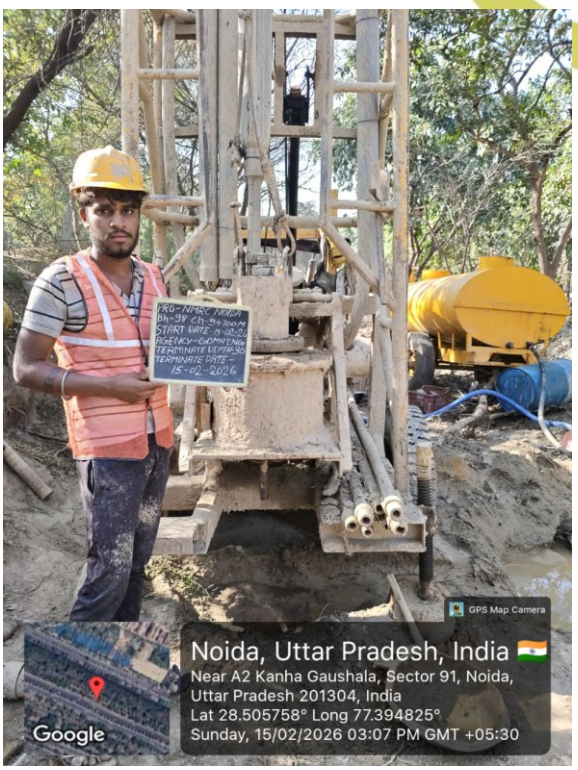
BH-96



BH-97



BH-98



BH-99



BH-100


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F.12 Zone 12: CH: 10+540 km to 11+400 km (BH-101 to BH-109)

BH-101



BH-102



BH-103



BH-104



BH-105



BH-106



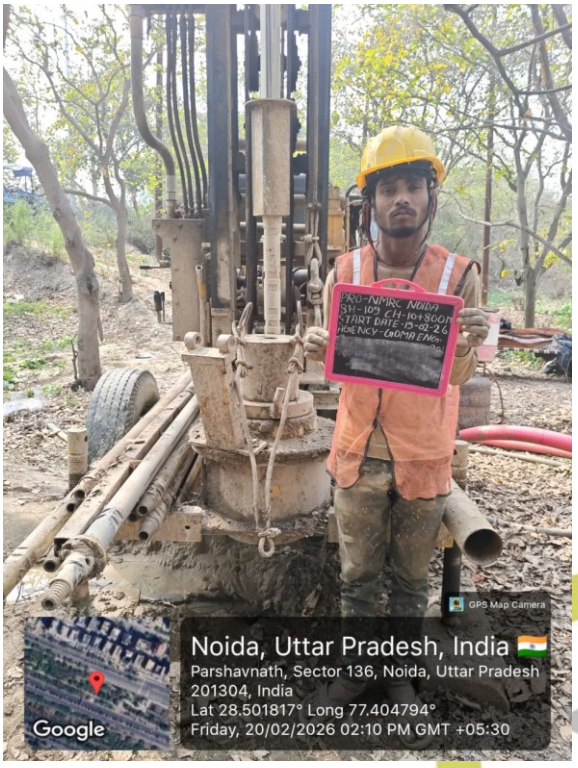
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BH-109


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F.13 Zone 13: CH: 11+400 km to 12+130 km (BH-111 to BH-116)

BH-111



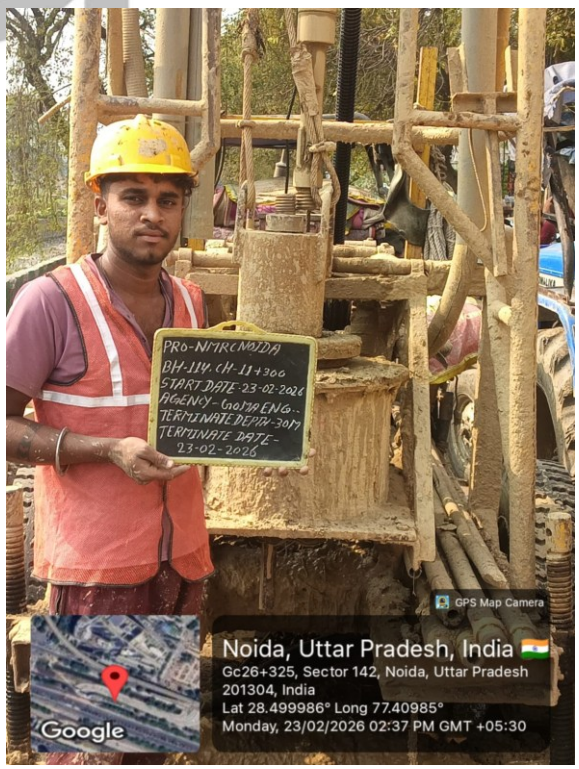
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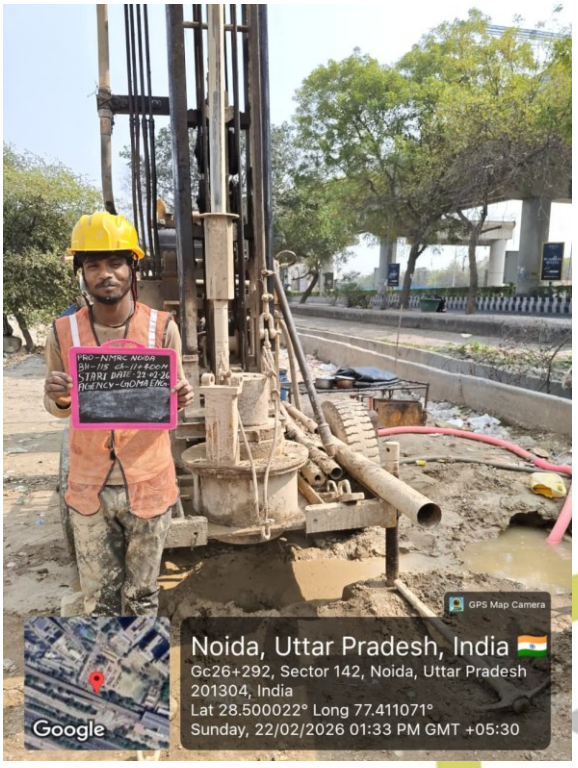
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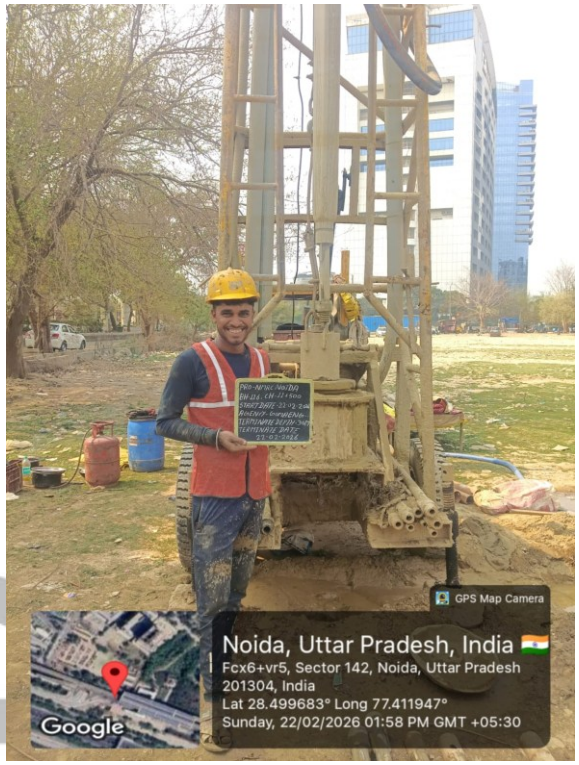
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201304, India
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Sunday, 22/02/2026 01:58 PM GMT +05:30
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Report By:

GOMA ENGINEERING AND CONSULTANCY

Geotech Investigation Report

for

Proposed Extension Metro corridors

of Aqua Line from

DEPOT STATION TO BORAKI MMTH

(0+000 km to 2+600 km)

under the project

named as

"GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)"

Submitted To:

NOIDA METRO RAIL CORPORATION LIMITED

Report No:		Revision:
158_DEST TO BOMM_R0	11/05/2026	RV00

Goma Engineering and Consultancy
Registered office: F-88, Tulsi Estate, Changodar, Ahmedabad – 382213 (Gujarat) India.
Phone:+91 82384 68031, W: www.gomaec.in, E: gomaconsultancy@gomaec.in

DEPOT STATION TO BORAKI MMTH(0+000 km to 2+600 km)	
Report No:	**158_DEST TO BOMM_R0**
Client:	**NOIDA METRO RAIL CORPORATION LIMITED**
Consultant:	–
Field Drilling Agency:	**GOMA ENGINEERING AND CONSULTANCY**

Current Revision

Current Revision	Prepared By	Reviewed By	Approved By	Date Approved	Reason for Review
	Designation				
	Senior Engineer	Technical Expert	Quality Manager		
RV00	J KHANAPARA S MARSONIA	D PATEL	H MAKADIYA D PATEL	11/05/2026	Final Report

Revision History

Revision	Prepared By	Reviewed By	Approved By	Date Approved	Reason for Review
	Designation				
	Senior Engineer	Technical Expert	Quality Manager		
RV00	J KHANAPARA S MARSONIA	D PATEL	H MAKADIYA D PATEL	11/05/2026	Final Report

Revision Summary

Paragraph Modified	Details of Modification

ACKNOWLEDGEMENT CERTIFICATE

We express our sincere gratitude to **NOIDA METRO RAIL CORPORATION LTD** for entrusting us with the Geotechnical Investigation work for the project titled:

"GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)"

(LOA No. NMRC/DGM/Civil/F.No.J-69/2025/17124)

Particulars of This Report

- **Stage / Corridor:** *Depot Station to Boraki Multi-Modal Transit Hub (MMTH) (2.60 km)*
- **Chainage Covered:** 0+000 to 2+600
- **Length of Stretch Covered in This Report:** 2.60 km
- **Report Reference No.:** 158_DEST TO BOMM_R0

This report forms part of the detailed geotechnical investigation carried out for the above-mentioned metro corridor extension project. The investigation has been executed and reported in kilometer-wise stretches in accordance with project specifications and guidelines.

We sincerely appreciate the continuous support, coordination, and cooperation extended by NMRC officials, project management representatives, and site authorities during the execution of field and laboratory investigations.

The investigations and reporting have been carried out in accordance with relevant Indian Standards including IS 1892, IS 1893, IS 2131, IS 2911, IS 6403, IS 2720 (series), and other applicable codes of practice.

This report has been prepared with due professional care and diligence. We trust that the findings and recommendations presented herein will assist NMRC in the safe and economical design of foundations and associated civil works for the proposed metro corridor extension.

D P Patel
(Authorized Signatory)
GOMA ENGINNERING AND CONSULTANCY

NABL ACCEREDIATION CERTIFICATE

National Accreditation Board for Testing and Calibration Laboratories

CERTIFICATE OF ACCREDITATION

GOMA ENGINEERING AND CONSULTANCY

has been assessed and accredited in accordance with the standard

ISO/IEC 17025:2017

"General Requirements for the Competence of Testing & Calibration Laboratories"

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TESTING

Certificate Number: TC-12603

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(To see the scope of accreditation of this laboratory, you may also visit NABL website www.nabl-india.org)

Name of Legal Entity: GOMA ENGINEERING AND CONSULTANCY

Signed for and on behalf of NABL

Anuja Anand
Director

Chakravarthy T. Kannan
Chief Executive Officer

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REFERENCES

The following standards, publications and documents have been referred to in preparation of this report:

- **Bureau of Indian Standards (BIS)**
  IS 1893 (Part 1): 2016 – *Criteria for Earthquake Resistant Design of Structures*
- **Bureau of Indian Standards (BIS)**
  IS 2911 (Part 1/Sec 1): 2010 – *Design and Construction of Pile Foundations*
- **Bureau of Indian Standards (BIS)**
  IS 2131: 1981 – *Method for Standard Penetration Test for Soils*
- **Bureau of Indian Standards (BIS)**
  IS 2720 (Relevant Parts) – *Methods of Test for Soils*
- **Geological Survey of India (2020)**
  Geology and Mineral Resources of Uttar Pradesh, Miscellaneous Publication No. 30, Part XIII
- **Central Ground Water Board**
  Groundwater Information and Hydrogeological Reports of Uttar Pradesh / NCR Region
- **Project Drawings**
  General Arrangement Drawing – Plan and Profile (SSS/NMRC/NOIDA/PROJECT/BORAKI-R0)
- **Relevant Project Specifications and Tender Documents**
- **Seed, H.B. and Idris, I.M. (1971)**
  Simplified Procedure for Evaluating Soil Liquefaction Potential
- **Youd, T.L. et al. (2001)**
  Liquefaction Resistance of Soils: Summary Report from NCEER Workshop

1 INTRODUCTION

1.1 Project Information

The **Noida Metro Rail Corporation Limited (NMRCL)** has undertaken the development of metro rail infrastructure to enhance urban mobility and support the rapidly growing transportation demands in Noida and its adjoining regions. As part of this initiative, NMRCL has proposed the extension of the existing Aqua Line corridor from the Depot Station to Boraki Multi-Modal Transport Hub (MMTH) (2.60 km), along with an additional corridor from Sector-142 to Botanical Garden, covering a total length of approximately 14.16 km.

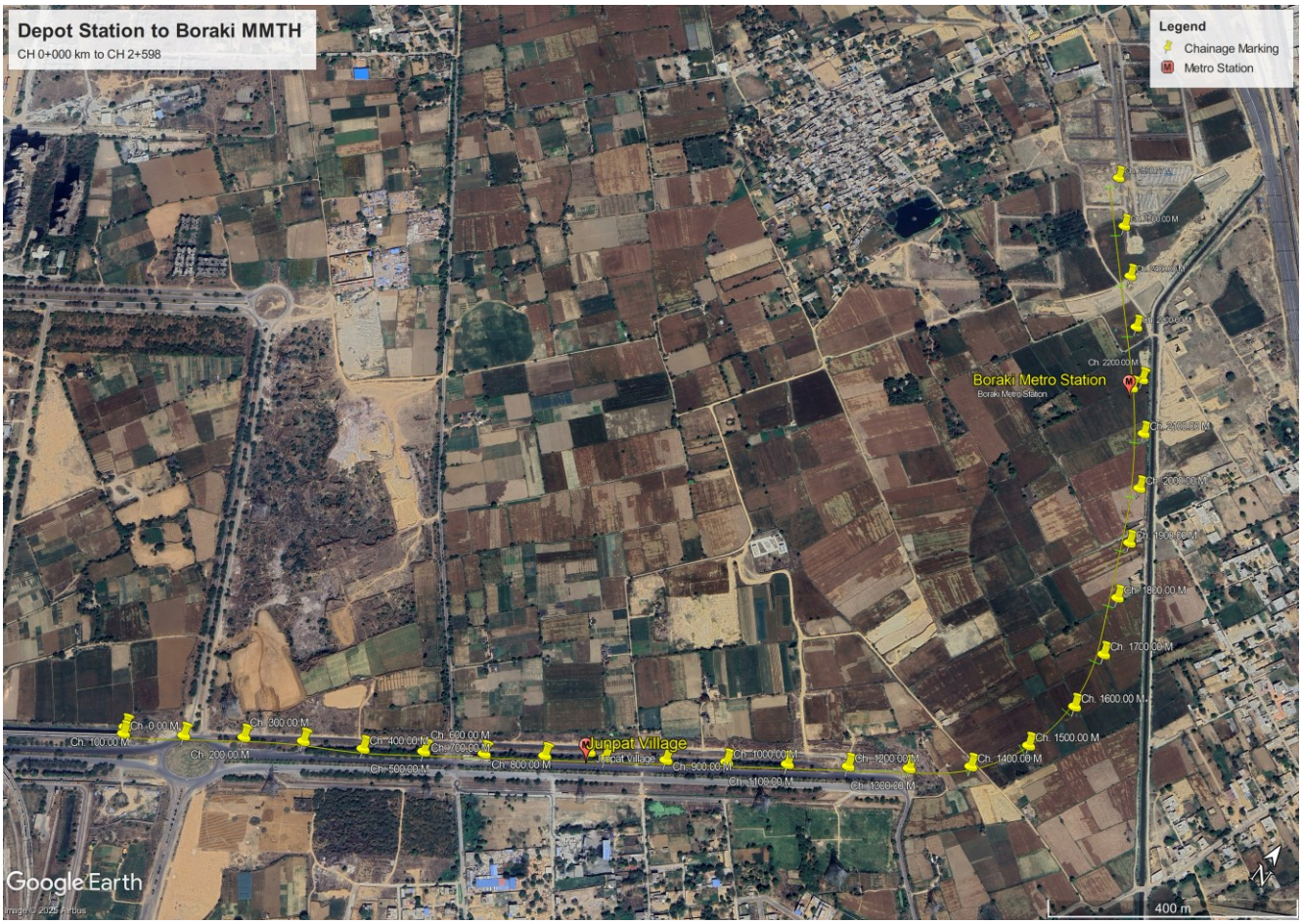


Figure 1 Proposed Alignment of Aqua Line from Depot Station to Boraki MMTH (CH 0+000 km to 2+600 km)

The proposed Boraki MMTH is envisioned as a major transportation hub facilitating seamless integration of metro, rail, and road-based transit systems. The project is expected to reduce traffic congestion, minimize travel time, and promote sustainable and environmentally friendly public transportation.

The development of the metro corridor involves the construction of elevated viaducts, stations, entry/exit structures, and associated infrastructure such as depot facilities and utility corridors. These structures

impose varying load conditions on the subsurface strata, necessitating a detailed understanding of the geotechnical characteristics of the soil and rock formations along the alignment. The performance and safety of such infrastructure are highly dependent on the engineering properties of the underlying ground, making geotechnical investigation a critical component of the project.

In this context, a comprehensive geotechnical investigation program has been carried out to evaluate the subsurface conditions along the proposed alignment. The scope of investigation includes drilling of boreholes at specified intervals and critical locations such as station areas, conducting in-situ tests like Standard Penetration Tests (SPT), collection of disturbed and undisturbed soil samples, and laboratory testing to determine index and engineering properties of soils. The investigation aims to establish subsurface stratification, assess the relative density and consistency of soil layers, evaluate shear strength and compressibility characteristics, and determine groundwater conditions.

