak, greyish-brown (mix) fine-medium coarse grain, COMPLETELY WEATHERED RESIDUAL SOIL |
| 6                                       |                             | 12:35                     |                                   |                       |         | 55               | (x100) | 15cm            |                | 6             |      |                     | v. weak, greyish-brown (mix) fine-medium coarse grain, COMPLETELY WEATHERED ROCK          |
| 7                                       |                             | 2:25                      |                                   |                       |         |                  |        |                 |                | 7             |      |                     | weak, medium-coarse grain, greyish, HIGHLY WEATHERED FRACTURE ROCK                        |
| 8                                       |                             | 2:35                      |                                   |                       |         |                  |        |                 |                | 8             |      |                     | HIGHLY WEATHERED FRACTURE ROCK                                                            |
| 9                                       |                             | 2:55                      |                                   |                       |         |                  |        |                 |                | 9             |      |                     | HIGHLY WEATHERED FRACTURE ROCK                                                            |
| 10                                      |                             | 3:07                      |                                   |                       |         |                  |        |                 |                | 10            |      |                     | HIGHLY WEATHERED FRACTURE ROCK                                                            |

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

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| GEO MARINE<br>THE SPIRIT OF ENGINEERING |                             |       |     |                                   |                       |          |             |       |       |                |       |     |            |           | SITE INVESTIGATION RECORD                                                         |  |                                    |  |                                  |  |  |  |  |  | BORE HOLE No. <b>5</b> |  |
|-----------------------------------------|-----------------------------|-------|-----|-----------------------------------|-----------------------|----------|-------------|-------|-------|----------------|-------|-----|------------|-----------|-----------------------------------------------------------------------------------|--|------------------------------------|--|----------------------------------|--|--|--|--|--|------------------------|--|
|                                         |                             |       |     |                                   |                       |          |             |       |       |                |       |     |            |           | PAGE No. <b>2</b>                                                                 |  | DIA OF BORE HOLE<br>150mm<br>100mm |  |                                  |  |  |  |  |  |                        |  |
| PROJECT NAME <b>BRIQUADE</b>            |                             |       |     |                                   |                       |          |             |       |       |                |       |     |            |           | MACHINE No.                                                                       |  | CHAINAGE (m)                       |  | BORE START DATE <b>3/06/2020</b> |  |  |  |  |  |                        |  |
| LOCATION <b>PALLAKURAM</b>              |                             |       |     |                                   |                       |          |             |       |       |                |       |     |            |           | DRILLING METHOD                                                                   |  | Rotary                             |  | BORE END DATE <b>5/06/2020</b>   |  |  |  |  |  |                        |  |
| STRUCTURE                               |                             |       |     |                                   |                       |          |             |       |       |                |       |     |            |           | FLUSHING MEDIUM                                                                   |  | Bentonite                          |  | CO-ORDINATES<br>N<br>E           |  |  |  |  |  |                        |  |
| JOB CODE                                |                             |       |     |                                   |                       |          |             |       |       |                |       |     |            |           | TOTAL DRILLING DAYS                                                               |  |                                    |  |                                  |  |  |  |  |  |                        |  |
| Depth below G.L.<br>(m)                 | Drilling progress per metre |       |     | Type of Drill Bit (SC / TCB / DB) | Core Details          |          | SPT Details |       |       | Sample Details |       |     | Layer Data |           |                                                                                   |  |                                    |  |                                  |  |  |  |  |  |                        |  |
|                                         | Date                        | Time  |     |                                   | Total Core Recovery % | R.Q.D. % | Blows/cm.   |       |       | SPT 'N' Value  | Depth | No. | Type       | Depth (m) | Geotechnical Description                                                          |  |                                    |  |                                  |  |  |  |  |  |                        |  |
|                                         |                             | Hr.   | Min |                                   |                       |          | 0-15        | 15-30 | 30-45 |                |       |     |            |           |                                                                                   |  |                                    |  |                                  |  |  |  |  |  |                        |  |
| 1                                       |                             | 2.15  |     |                                   |                       |          |             |       |       |                |       |     |            |           |                                                                                   |  |                                    |  |                                  |  |  |  |  |  |                        |  |
|                                         |                             | 3.25  |     |                                   |                       |          |             |       |       |                |       |     |            |           |                                                                                   |  |                                    |  |                                  |  |  |  |  |  |                        |  |
|                                         |                             | 3.25  |     | DB                                | 23%                   | 15%      |             |       |       |                |       |     |            |           | moderate - Brown - pinkish (mix) medium - coarser grain Moderately weathered Rock |  |                                    |  |                                  |  |  |  |  |  |                        |  |
|                                         |                             | 4.25  |     |                                   |                       |          |             |       |       |                |       |     |            |           |                                                                                   |  |                                    |  |                                  |  |  |  |  |  |                        |  |
|                                         |                             | 4.45  |     |                                   |                       |          |             |       |       |                |       |     |            |           |                                                                                   |  |                                    |  |                                  |  |  |  |  |  |                        |  |
| 2                                       |                             | 5.35  |     | DB                                | 25%                   | 8%       |             |       |       |                |       |     |            |           | uneven, medium - coarser grain Moderately weathered Rock                          |  |                                    |  |                                  |  |  |  |  |  |                        |  |
|                                         |                             | 9.12  |     |                                   |                       |          |             |       |       |                |       |     |            |           |                                                                                   |  |                                    |  |                                  |  |  |  |  |  |                        |  |
|                                         |                             | 10.15 |     |                                   |                       |          |             |       |       |                |       |     |            |           |                                                                                   |  |                                    |  |                                  |  |  |  |  |  |                        |  |
|                                         |                             | 10.35 |     |                                   |                       |          |             |       |       |                |       |     |            |           |                                                                                   |  |                                    |  |                                  |  |  |  |  |  |                        |  |
| 3                                       |                             | 12.25 |     | DB                                | 63%                   | 17%      |             |       |       |                |       |     |            |           | greenish, medium - coarse grain SLIGHTLY WEATHERED ROCK FRESH HAND ROCK           |  |                                    |  |                                  |  |  |  |  |  |                        |  |
| 4                                       |                             |       |     |                                   |                       |          |             |       |       |                |       |     |            |           |                                                                                   |  |                                    |  |                                  |  |  |  |  |  |                        |  |
| 5                                       |                             |       |     |                                   |                       |          |             |       |       |                |       |     |            |           |                                                                                   |  |                                    |  |                                  |  |  |  |  |  |                        |  |
| 6                                       |                             |       |     |                                   |                       |          |             |       |       |                |       |     |            |           |                                                                                   |  |                                    |  |                                  |  |  |  |  |  |                        |  |
| 7                                       |                             |       |     |                                   |                       |          |             |       |       |                |       |     |            |           |                                                                                   |  |                                    |  |                                  |  |  |  |  |  |                        |  |
| 8                                       |                             |       |     |                                   |                       |          |             |       |       |                |       |     |            |           |                                                                                   |  |                                    |  |                                  |  |  |  |  |  |                        |  |
| 9                                       |                             |       |     |                                   |                       |          |             |       |       |                |       |     |            |           |                                                                                   |  |                                    |  |                                  |  |  |  |  |  |                        |  |
| 0                                       |                             |       |     |                                   |                       |          |             |       |       |                |       |     |            |           |                                                                                   |  |                                    |  |                                  |  |  |  |  |  |                        |  |