The findings of the geotechnical investigation are utilized to develop design parameters for foundation systems, including pile and shallow foundations, and to assess settlement behavior, bearing capacity, and overall stability of structures. In addition, the study provides inputs for construction methodologies, ground improvement measures (if required), and quality control criteria during execution. Special attention is given to identifying potential geotechnical risks such as loose granular deposits, soft cohesive strata, and groundwater-related challenges that may influence the design and construction of the metro infrastructure.

This report presents the results of the geotechnical investigation carried out for the proposed extension corridors and provides recommendations for foundation design and construction considerations. The report is intended to serve as a technical reference for detailed design and execution of the project, in accordance with relevant Indian Standards and project-specific requirements.

1.2 Purpose of Study

The primary aim of this study is to conduct a geotechnical investigation at the site and formulate geotechnical recommendations essential for the design and construction of foundations for the proposed project and its related facilities.

To accomplish these purposes, the study is being conducted in the following phases,

- Mobilization of necessary equipment and personnel to carry out all the works and demobilization after completing the work.
- Drilling boreholes to specified depths, in order to evaluate the stratigraphy, and to collect rock/soil samples for laboratory testing.
- Conduct field tests as specified in the scope of work to evaluate relevant geotechnical parameters for subsequent analysis and design assessments.
- Analysing all field and laboratory data to develop geotechnical sub surface strata within project area.

The main goal of the subsurface (geotechnical) investigation is to:

- **Understand the type of soil and rock layers (sub-strata)** present beneath the site.
- **Assess the engineering properties** of these layers (such as strength, compressibility, etc.).
- **Evaluate whether these ground conditions are suitable** for safely supporting the proposed structure's foundation and substructure.
- **Ensure the ground can bear the expected loads** — including the weight of the structure, live loads (people, vehicles), and environmental forces (like wind or seismic).

1.3 Scope of Geotechnical Investigation

This report summarizes the geotechnical investigation and associated field and laboratory test results conducted for the proposed extension of the Aqua Line metro corridor from Depot Station to Boraki Multi-Modal Transport Hub (MMTH). The tests performed as part of the investigation are listed below:

Table 1 Summary of Geotechnical Investigation and Tests Conducted for Proposed project

Test	**No. of Locations**	**Purpose / Remarks**	**Report Section Reference**
Borehole Drilling	29 Nos.	• Performed to collect disturbed & undisturbed soil samples and log stratigraphy.	**Section 1.4 & Appendix C**
Groundwater Table Observation	In boreholes	• Depth to water table recorded during drilling and after 24 hours of stabilization.	**Section 1.4 & Appendix C**
Visual and Tactile Soil Classification	All borehole samples	• Field identification of soil type (SPT samples and undisturbed samples) in accordance with IS 1498. • Perform Field Permeability Test as per IS 5529.	**Section 1.4 & Appendix C & Appendix E**
Laboratory Testing of Soil Samples	As required	Includes • Sieve Analysis & Hydrometer test, • Bulk Density, Dry density and natural moisture content, • Specific Gravity of Soil Solid Test, • Liquid Limit & Plastic Limit test, • Consolidation Test, • Direct Shear Test, • Undrained Triaxial Compressive Strength, • Chemical Test (pH, Chloride & Sulphate), etc.	**Appendix C**

1.4 Regional Geology, History and Hydrology

1.4.1 Regional Geological Setting

The project corridor from Depot Station to Boraki Multi-Modal Transport Hub (MMTH), Noida, lies within the Indo-Gangetic alluvial plains and forms part of the Yamuna River basin. The area is geologically characterized by recent (Quaternary) alluvial deposits comprising predominantly sand, silt, clay, and occasional gravel/kankar.

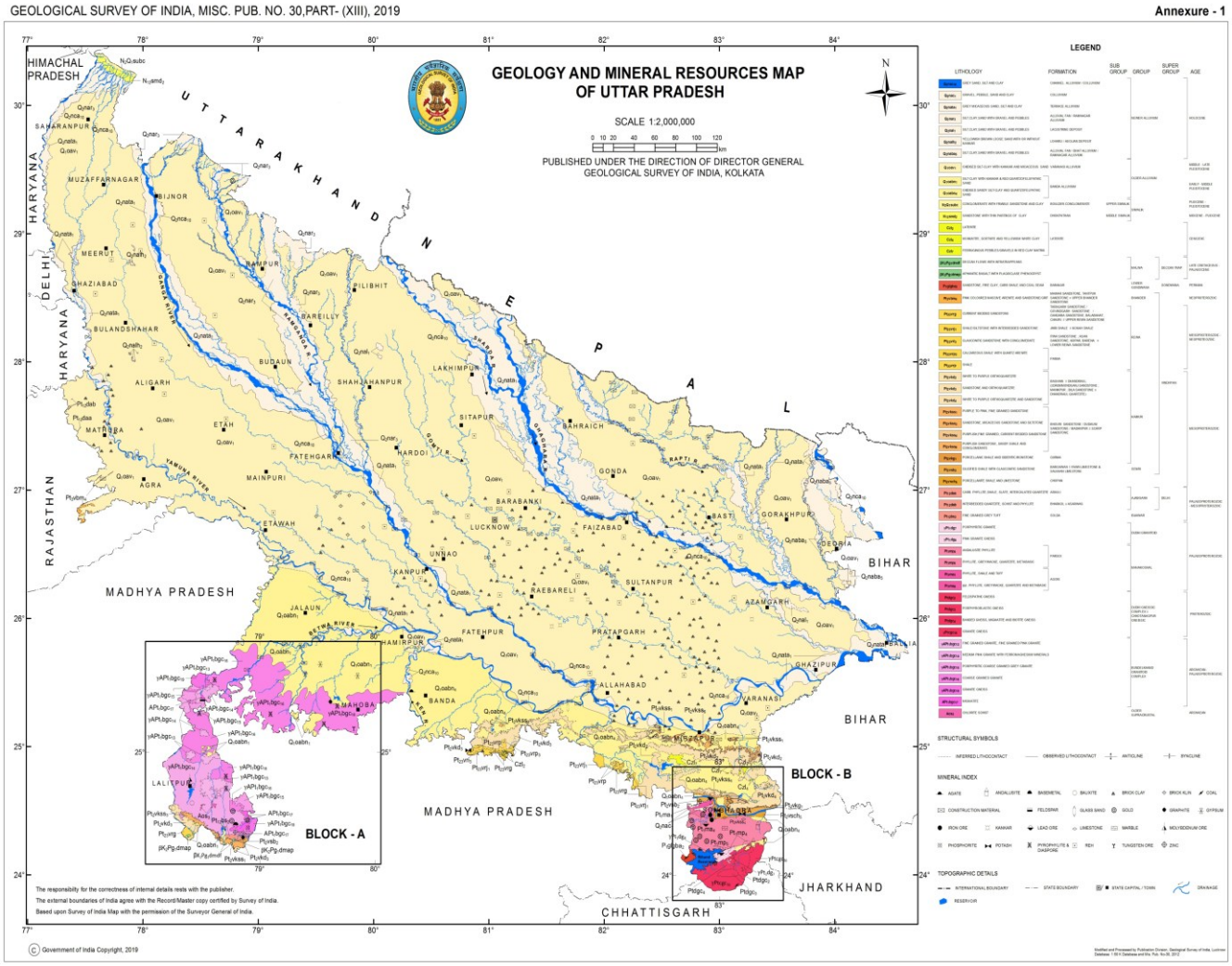


Figure 2 Geological Map of Uttar Pradesh (Geological Survey of India MISC. PUB. NO. 30,PART-(XIII), 2019

These alluvial deposits are of fluvial origin and have been transported and deposited by the Yamuna River and its tributaries over geological time. The deposits are generally unconsolidated to semi-consolidated and extend to considerable depths. The subsurface conditions are typically heterogeneous, with interlayering of silty sand (SM), silt (ML), and occasional clay (CI-CL).

Based on regional geology, the area can be broadly classified into:

- **Newer Alluvium**: Found near active and old floodplains, consisting of loose to medium dense soils.
- **Older Alluvium:** Slightly compacted deposits with relatively higher density.

The rock formations of the Delhi Supergroup are known to exist at significant depths; however, these are not encountered within the scope of the present geotechnical investigation.

1.4.2 Geological Characteristics (Engineering Perspective)

The regional geological conditions indicate:

- **Predominance of** silty sand (SM) deposits
- **Occurrence of** inorganic silt (ML) layers **at varying depths**
- **Occasional presence of** clay (CI-CL) layers
- **Gradual increase in density with depth**
- Thick deposits of unconsolidated alluvial soils

The area falls under **Seismic Zone IV** as per IS 1893, indicating a zone of high seismic risk. The alluvial nature of soils, combined with groundwater conditions, may influence seismic response and foundation behaviour.

1.4.3 Historical Development of Noida

Noida (New Okhla Industrial Development Authority) was established in 1976 under the Uttar Pradesh Industrial Area Development Act as a planned urban extension of Delhi within the National Capital Region (NCR).

The Depot Station to Boraki Multi-Modal Transport Hub (MMTH) stretch traverses rapidly developing suburban and peri-urban areas comprising transportation infrastructure, industrial developments, open land parcels, and proposed urban expansion zones, thereby necessitating a detailed geotechnical evaluation for the safe and economical design of the proposed metro structures.

1.4.4 Hydrological Setting

a) Surface Water Regime

The project area falls within the Yamuna River basin. The Yamuna River is the primary drainage system controlling the regional hydrology, while the Hindon River acts as a secondary drainage channel in the vicinity.

The terrain is generally flat with a gentle slope, typical of alluvial plains, facilitating natural drainage towards the Yamuna River.

b) Rainfall Pattern

The average annual rainfall in the region is approximately **750–800 mm**, with the majority (about 85–90%) occurring during the monsoon season (June to September).

This seasonal rainfall plays a significant role in groundwater recharge and influences the fluctuation of the water table.

c) Groundwater Conditions

Groundwater in the region occurs under both phreatic (unconfined) and confined conditions within the alluvial deposits.

- **Typical depth to groundwater:** ~13 m to 15 m below ground level (bgl) **(subject to seasonal variation)**
- **Aquifer system:** Multi-layered, consisting of sand-dominated strata
- **Groundwater extraction:** Primarily through bore wells and tube wells

The presence of sandy strata facilitates good permeability, while interbedded silt and clay layers may locally influence seepage and water retention.

1.4.5 Hydrogeological Implications

Based on the regional geology and hydrology, the following implications are relevant:

- **Sandy strata provide** good drainage and permeability
- **Interlayered ML/CL soils may lead to** localized water retention or perched water conditions
- **Groundwater fluctuations may affect** excavation and construction activities
- Alluvial deposits in seismic zones may have **liquefaction susceptibility** under certain conditions

1.4.6 Summary

The project corridor is underlain by thick alluvial deposits dominated by silty sand with varying density and occasional cohesive interlayers. Groundwater conditions and stratigraphic variability are typical of the Yamuna floodplain environment.

Overall, the geological and hydrological conditions are consistent with the findings of the geotechnical investigation and are suitable for foundation design with appropriate considerations.

2 GROUND INVESTIGATION BY BOREHOLE DRILLING

The ground investigation includes borehole drilling through soil strata. All in-situ testing has been conducted in accordance with relevant IS codes and the specifications detailed below.

2.1 Soil Boring

Soil boring is a key subsurface investigation method carried out in accordance with IS 1892:2021 to determine the soil profile and collect representative samples for geotechnical evaluation. Boreholes, typically 150 mm in diameter, are advanced using rotary drilling with mud circulation through all types of soils except rock. During the boring process, disturbed soil samples are collected at every 1.5 m interval, and undisturbed samples are obtained at every 3.0 m interval for detailed laboratory testing. Standard Penetration Tests (SPT) are also performed at 1.5 m depth intervals, as per the specifications, to evaluate the in-situ strength and stratification of the soil layers. The results obtained from soil boring form the basis for foundation design and other geotechnical analyses.

A summary of borehole details, including borehole identification, coordinates (Lat, Long), ground level at borehole location, date of commencement and completion of drilling, and termination depth, is presented in the table below.