5/06/2020

Borehole terminated at 13.5m

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

DS - Disturbed Sample  
 SC - Soil Cutter  
 TCB - Conventional TCB  
 DB - Diamond Bit

SUPERVISOR NAME **K. SIVASANKARAN**  
 SIGNATURE **[Signature]**  
 DATE **5/06/2020**  
 CLIENT IN-CHARGE

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

Authorised Signatory

| GEO MARINE<br>THE SPIRIT OF ENGINEERING |                             | SITE INVESTIGATION RECORD |                                   |                       |          |                     |                  |                 |                |               |      | BORE HOLE No. 06 |                                                                                    |
|-----------------------------------------|-----------------------------|---------------------------|-----------------------------------|-----------------------|----------|---------------------|------------------|-----------------|----------------|---------------|------|------------------|------------------------------------------------------------------------------------|
| PROJECT NAME                            |                             | BRIGADE                   |                                   |                       |          |                     |                  |                 |                |               |      | PAGE No. 1       |                                                                                    |
| LOCATION                                |                             | MACHINE No.               |                                   | CHAINAGE (m)          |          | DIA OF BORE HOLE    |                  | BORE START DATE |                | BORE END DATE |      |                  |                                                                                    |
| STRUCTURE                               |                             | DRILLING METHOD           |                                   | Rotary                |          | CO-ORDINATES        |                  | N               |                | E             |      |                  |                                                                                    |
| JOB CODE                                |                             | FLUSHING MEDIUM           |                                   | Bentonite             |          | TOTAL DRILLING DAYS |                  |                 |                |               |      |                  |                                                                                    |
| Depth below L.G.L. (m)                  | Drilling progress per metre |                           | Type of Drill Bit (SC / TCB / DB) | Core Details          |          | SPT Details         |                  |                 | Sample Details |               |      | Layer Data       |                                                                                    |
|                                         | Date                        | Time                      |                                   | Total Core Recovery % | R.Q.D. % | Blows/cm.           |                  |                 | Depth          | No.           | Type | Depth (m)        | Geotechnical Description                                                           |
|                                         |                             |                           |                                   |                       |          | 0-15                | 15-30            | 30-45           |                |               |      |                  |                                                                                    |
| 1                                       | 5/06/2020                   | 10:35<br>10:40            |                                   |                       |          |                     |                  |                 |                |               |      |                  | Brown - grey (mix) Compact CLAY UNDISTURBED SAMPLES.                               |
| 2                                       |                             | 10:58<br>11:02            |                                   |                       |          | 13                  | 25               | 25              | 50             | 2             |      |                  | V. Dense, greyish, fine-medium coarse grained RESIDUAL SOIL                        |
| 3                                       |                             | 11:18<br>11:23            |                                   |                       |          | 55                  | HAMMAREES (1000) |                 |                | 3             |      |                  | V. WEAK Brown - greyish (mix) fine-medium coarse grained COMPLETELY WEATHERED ROCK |
| 4                                       |                             | 11:40<br>11:45            |                                   |                       |          | 58                  | HAMMAREES (1000) |                 |                | 4             |      |                  | COMPLETELY WEATHERED ROCK                                                          |
| 5                                       |                             | 11:58<br>12:15            |                                   |                       |          |                     | HAMMAREES        |                 |                | 5             |      |                  | V. WEAK, medium-coarse grained grey - blackish (mix) HIGHLY WEATH - FRACTURE ROCK  |
| 6                                       |                             | 12:25<br>1:00             |                                   |                       |          |                     |                  |                 |                | 6             |      |                  | grey - medium coarse grained MODERATELY WEATHERED ROCK                             |
| 7                                       |                             | 1:45<br>3:00              |                                   |                       |          |                     |                  |                 |                | 7             |      |                  | grey, medium coarse grained SLIGHTLY WEATHERED ROCK                                |
| 8                                       |                             | 3:10<br>4:25              |                                   |                       |          |                     |                  |                 |                | 8             |      |                  | Strong, grey, medium-coarse grained SLIGHTLY WEATHERED ROCK (FRESH ROCK)           |
| 9                                       |                             | 4:35<br>5:15              |                                   |                       |          |                     |                  |                 |                | 9             |      |                  | Strong - grey - medium coarse grained FRESH HARD ROCK (GRANITE)                    |
| 10                                      |                             | 5:35                      |                                   |                       |          |                     |                  |                 |                | 10            |      |                  | FRESH HARD ROCK (GRANITE)                                                          |

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

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

h. h. h.  
Authorised Signatory

| GEOMARINE<br>THE SPIRIT OF ENGINEERING |                             | SITE INVESTIGATION RECORD          |       |                                   |                       |                 |                  |                      |             |                     |       | BORE HOLE No. 07 |            |           |                                                   |
|----------------------------------------|-----------------------------|------------------------------------|-------|-----------------------------------|-----------------------|-----------------|------------------|----------------------|-------------|---------------------|-------|------------------|------------|-----------|---------------------------------------------------|
| PROJECT NAME                           |                             | BRIGADE Personal Nagar, Pallavaram |       |                                   |                       |                 |                  |                      |             |                     |       | PAGE No. 01      |            |           |                                                   |
| LOCATION                               |                             | MACHINE No.                        |       | CHAINAGE (m)                      |                       | BORE START DATE |                  | BORE END DATE        |             | TOTAL DRILLING DAYS |       |                  |            |           |                                                   |
| STRUCTURE                              |                             | DRILLING METHOD                    |       | Rotary                            |                       | CO-ORDINATES    |                  | N                    |             | E                   |       |                  |            |           |                                                   |
| JOB CODE                               |                             | FLUSHING MEDIUM                    |       | Bentonite                         |                       | CO-ORDINATES    |                  | N                    |             | E                   |       |                  |            |           |                                                   |
| Depth below E.G.L. (m)                 | Drilling progress per metre |                                    |       | Type of Drill Bit (SC / TCS / DB) | Core Details          |                 | SPT Details      |                      |             | Sample Details      |       |                  | Layer Data |           |                                                   |
|                                        | Date                        | Time                               |       |                                   | Total Core Recovery % | R.Q.D. %        | Blows/cm.        |                      |             | SPT 'N' Value       | Depth | No.              | Type       | Depth (m) | Geotechnical Description                          |
|                                        |                             | Hr.                                | Min   |                                   |                       |                 | 0-15             | 15-30                | 30-45       |                     |       |                  |            |           |                                                   |
| 1                                      | 13/06                       | 12:02                              | 12:03 | SC                                |                       |                 | 9                | 9                    | 10          | 19                  | 1.00  | 1                | SS         |           | Greenish Brown very stiff Sandy clay with pebbles |
| 2                                      | 06/06                       | 12:11                              | 12:14 | SC                                |                       |                 | Hammer Rebounded | 14cm/526             | H/Rebounded | 12/100              | 2.00  | 2                | DS         |           | Brownish very dense Residual Soil                 |
| 3                                      | 22/06                       | 12:15                              | 12:39 | SC                                |                       |                 | Hammer Rebounded | 12/100               |             |                     | 3.00  | 3                | DS         |           | Brownish very weak completely weathered Rock      |
| 4                                      |                             | 1:55                               | 3:00  | DB                                | 10%                   | -               |                  |                      |             |                     | 4.00  | 4                | CS         |           | Brownish weak completely weathered Rock           |
| 5                                      |                             | 3:20                               | 5:29  | DB                                | 62%                   | 58%             |                  |                      |             |                     | 5.00  | 5                | CS         |           | Greenish strong slightly weathered Rock           |
| 6                                      | 14/06                       | 9:50                               | 10:15 | DB                                | 69%                   | 55%             |                  |                      |             |                     | 6.00  |                  |            |           | Greenish slightly weathered Rock                  |
| 7                                      | 06/06                       | 12:00                              | 01:15 | DB                                | 92%                   | 79%             |                  |                      |             |                     |       |                  |            |           | Grey very strong fresh Rock                       |
| 8                                      | 02/06                       | 1:33                               | 2:50  | DB                                | 95%                   | 81%             |                  |                      |             |                     |       |                  |            |           |                                                   |
| Bore hole Terminated at 8.0m           |                             |                                    |       |                                   |                       |                 |                  |                      |             |                     |       |                  |            |           |                                                   |
| Depth below in G.L.                    |                             |                                    |       |                                   |                       |                 |                  |                      |             |                     |       |                  |            |           |                                                   |
| CS - Core Sample                       |                             | DS - Disturbed Sample              |       | SUPERVISOR NAME                   |                       | 19/06/2020      |                  | PROJECT SITE DETAILS |             |                     |       |                  |            |           |                                                   |
| SS - Split Spoon Sample                |                             | SC - Soil Cutter                   |       | SIGNATURE                         |                       | 19/06/2020      |                  | GROUND LEVEL (m)     |             |                     |       |                  |            |           |                                                   |
| UDS - Undisturbed Sample               |                             | TCS - Tungsten Carbide Bit         |       | DATE                              |                       | 14/06/2020      |                  | 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.       | 08             |
| PAGE No.            | 01             |
| DIA OF BORE HOLE    | 150mm<br>100mm |
| BORE START DATE     | 11/06/2020     |
| BORE END DATE       | 12/06/2020     |
| TOTAL DRILLING DAYS | 2              |

|              |                                    |              |              |
|--------------|------------------------------------|--------------|--------------|
| PROJECT NAME | BRIGADE - Old Pallavaram - Chennai |              |              |
| LOCATION     | MACHINE No.                        | CHAINAGE (m) |              |
| STRUCTURE    | DRILLING METHOD                    | Rotary       | CO-ORDINATES |
| JOB CODE     | FLUSHING MEDIUM                    | Bentonite    |              |

| Depth below E.G.L.<br>(m)                      | Drilling progress<br>per metre |       |     | Type of Drill Bit (SC<br>/ TCB / DB) | Core Details             |         | SPT Details |       |       | Sample Details   |       |      | Layer Data |           |                                                         |                                                           |
|------------------------------------------------|--------------------------------|-------|-----|--------------------------------------|--------------------------|---------|-------------|-------|-------|------------------|-------|------|------------|-----------|---------------------------------------------------------|-----------------------------------------------------------|
|                                                | Date                           | Time  |     |                                      | Total Core<br>Recovery % | R.Q.D % | Blows/cm.   |       |       | SPT 'N'<br>Value | Depth | No.  | Type       | Depth (m) | Geotechnical Description                                |                                                           |
|                                                |                                | Hr.   | Min |                                      |                          |         | 0-15        | 15-30 | 30-45 |                  |       |      |            |           |                                                         |                                                           |
|                                                |                                |       |     |                                      |                          |         |             |       |       |                  |       |      |            |           |                                                         |                                                           |
| 1                                              | 12-06-2020                     | 10 20 |     | SC                                   |                          |         | 3           | 3     | 10    | 13               | 1.00  | 1    | SS         |           | Whitish Brown stiff<br>sandy clay with pebbles          |                                                           |
|                                                |                                | 10 21 |     |                                      |                          |         |             |       |       |                  |       |      |            |           |                                                         |                                                           |
| 2                                              |                                | 10 31 |     | SC                                   |                          |         | 8           | 15    | 30    | 45               | 2.00  | 2    | SS         |           | Brownish dense/v. weak<br>completely weathered<br>Rocks |                                                           |
|                                                |                                | 10 34 |     |                                      |                          |         |             |       |       |                  |       |      |            |           |                                                         |                                                           |
|                                                |                                | 10 45 |     |                                      |                          |         |             |       |       |                  |       |      |            |           |                                                         |                                                           |
|                                                |                                | 10 49 |     |                                      |                          |         |             |       |       |                  |       |      |            |           |                                                         |                                                           |
| 3                                              |                                |       |     | SC                                   |                          |         | 18          | 24    | 32    | 56               | 3.00  | 3    | SS         |           | - DO -                                                  |                                                           |
|                                                |                                | 11 01 |     |                                      |                          |         |             |       |       |                  |       |      |            |           |                                                         |                                                           |
| 4                                              |                                | 11 34 |     | DB                                   | 10%                      |         |             |       |       |                  |       | 4.00 | 4          | CS        |                                                         | Greyish Brown very<br>weak, completely weathered<br>Rocks |
|                                                |                                | 11 50 |     |                                      |                          |         |             |       |       |                  |       |      |            |           |                                                         |                                                           |
| 5                                              | 12 57                          |       | DB  | 29/12%                               |                          |         |             |       |       |                  | 5.00  | 5    | CS         |           | Greyish Brown weak<br>moderately weathered<br>Rocks     |                                                           |
|                                                | 1 50                           |       |     |                                      |                          |         |             |       |       |                  |       |      |            |           |                                                         |                                                           |
|                                                | 2 46                           |       |     |                                      |                          |         |             |       |       |                  |       |      |            |           |                                                         |                                                           |
| 6                                              | 3 13                           |       | DB  | 38%                                  |                          |         |             |       |       |                  | 6.00  | 6    | CS         |           | - DO -                                                  |                                                           |
|                                                | 4 27                           |       |     |                                      |                          |         |             |       |       |                  |       |      |            |           |                                                         |                                                           |
|                                                | 5 35                           |       |     |                                      |                          |         |             |       |       |                  |       |      |            |           |                                                         |                                                           |
| 7                                              | 9 10                           |       | DB  | 59/61%                               |                          |         |             |       |       |                  | 7.00  | 7    | CS         |           | Brownish Grey strong<br>slightly weathered<br>Rocks     |                                                           |
|                                                | 10 20                          |       |     |                                      |                          |         |             |       |       |                  |       |      |            |           |                                                         |                                                           |
|                                                | 10 37                          |       |     |                                      |                          |         |             |       |       |                  |       |      |            |           |                                                         |                                                           |
| 8                                              | 12 00                          |       | DB  | 86/71%                               |                          |         |             |       |       |                  | 8.00  | 8    | CS         |           | Greyish strong slightly<br>weathered Rocks              |                                                           |
|                                                | 12 14                          |       |     |                                      |                          |         |             |       |       |                  |       |      |            |           |                                                         |                                                           |
|                                                | 1 40                           |       |     |                                      |                          |         |             |       |       |                  |       |      |            |           |                                                         |                                                           |
| 9                                              |                                |       | DB  | 90/35%                               |                          |         |             |       |       |                  | 9.00  | 9    | SS         |           | Brownish Grey strong<br>slightly weathered Rocks        |                                                           |
|                                                | 2 40                           |       |     |                                      |                          |         |             |       |       |                  |       |      |            |           |                                                         |                                                           |
|                                                | 3 26                           |       |     |                                      |                          |         |             |       |       |                  |       |      |            |           |                                                         |                                                           |
|                                                | 3 50                           |       |     |                                      |                          |         |             |       |       |                  |       |      |            |           |                                                         |                                                           |
| 10                                             | 5 27                           |       | DB  | 72/30%                               |                          |         |             |       |       |                  | 10.00 | 10   | SS         |           | - DO -                                                  |                                                           |
| Bore hole Terminated at 10.00m depth below G.L |                                |       |     |                                      |                          |         |             |       |       |                  |       |      |            |           |                                                         |                                                           |