Table 2 Summary of Field Borehole Drilling Activities

BH ID	Chainage	Field Activity Dates		Borehole Location Coordinates		Ground Level of Borehole	Groundwater Level	Termination Depth
-	km	Start Date	End Date	Latitude	Longitude	MSL	Mtr	Mtr
BH-01	0+031	17.10.2025	19.10.2025	28.492495	77.549987	207.05	17.00	30.00
BH-01A++	0+037	17.01.2026	19.01.2026	28.492532	77.550033	206.90	16.40	30.00
BH-02	0+124	17.10.2025	20.10.2025	28.493103	77.550661	206.73	17.50	30.00
BH-03	0+202	27.10.2025	29.10.2025	28.493316	77.551465	206.50	17.00	30.00
BH-03A++	0+267	20.01.2026	21.01.2026	28.493581	77.552057	206.63	16.50	30.00
BH-04	0+291	27.10.2025	29.10.2025	28.493736	77.552256	206.67	17.10	30.00
BH-05	0+410	30.10.2025	02.11.2025	28.494218	77.553316	206.49	14.60	30.00
BH-06	0+501	30.10.2025	01.11.2025	28.494662	77.554107	207.24	14.50	30.00
BH-07	0+622	02.11.2025	04.11.2025	28.495297	77.555105	207.65	13.40	30.00
BH-08	0+701	02.12.2025	07.11.2025	28.495697	77.555777	206.91	14.30	30.00
BH-08A**	0+734	04.12.2025	05.12.2025	28.496151	77.556112	206.58	14.30	30.00
BH-08B**	0+847	05.12.2025	06.12.2025	28.496073	77.557246	207.44	14.50	30.00
BH-09	0+802	08.11.2025	10.11.2025	28.496133	77.556640	206.45	13.77	30.00
BH-10	0+907	09.11.2025	14.11.2025	28.496682	77.557555	207.15	13.50	30.00
BH-11	1+004	10.11.2025	12.11.2025	28.497129	77.558403	207.09	14.70	30.00
BH-12	1+092	20-11-2025	22-11-2025	28.497567	77.559160	206.76	14.00	30.00
BH-13	1+214	19-11-2025	27-12-2025	28.498284	77.560110	206.32	13.40	30.00
BH-14	1+293	21-11-2025	24-11-2025	28.498549	77.560884	206.13	13.40	30.00
BH-15	1+392	25-11-2025	27-11-2025	28.499135	77.561661	205.64	13.80	30.00
BH-16	1+487	23-11-2025	25-11-2025	28.499733	77.562394	205.19	13.00	30.00

BH ID	Chainage	Field Activity Dates		Borehole Location Coordinates		Ground Level of Borehole	Groundwater Level	Termination Depth
-	km	Start Date	End Date	Latitude	Longitude	MSL	Mtr	Mtr
BH-17	1+587	26-11-2025	29-11-2025	28.500627	77.562682	205.36	13.00	30.00
BH-18	Location at site was not Accessible							
BH-19	Location at site was not Accessible							
BH-20	1+869	30-11-2025	01-12-2025	28.503221	77.562402	206.25	13.00	30.00
BH-21	1+925	03-12-2025	05-12-2025	28.503452	77.561412	206.16	13.00	30.00
BH-22	2+036	30-11-2025	02-12-2025	28.5040090	77.5600386	207.06	13.50	30.00
BH-23	2+116	02-12-2025	04-12-2025	28.5054190	77.5616740	205.26	13.00	30.00
BH-23A**	2+257	02-12-2025	03-12-2025	28.5065980	77.5609360	206.28	14.20	30.00
BH-23B**	2+190	02-12-2025	05-12-2025	28.5060360	77.5612790	206.94	13.00	30.00
BH-24	2+338	02-12-2025	03-12-2025	28.5070590	77.5602030	206.45	13.60	30.00
BH-25	2+404	28-11-2025	06-12-2025	28.5073080	77.5594560	206.00	14.20	30.00
BH-26	2+532	28-11-2025	30-11-2025	28.5081900	77.5586080	206.04	13.00	30.00
BH-27	2+586	27-11-2025	29-11-2025	28.5086540	77.5583970	205.97	13.00	30.00

Note:

- The chainages of the boreholes have been derived by plotting the drilled borehole locations with reference to the submitted drawing titled **"Plan and Profile (SSS/NMRC/NOIDA/Project/Boraki-R0)**
- **Marked boreholes have been drilled at locations corresponding to the proposed station entry and exit structures.
- ++Marked boreholes have been drilled as confirmentry boreholes.

The geological plan and profile illustrating borehole locations and the probable stratigraphy between boreholes are presented in **Appendix G** of this report. The interpreted stratification between boreholes has been developed based on the lithological observations recorded in the boreholes and the strata encountered during the drilling investigations. However, the subsurface conditions may vary locally, and the actual stratigraphy at site may differ from the interpreted profile.

2.1.1 Disturbed and Undisturbed Sample Collection

Undisturbed Samples Undisturbed soil samples in 100mm Ø Shelby tubes were collected in the thin-walled sampling tubes in accordance with IS:2132-1986 at regular interval for finding shear parameters, field density, moisture content etc. of soil. The sampling tube was connected to the rod by jarring link in case of 100mm Ø tubes. 'A' drill rods were connected by suitable adaptor with ball check value. Before lowering the sampler, the borehole was properly cleaned. Sampling tube was pushed into the borehole by pressure hammering as per the soil stiffness. The sampling tubes were waxed immediately after removal.



Figure 3 Thin Wall Shelby Tube Sampler



Figure 4 Split Spoon Sampler (SPT)

In case of medium to coarse grained, non-cohesive sand samples, where sampling is unsuccessful, Standard Penetration Tests was carried out after cleaning the borehole. However, **Disturbed Samples** from shell or split spoon samplers were also collected in polythene bags with proper levels during drilling for finding index properties of the soil.

Details of boring with soil/rock profile, SPT values along with sampling details are given in the respective bore logs in the appendix of the report.