Bore hole Terminated at 10.0m Depth below G.L

|                          |                            |                  |               |                      |  |
|--------------------------|----------------------------|------------------|---------------|----------------------|--|
| CS - Core Sample         | DS - Disturbed Sample      | SUPERVISOR NAME  | B. Loganathan | PROJECT SITE DETAILS |  |
| SS - Split Spoon Sample  | SC - Soil Cutter           | SIGNATURE        | M. Loganathan | GROUND LEVEL (m)     |  |
| UDS - Undisturbed Sample | TCB - Tungsten Carbide Bit | DATE             | 12/06/2020    | WATER TABLE (m)      |  |
| WS - Wash Sample         | DB - Diamond Bit           | CLIENT IN-CHARGE |               | CASING DEPTH (m)     |  |

*[Signature]*  
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| GEO MARINE<br>THE SPIRIT OF ENGINEERING |                             | SITE INVESTIGATION RECORD |                                   |                       |          |                 |       |               |                |                     |     | BORE HOLE No. 09 |           |                                                   |
|-----------------------------------------|-----------------------------|---------------------------|-----------------------------------|-----------------------|----------|-----------------|-------|---------------|----------------|---------------------|-----|------------------|-----------|---------------------------------------------------|
| PROJECT NAME                            |                             | BRIGADE, Pallanam         |                                   |                       |          |                 |       |               |                |                     |     | PAGE No. 1       |           |                                                   |
| LOCATION                                |                             | MACHINE No.               |                                   | CHAINAGE (m)          |          | BORE START DATE |       | BORE END DATE |                | TOTAL DRILLING DAYS |     |                  |           |                                                   |
| STRUCTURE                               |                             | DRILLING METHOD           |                                   | Rotary                |          | CO-ORDINATES    |       | N             |                | E                   |     |                  |           |                                                   |
| JOB CODE                                |                             | FLUSHING MEDIUM           |                                   | Bentonite             |          | CO-ORDINATES    |       | N             |                | E                   |     |                  |           |                                                   |
| Depth below E.L. (m)                    | Drilling progress per metre |                           | Type of Drill Bit (SC / TCB / DB) | Core Details          |          | SPT Details     |       |               | Sample Details |                     |     | Layer Data       |           |                                                   |
|                                         | Date                        | Time                      |                                   | Total Core Recovery % | R.Q.D. % | Blows/cm.       |       |               | SPT 'N' Value  | Depth               | No. | Type             | Depth (m) | Geotechnical Description                          |
|                                         |                             |                           |                                   |                       |          | 0-15            | 15-30 | 30-45         |                |                     |     |                  |           |                                                   |
| 1                                       | 1                           | 53                        | SC                                |                       |          | 6               | 7     | 9             | 16             | 1                   |     | SS               |           | Brown - Grey very stiff sandy clay with pebbles   |
| 2                                       | 2                           | 13                        | SC                                |                       |          | 14              | 12    | 13            | 25             | 2                   |     | SS               |           | Brown - medium dense fine grain sand with pebbles |
| 3                                       | 2                           | 37                        | SC                                |                       |          | 30              | 22    | 7             | cm             | 3                   |     | SS               |           | Brown - Greyish completely weather rock           |
| 4                                       | 3                           | 06                        | DB                                | 46%                   | 10%      |                 |       |               |                | 4                   |     | CS               |           | Grey - pinkish moderate weather rock              |
| 5                                       | 4                           | 12                        | DB                                | 38%                   | 10%      |                 |       |               |                | 5                   |     | CS               |           | Greyish SLIGHTLY weather rock                     |
| 6                                       | 9                           | 25                        | DB                                | 26%                   | 0%       |                 |       |               |                | 6                   |     | CS               |           | Greyish SLIGHTLY weather rock                     |
| 7                                       | 11                          | 01                        | DB                                | 36%                   | 24%      |                 |       |               |                | 7                   |     | CS               |           | Greyish SLIGHTLY weather rock                     |
| 8                                       | 2                           | 21                        | DB                                | 89%                   | 70%      |                 |       |               |                | 8                   |     | CS               |           | Greyish SLIGHTLY fresh rock                       |
| 9                                       | 4                           | 18                        | DB                                | 92%                   | 79%      |                 |       |               |                | 9                   |     | CS               |           | SLIGHTLY fresh rock                               |
| 10                                      | 4                           | 35                        | DB                                | 81%                   | 75%      |                 |       |               |                | 10                  |     | CS               |           | SLIGHTLY fresh rock                               |
| 11                                      | 5                           | 25                        | DB                                |                       |          |                 |       |               |                |                     |     |                  |           |                                                   |
| 12                                      | 10                          | 30                        | DB                                |                       |          |                 |       |               |                |                     |     |                  |           |                                                   |
| 13                                      | 11                          | 50                        | DB                                |                       |          |                 |       |               |                |                     |     |                  |           |                                                   |
| 14                                      | 12                          | 10                        | DB                                |                       |          |                 |       |               |                |                     |     |                  |           |                                                   |
| 15                                      | 12                          | 55                        | DB                                |                       |          |                 |       |               |                |                     |     |                  |           |                                                   |
| 16                                      | 2                           | 03                        | DB                                |                       |          |                 |       |               |                |                     |     |                  |           |                                                   |
| 17                                      | 3                           | 30                        | DB                                |                       |          |                 |       |               |                |                     |     |                  |           |                                                   |

|                          |                            |                  |              |                      |  |
|--------------------------|----------------------------|------------------|--------------|----------------------|--|
| CS - Core Sample         | DS - Disturbed Sample      | SUPERVISOR NAME  | S. TISON RAS | PROJECT SITE DETAILS |  |
| SS - Split Spoon Sample  | SC - Soil Cutter           | SIGNATURE        | [Signature]  | GROUND LEVEL (m)     |  |
| UDS - Undisturbed Sample | TCB - Tungsten Carbide Bit | DATE             | 13/06/2020   | WATER TABLE (m)      |  |
| WS - Wash Sample         | DB - Diamond Bit           | CLIENT IN-CHARGE |              | CASING DEPTH (m)     |  |

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| GEOMARINE<br>THE SPIRIT OF ENGINEERING |                             | SITE INVESTIGATION RECORD |      |                                   |                       |                 |             |                     |       |                |       | BORE HOLE No. 11 |            |           |                                                                                                    |
|----------------------------------------|-----------------------------|---------------------------|------|-----------------------------------|-----------------------|-----------------|-------------|---------------------|-------|----------------|-------|------------------|------------|-----------|----------------------------------------------------------------------------------------------------|
| PROJECT NAME                           |                             | BRIGADE                   |      |                                   |                       |                 |             |                     |       |                |       | PAGE No. 1       |            |           |                                                                                                    |
| LOCATION                               |                             | MACHINE No.               |      | CHAINAGE (m)                      |                       | BORE START DATE |             | DIA OF BORE HOLE    |       | 150mm          |       |                  |            |           |                                                                                                    |
| STRUCTURE                              |                             | DRILLING METHOD           |      | Rotary                            |                       | CO-ORDINATES    |             | N                   |       | BORE END DATE  |       |                  |            |           |                                                                                                    |
| JOB CODE                               |                             | FLUSHING MEDIUM           |      | Bentonite                         |                       | E               |             | TOTAL DRILLING DAYS |       | 2              |       |                  |            |           |                                                                                                    |
| Depth below G.L. (m)                   | Drilling progress per metre |                           |      | Type of Drill Bit (SC / TCB / DB) | Core Details          |                 | SPT Details |                     |       | Sample Details |       |                  | Layer Data |           |                                                                                                    |
|                                        | Date                        | Time                      |      |                                   | Total Core Recovery % | R.Q.D. %        | Blows/cm.   |                     |       | SPT 'N' Value  | Depth | No.              | Type       | Depth (m) | Geotechnical Description                                                                           |
|                                        |                             | Hr.                       | Min  |                                   |                       |                 | 0-15        | 15-30               | 30-45 |                |       |                  |            |           |                                                                                                    |
| 1                                      | 09/06/2020                  | 3                         | 20   | SC                                |                       |                 | 3           | 4                   | 8     | 12             | 1     | SS               |            |           | Stiff moist, Greyish Sandy Clay                                                                    |
|                                        |                             | 3                         | 24   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 3                         | 36   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 3                         | 40   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 2                                      | 09/06/2020                  | 3                         | 55   | SC                                |                       |                 | 8           | 11                  | 18    | 29             | 2     | SS               |            |           | V. stiff, moist, Greenish Compact Sandy Clay with Pabb V. Wene Brown - Pinkish Medium Coarse Grain |
|                                        |                             | 3                         | 59   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 4                         | 15   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 4                         | 25   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 3                                      | 09/06/2020                  | 4                         | 15   | SC                                |                       |                 | 13          | 18                  | 60    | 78             | 3     | SS               |            |           | Completely weathered Rock                                                                          |
|                                        |                             | 4                         | 25   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 4                         | 40   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 5                         | 40   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 4                                      | 10/06/2020                  | 5                         | 40   | DB                                | 86%                   | 63%             |             |                     |       |                |       | CS               |            |           | Completely weathered Rock Green Medium, Coarse Grain Slightly weathered Rock                       |
|                                        |                             | 08                        | 55   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 10                        | 40   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 11                        | 05   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 5                                      | 10/06/2020                  | 12                        | 55   | DB                                | 85%                   | 70%             |             |                     |       |                |       | CS               |            |           | Fresh Hard Rock Grey, strong Medium to Coarse Grains, Slightly weathered Rock                      |
|                                        |                             | 14                        | 00   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 6                                      | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock Grey, strong Medium, Coarse Grains, Slightly weathered Rock                             |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 7                                      | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 8                                      | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 9                                      | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 10                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 11                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 12                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 13                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 14                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 15                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 16                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 17                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 18                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 19                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 20                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 21                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 22                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 23                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 24                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 25                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 26                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 27                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 28                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 29                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 30                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 31                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 32                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 33                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 34                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 35                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 36                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 37                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 38                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 39                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 40                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 41                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 42                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 43                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 44                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 45                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 46                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 47                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
| 48                                     | 10/06/2020                  | 16                        | 30   | DB                                | 80%                   | 68%             |             |                     |       |                |       | CS               |            |           | Fresh Rock                                                                                         |
|                                        |                             | 16                        | 30   |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |
|                                        |                             | 16                        | 30</ |                                   |                       |                 |             |                     |       |                |       |                  |            |           |                                                                                                    |

| GEOMARINE<br>THE SPIRIT OF ENGINEERING |                             | SITE INVESTIGATION RECORD |       |                                   |                       |                 |             |               |        |                     |       | BORE HOLE No. 10 |                           |                                                                              |                          |
|----------------------------------------|-----------------------------|---------------------------|-------|-----------------------------------|-----------------------|-----------------|-------------|---------------|--------|---------------------|-------|------------------|---------------------------|------------------------------------------------------------------------------|--------------------------|
| PROJECT NAME                           |                             | BRIGADE                   |       |                                   |                       |                 |             |               |        |                     |       | PAGE No. 1       |                           |                                                                              |                          |
| LOCATION                               |                             | MACHINE No.               |       | CHAINAGE (m)                      |                       | BORE START DATE |             | BORE END DATE |        | TOTAL DRILLING DAYS |       |                  |                           |                                                                              |                          |
| STRUCTURE                              |                             | DRILLING METHOD           |       | Rotary                            |                       | CO-ORDINATES    |             | N             |        | E                   |       |                  |                           |                                                                              |                          |
| JOB CODE                               |                             | FLUSHING MEDIUM           |       | Bentonite                         |                       | CO-ORDINATES    |             | N             |        | E                   |       |                  |                           |                                                                              |                          |
| Depth below E.G.L. (m)                 | Drilling progress per metre |                           |       | Type of Drill Bit (SC / TCB / DB) | Core Details          |                 | SPT Details |               |        | Sample Details      |       |                  | Layer Data                |                                                                              |                          |
|                                        | Date                        | Time                      |       |                                   | Total Core Recovery % | R.Q.D %         | Blows/cm.   |               |        | SPT 'N' Value       | Depth | No.              | Type                      | Depth (m)                                                                    | Geotechnical Description |
|                                        |                             | Hr.                       | Min   |                                   |                       |                 | 0-15        | 15-30         | 30-45  |                     |       |                  |                           |                                                                              |                          |
| 1                                      | 8/06/2020                   | 2.00                      | 2.03  | SC                                |                       |                 | 5           | 6             | 6      | 12                  | 1     | CS               |                           | Compact, stiff, greyish, sandy clay                                          |                          |
| 2                                      | 8/06/2020                   | 2.15                      | 2.17  | SC                                |                       |                 | 5           | 18            | 20     | 38                  | 2     | CS               |                           | Dense, Brown-greyish (mix) fine-medium coarse grained CLAYEY RESIDUAL SOIL   |                          |
| 3                                      | 8/06/2020                   | 2.27                      | 2.30  | SC                                |                       |                 | 10          | 27            | 39     | 66                  | 3     | CS               |                           | CLAYEY RESIDUAL SOIL                                                         |                          |
| 4                                      | 8/06/2020                   | 2.45                      | 2.49  | SC                                |                       |                 | 18          | 58            | (7.00) | 15cm                | 4     | SC               |                           | V. WEAK, grey-pinkish (mix) medium-coarse grained. COMPLETELY WEATHERED ROCK |                          |
| 5                                      | 8/06/2020                   | 3.02                      | 3.05  | TCB                               |                       |                 | 58          | (2.00)        | 5cm    | 5                   | WE    |                  | COMPLETELY WEATHERED ROCK |                                                                              |                          |
| 6                                      | 8/06/2020                   | 3.27                      | 3.50  | DB                                | 15% 0%                |                 |             |               |        |                     | 6     | CS               |                           | Grey-pinkish (mix) medium-coarse MODERATELY WEATHERED FRAGILE ROCK           |                          |
| 7                                      | 8/06/2020                   | 4.03                      | 5.30  | DB                                | 70% 54%               |                 |             |               |        |                     | 7     | CS               |                           | Grey-medium-coarse grained SLIGHTLY WEATHERED ROCK (FRESH - GRANITE ROCK)    |                          |
| 8                                      | 8/06/2020                   | 8.50                      | 9.50  | DB                                | 90% 67%               |                 |             |               |        |                     | 8     | CS               |                           |                                                                              |                          |
| 9                                      | 8/06/2020                   | 10.02                     | 11.40 | DB                                | 85% 62%               |                 |             |               |        |                     | 9     | CS               |                           |                                                                              |                          |
| 10                                     | 8/06/2020                   | 12.50                     | 2.10  | DB                                | 95% 35%               |                 |             |               |        |                     | 10    | CS               |                           |                                                                              |                          |