In case of medium to coarse grained, non-cohesive sand or highly weathered rock where core recovery not possible where sampling is unsuccessful, disturbed sample was taken from the cleaning the borehole. Disturbed samples were also collected in polythene bags with proper labels during drilling for finding index properties of the samples.

2.1.2 Standard Penetration Test: (SPT)

The standard penetration tests were performed in accordance with IS: 2131:1981. The test was carried out by using standard split spoon sampler connected to 'A' road and driving by 45cm using 63.5kg hammer freely dropped from 75cm.

Before testing, the borehole was cleaned properly and Split spoon sampler was centrally seated in the borehole. In case of SPT to be conducted below water table, care was taken to keep casing position above the borehole depth. The water level in borehole is maintained above or at least at the water table.

SPT 'N'-Values are described as below.

- The number of blows for each 15cm of penetration of the split spoon sampler is recorded.
- The blows required to penetrate the initial 15cm of the split spoon for seating the sampler is ignored due to the possible presence of loose materials or cuttings from the drilling operation.
- The cumulative number of blows required to penetrate the balance 30cm of the 45cm split spoon sampler is termed the SPT value or the 'N' value. For example, a SPT value reported as "20" means that 20 blows were imparted to penetrate the split spoon sampler by the last 30 cm.
- Where the number of blows required to penetrate the balance 30 cm of the split spoon sampler exceeds 100, the number of blows is presented along with the corresponding penetration. For example, an SPT value reported as "101 / 5 cm" means that 101 blows were imparted to penetrate the split spoon sampler by 5 cm after the first 15 cm initial (seating) penetration.
- Where refusal (N>100) to further penetration of the split spoon sampler is encountered in the first 15 cm of seating penetration itself, SPT test could not be completed and "Ref" is indicated in the bore logs, along with the penetration achieved. For example, an SPT value reported as "Ref / 5 cm" means that more than 100 blows were imparted to penetrate the split spoon sampler by a total of 5 cm only, and the 15 cm seating penetration could not be achieved.

SPT 'N' values are correlated in the Table 3 below with the relative density of granular strata (sandy strata) and the consistency of cohesive strata, as referenced in BS 5930 (1999).

Table 3 SPT 'N" Value Correlation with Relative Density and Consistency

Correlation for Clay/Plastic Silt		**Correlation for Sand/Non-Plastic Silt**	
Consistency of Clays	**Penetration Value (Blows)**	**Relative Density of Sand**	**Penetration Value (Blows)**
Very Soft	0 to 2	Very Loose	0 to 4
Soft	3 to 4	Loose	5 to 10
Medium Stiff	5 to 8	Medium	11 to 30
Stiff	9 to 16	Dense	31 to 50
Very Stiff	17 to 32	Very Dense	Above 50
Hard	Above 32	-	-

2.2 Additional In-Situ Field Testing

A brief methodology for test is outlined in the subsections, while detailed evaluations and results are provided in the relevant annexures of this report.

2.2.1 Field Permeability Test

The field permeability test by falling head method, as per Clause 3.3 of IS 5529 (Part 1): 2013, is conducted by first drilling the borehole to the required depth and thoroughly cleaning it to remove loose cuttings and debris.

A suitable permeameter casing is then installed, ensuring proper sealing around the test section to prevent leakage. The borehole is filled with clean water and allowed to stand until the surrounding soil becomes fully saturated. The coefficient of permeability is then calculated using the relevant formula specified in the code, considering borehole size and test section length.

$$K = \left(d^2/(8L)\right)\log_e(L/R)\left(\log_e(h_1/h_2)/(t_2 - t_1)\right)$$

Where,

K = coefficient of permeability;

d = diameter of intake pipe (stand pipe);

L = length of test zone;

h_1 = head of water in the stand pipe at time (t_1, above piezometeric surface;)

h_2 = head of water in the stand pipe at the time (t_2, above piezometeric surface)

R = radius of hole.

After completion, the casing is removed if required, the borehole is backfilled, and all observations and results are documented.

3 LABORATORY TESTING

Laboratory testing was conducted in our NABL-accredited facility**,** adhering to the quality management system in compliance with ISO/IEC 17025:2017 standards. Selected soil, groundwater and rock samples were subjected to laboratory tests to determine their physical and engineering properties. All testing procedures strictly followed the relevant Indian Standard (IS) codes, ensuring accuracy, reliability, and consistency in the results.

Tests were conducted on selected soil and groundwater samples obtained from the boreholes, as summarized in Table 4 below.

Table 4 Laboratory Tests and Relevant IS Standard of Test

Laboratory Test	IS Code Referred
Soil	
Bulk Density	By calculations
Natural Moisture Content	IS 2720 (Part-2): 1973
Specific Gravity	IS 2720 (Part-3): 1980
Grain Size Analysis & Hydrometer	IS 2720 (Part-4): 1985
Liquid Limit and Plastic Limit	IS 2720 (Part-5): 1985
Direct Shear Test	IS 2720 (Part-13): 1986
Consolidation Test	IS 2720 (Part 15): 1986
Triaxial Compression Test	IS 2720 (Part 11): 1993
Chemical	
Chemical Test of Groundwater	IS 3025 Relevant Part
Chemical Test of Soil Sample	IS 2720 Relevant Part

3.1 Laboratory Testing of Soil Sample

3.1.1 Grain Size Analysis

Testing procedure generally confirms to IS: 2720 (Part 4) - 1985. Both sieve analysis and hydrometer analysis has been carried out. Sieve Analysis: Sieve analysis for coarser fractions has been done by dry sieving, while wet sieving method has been followed for soil fractions with appreciable amount of clay. Sieving has been done using a sieve shaker by passing through the following IS sieves. 4.75mm, 2.36 mm, 1.70 mm, 1.40 mm, 1.00 mm, 600 microns, 425 microns, 100 microns and 75 microns.

3.1.2 Atterberg's Limits

Liquid Limit: Testing is done as per IS: 2720 (Part 5) - 1985. About 200gm of soil sample passing through 425 microns IS sieve is mixed thoroughly with distilled water on the flat glass to form a uniform paste. The paste generally has a consistency that will require 30 to 35 drops of the cup to cause the required closure of standard groove. The ready-mix soil is placed in the Casagrande cup in such a way to form a depth of 1cm at the centre of the cup and then central groove of 12mm is made using standard grooving tool. The cup is fitted and dropped by turning the crank at the rate of 2 revolutions per second until the two halves of the soil close. The number of drops required to make the groove close for the length of 12mm is recorded. A portion of the sample is then taken out for water content determination and the water content corresponding to 25 blows represents the liquid limit.