|                          |                       |                  |                   |  |                      |  |
|--------------------------|-----------------------|------------------|-------------------|--|----------------------|--|
| CS - Core Sample         | DS - Disturbed Sample | SUPERVISOR NAME  | K. G. VISWANATHAN |  | PROJECT SITE DETAILS |  |
| SS - Split Spoon Sample  | SC - Soil Cutter      | SIGNATURE        | K. G. VISWANATHAN |  | GROUND LEVEL (m)     |  |
| UDS - Undisturbed Sample | DB - Diamond Bit      | DATE             | 9/06/2020         |  | WATER TABLE (m)      |  |
| WS - Wash Sample         |                       | CLIENT IN-CHARGE |                   |  | CASING DEPTH (m)     |  |

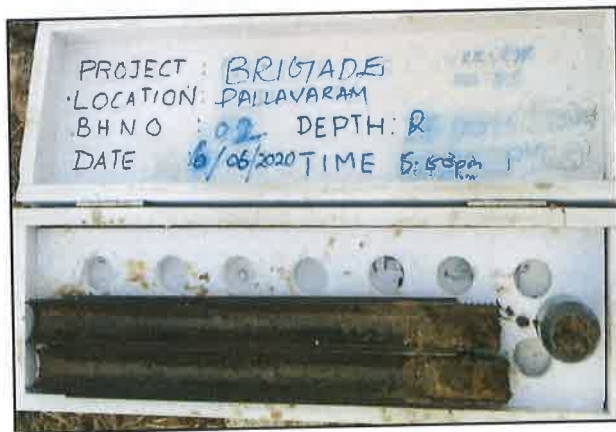
| GEOMARINE<br>THE SPIRIT OF ENGINEERING |                                        | SITE INVESTIGATION RECORD |     |                                   |                       |                 |                    |                     |       |                |       | BORE HOLE No. 13 |            |           |                          |                                           |                                                     |
|----------------------------------------|----------------------------------------|---------------------------|-----|-----------------------------------|-----------------------|-----------------|--------------------|---------------------|-------|----------------|-------|------------------|------------|-----------|--------------------------|-------------------------------------------|-----------------------------------------------------|
| PROJECT NAME                           |                                        | BRIGADE - PALLAVARAM      |     |                                   |                       |                 |                    |                     |       |                |       | PAGE No. 1       |            |           |                          |                                           |                                                     |
| LOCATION                               |                                        | MACHINE No.               |     | CHAINAGE (m)                      |                       | BORE START DATE |                    | DIA OF BORE HOLE    |       | 150mm          |       |                  |            |           |                          |                                           |                                                     |
| STRUCTURE                              |                                        | DRILLING METHOD           |     | Rotary                            |                       | BORE END DATE   |                    | 100mm               |       | 12/06/20       |       |                  |            |           |                          |                                           |                                                     |
| JOB CODE                               |                                        | FLUSHING MEDIUM           |     | Bentonite                         |                       | CO-ORDINATES    |                    | N                   |       | 10/06/20       |       |                  |            |           |                          |                                           |                                                     |
|                                        |                                        |                           |     |                                   |                       | E               |                    | TOTAL DRILLING DAYS |       | 1              |       |                  |            |           |                          |                                           |                                                     |
| Depth below E.G.L. (m)                 | Drilling progress per metre            |                           |     | Type of Drill Bit (SC / TCB / DB) | Core Details          |                 | SPT Details        |                     |       | Sample Details |       |                  | Layer Data |           |                          |                                           |                                                     |
|                                        | Date                                   | Time                      |     |                                   | Total Core Recovery % | R.Q.D. %        | Blows/cm.          |                     |       | SPT 'N' Value  | Depth | No.              | Type       | Depth (m) | Geotechnical Description |                                           |                                                     |
|                                        |                                        | Hr.                       | Min |                                   |                       |                 | 0-15               | 15-30               | 30-45 |                |       |                  |            |           |                          |                                           |                                                     |
| 1                                      | 10                                     | 22                        |     |                                   |                       |                 |                    |                     |       |                |       |                  |            |           |                          |                                           |                                                     |
|                                        | 10                                     | 25                        | SC  |                                   |                       |                 | 5                  | 7                   | 8     | 15             |       | 1.00             | 1          | SS        | 1.00                     | Brown, Grey Medium dense silty sand.      |                                                     |
| 2                                      | 10                                     | 50                        | SC  |                                   |                       |                 | 11                 | 26                  | 31    | 57             |       | 2.00             | 2          | SS        | 2.00                     | Brown, Grey very dense clayey silty sand. |                                                     |
|                                        | 10                                     | 56                        |     |                                   |                       |                 |                    |                     |       |                |       |                  |            |           |                          |                                           |                                                     |
| 3                                      | 11                                     | 08                        | SC  |                                   |                       |                 | SPT Hammer Rebound |                     |       |                |       |                  | 3.00       | 3         | WS                       | 3.00                                      | Brown & Greyish fine to coarse grain, Residual soil |
|                                        | 11                                     | 13                        |     |                                   |                       |                 |                    |                     |       |                |       |                  |            |           |                          |                                           |                                                     |
| 4                                      | 11                                     | 26                        |     |                                   |                       |                 |                    |                     |       |                |       |                  | 1.00       | 4         | CS                       | 4.00                                      | Grey & Brown Moderately weather rock                |
|                                        | 12                                     | 35                        | DB  | 23                                | 12                    |                 |                    |                     |       |                |       |                  |            |           |                          |                                           |                                                     |
| 5                                      | 13                                     | 25                        | DB  |                                   |                       |                 |                    |                     |       |                |       |                  | 5.00       | 5         | CS                       | 5.00                                      | Grey & Brown Highly to moderately weather rock.     |
|                                        | 14                                     | 10                        |     | 9                                 | 0                     |                 |                    |                     |       |                |       |                  |            |           |                          |                                           |                                                     |
| 6                                      |                                        |                           |     |                                   |                       |                 |                    |                     |       |                |       |                  |            |           |                          |                                           |                                                     |
| 7                                      |                                        |                           |     |                                   |                       |                 |                    |                     |       |                |       |                  |            |           |                          |                                           |                                                     |
|                                        | Bore hole terminate @ 5.00 meter Depth |                           |     |                                   |                       |                 |                    |                     |       |                |       |                  |            |           |                          |                                           |                                                     |
| 8                                      |                                        |                           |     |                                   |                       |                 |                    |                     |       |                |       |                  |            |           |                          |                                           |                                                     |
| 9                                      |                                        |                           |     |                                   |                       |                 |                    |                     |       |                |       |                  |            |           |                          |                                           |                                                     |
| 0                                      |                                        |                           |     |                                   |                       |                 |                    |                     |       |                |       |                  |            |           |                          |                                           |                                                     |

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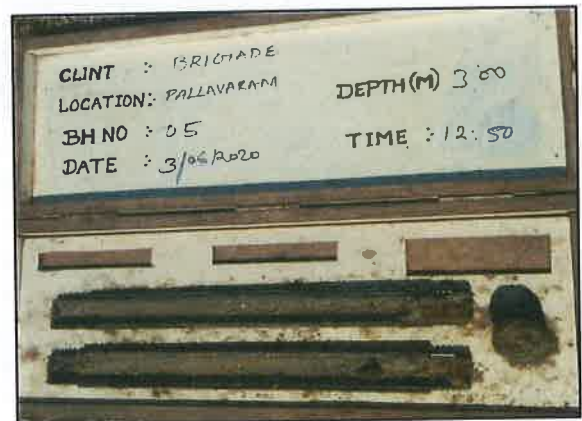
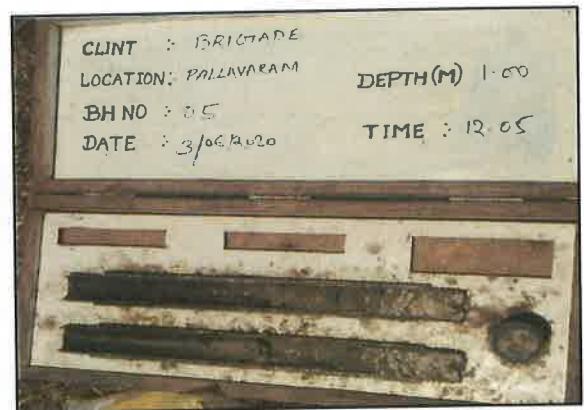
Authorised Signatory

|                                                                                             |                                                                                             |                                                          |                                                                                                                         |                                                                                 |
|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| (CS) Core Sample<br>(SS) Split Spoon Sample<br>UDS - Undisturbed Sample<br>WS - Wash Sample | DS - Disturbed Sample<br>SC - Soil Cutter<br>TCB - Tungsten Carbide Bit<br>DB - Diamond Bit | SUPERVISOR NAME<br>SIGNATURE<br>DATE<br>CLIENT IN-CHARGE | S. V. S. N. R. A. T.<br><br>12/6/20 | PROJECT SITE DETAILS<br>GROUND LEVEL (m)<br>WATER TABLE (m)<br>CASING DEPTH (m) |
|---------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|



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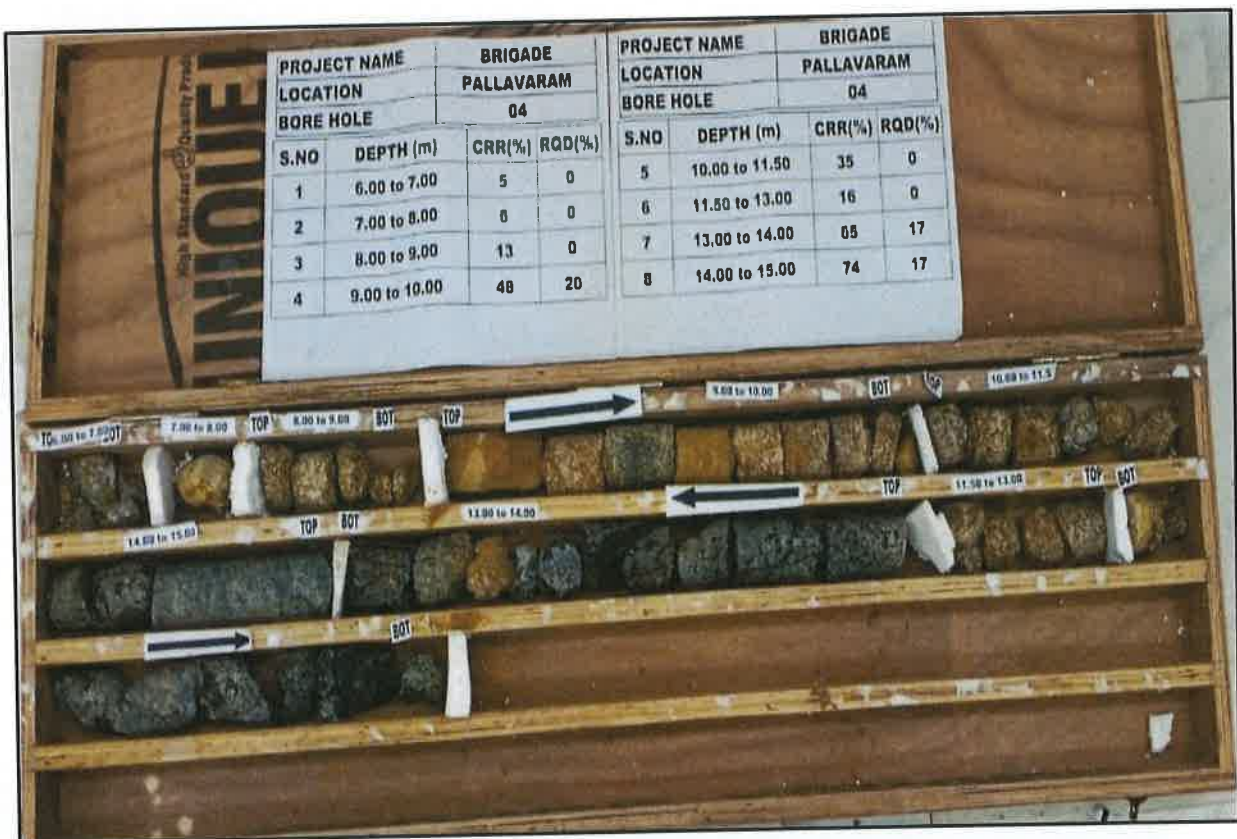
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*K. Suresh*  
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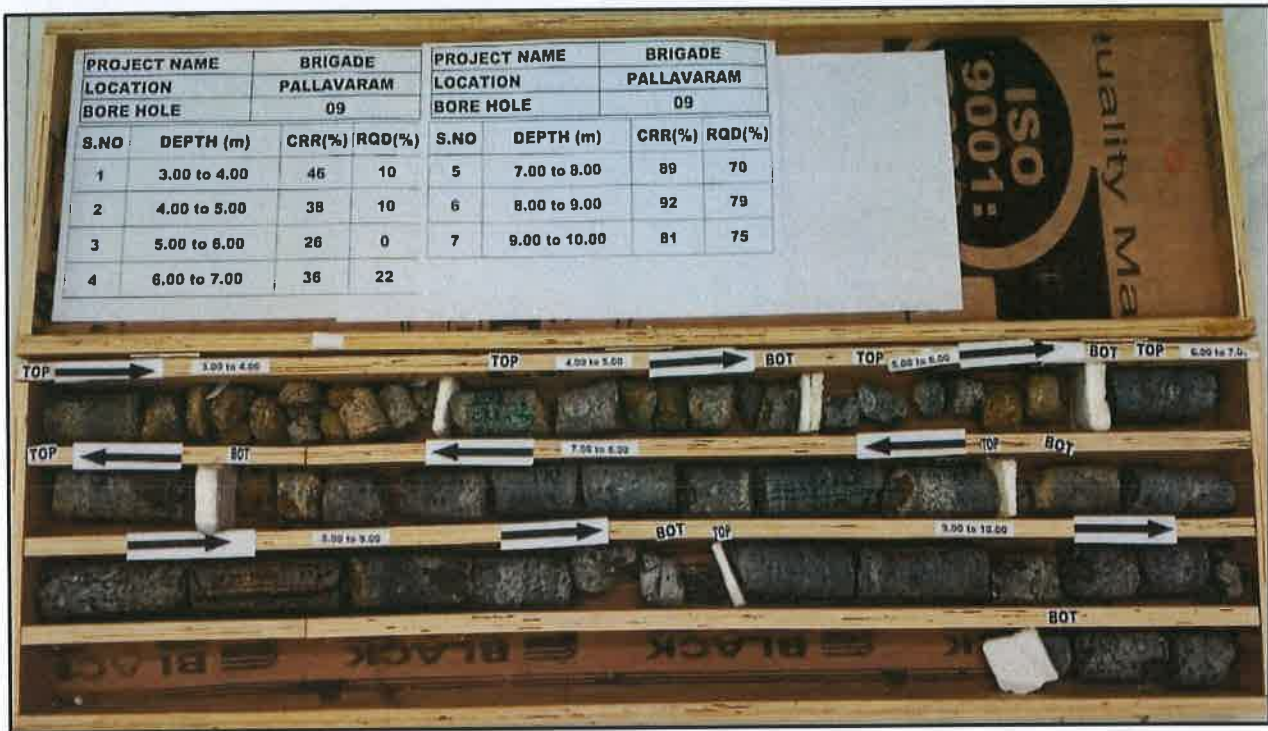
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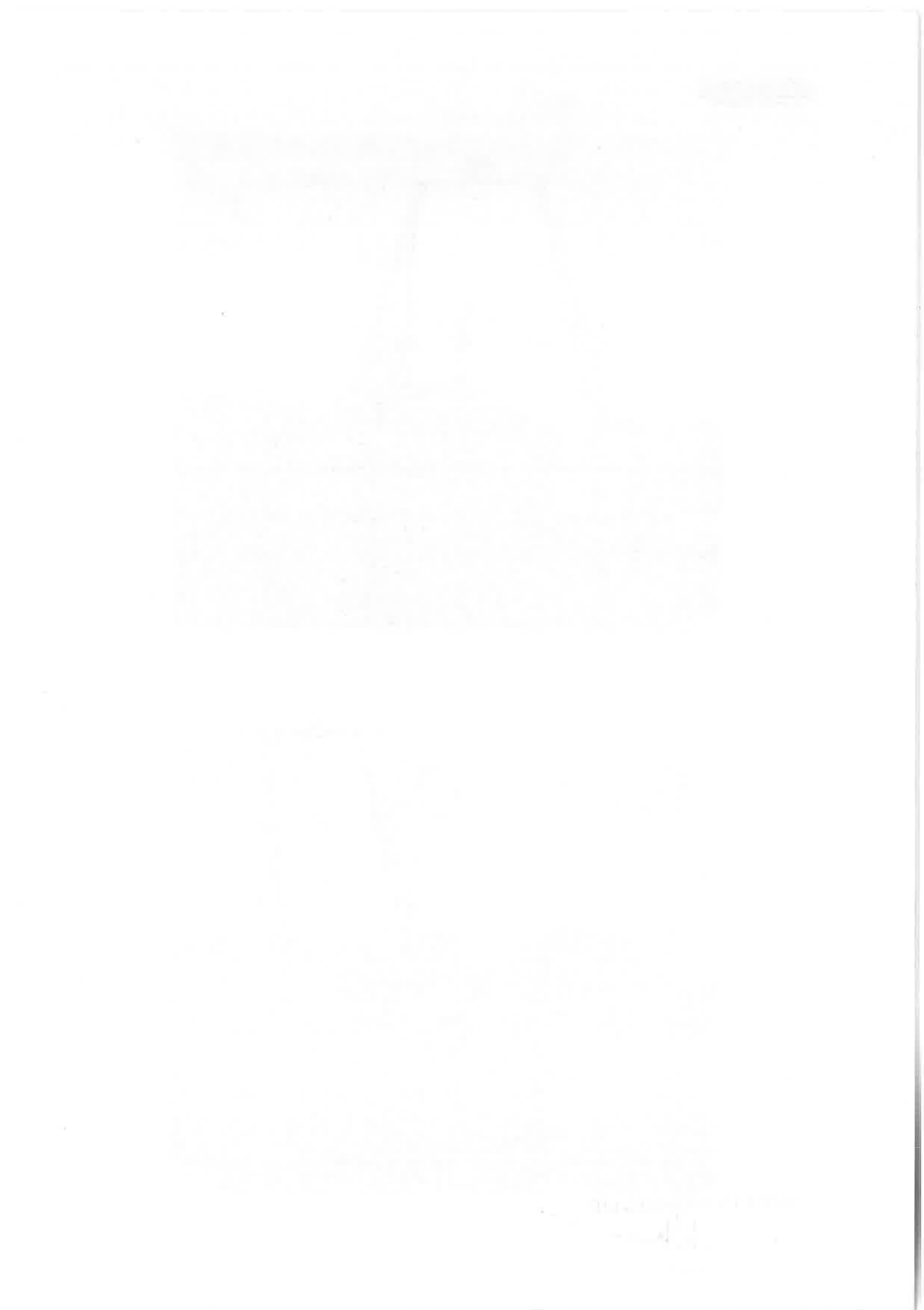
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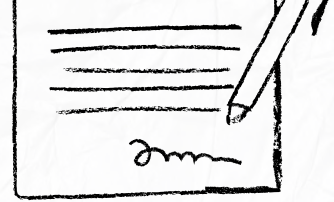
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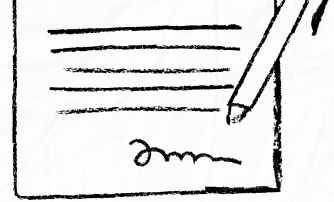
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