Plastic Limit: About 15gms of oven dried soil passing through 425 microns' sieve is mixed with sufficient quantity of water such that the soil mass becomes plastic enough to be easily shaped into a ball. A portion of this ball is rolled on a glass plate with the palm of the hand into a thread of uniform dia of 3 mm. The water content represents the plastic limit.

3.1.3 Natural Moisture Content

A moisture cup is loosely filled with soil and weighed with lid. It is then kept in oven with lid removed and maintained at temperature of the oven at 110 ± 5°C for 24 hours. The lid of the container is replaced and the dry weight found out. The percentage of water content shall be calculated using the formula.

$$W = \frac{W_2 - W_3}{W_3 - W_1} \text{x } 100$$

Where,

W = Water content in %,

W_2 = Weight of container with lid with wet soil in g,

W_3 = Weight of container with lid with dry soil in g,

W_1 = Weight of container with lid in g.

3.1.4 Bulk and Dry Density

Test procedure shall be as per IS: 2720 (Part 7) - 1987. The unit weight of soil in g/cc is its weight per unit volume. Soil is filled in container and its weight determined. Knowing the volume of container, the ratio of weight to volume represents bulk density. The soil is then oven dried and weighed and dry density yd(g/cc) is computed using formula.

$$Y_d = \frac{Y_b}{(1+W)}$$

Where,

Y_d= Dry density in g/cc,

Y_b = Bulk density in g/cc,

W = Natural moisture content in %.

3.1.5 Specific Gravity

Test procedure shall be as per IS: 2720 (Part 3/Section 1) - 1987 for fine-grained soils. The specific gravity of soil solids can be defined as the weight of given volume of soil particles to the weight of equal volume of distilled water. This term is used in relating weight of soil to its volume. Specific gravity is found out using standard specific gravity bottle of 50 ml capacity by weighing empty bottle (W_1), bottle + dry soil (W_2), bottle + dry soil + water (W_3), bottle + water (W_4).

$$G = \frac{(W_2 - W_1)}{((W_2 - W_1) - (W_3 - W_4))}$$

Where,

G = Specific gravity of the soil solid,

W_1 = Weight of density bottle in g,

W_2 = Weight of bottle and dry soil in g,

W_3 = Weight of bottle, soil and water in g,

W_4 = Weight of bottle when full of water only in g.

3.1.6 Direct Shear Test

Test procedure shall be as per IS: 2720 (Part 13) - 1986. In this test the soil specimen is confined in a square metal box split into two halves horizontally. Perforated metal plates and pores stones are placed above and below the specimen to allow free drainage. After applying vertical load, the soil is gradually sheared by applying horizontal force, which makes the two halves of the box move relative to each other. The shear is applied at a constant strain rate and measured in a proving ring. Vertical deformation is measured with dial gauge. Minimum of three specimens are tested and the graph drawn with normal stress in 'X' axis and shear stress in 'Y' axis. From the straight-line plot, values of *c* and ϕ are measured.

3.1.7 Consolidation Test

The One-Dimensional Consolidation Test is conducted as per IS 2720 (Part 15): 1986 to determine the rate and magnitude of consolidation of soil under controlled loading conditions. A representative undisturbed or remoulded soil sample is placed in a consolidometer ring, ensuring minimal disturbance. The sample is saturated and positioned between porous stones within a rigid loading frame to allow vertical drainage. An initial seating load is applied, followed by successive increments of load, typically following a logarithmic sequence, and each load is maintained until primary consolidation is deemed complete (determined by dial gauge readings). The settlement of the specimen is recorded over time using a dial gauge or electronic displacement sensor. The coefficient of consolidation (C_v) and compression index (C_c) are calculated from the data, which helps in predicting settlement behaviour of soil under field conditions.

3.1.8 Triaxial Compression Test

The triaxial compression test is used to determine the shear strength parameters of soil under controlled drainage and confining pressure conditions. A cylindrical soil specimen, usually 38 mm in diameter and 76 mm in height, is enclosed in a rubber membrane and placed inside a triaxial cell. The sample is first saturated using back pressure techniques to ensure full saturation, confirmed by achieving a Skempton's B-value close to 1.0. Once saturated, the specimen is consolidated under a predetermined confining pressure, and volume changes are monitored until consolidation is complete. After consolidation, the specimen is sheared by applying axial stress at a constant rate of strain (commonly 0.5–2% per minute). Depending on the drainage conditions during the test, it can be performed as unconsolidated undrained (UU), consolidated undrained (CU), or consolidated drained (CD). In the CU test, pore water pressures are measured to allow for the determination of effective stress parameters. During shearing, axial load, deformation, and pore pressures are recorded to develop stress-strain curves and plot Mohr's circles, from which the cohesion and angle of internal friction of the soil are determined.

4 SUBSURFACE STRATIGRAPHY AND GEOTECHNICAL PROPERTIES OF SOIL

Subsurface profiles have been developed based on the analysis of samples collected from the exploratory boreholes and the corresponding laboratory test results. The average parameters of each stratum, as determined from laboratory testing, are presented strata-wise.

The average soil properties for each stratum, representative of the investigated area, are summarized below. Additionally, the results of the Standard Penetration Tests (SPT) conducted within each identifiable layer have been documented, with the “N” values presented in the borehole logs.

4.1 Subsurface Stratification

The subsurface stratification along the proposed alignment has been established based on the interpretation of borehole data obtained from the geotechnical investigation carried out at various locations along the corridor.

The boreholes have been planned and executed along the alignment at regular intervals, and the stratification has been interpreted considering the borehole locations with respect to the corresponding chainages. The classification of soil strata has been carried out based on field observations during drilling, in-situ test results, and laboratory test data.

Based on the analysis of lithological logs of individual boreholes, the subsurface profile has been generalized by grouping boreholes exhibiting similar stratification patterns and soil characteristics. Accordingly, the entire alignment has been divided into different zones-based borehole locations and corresponding chainages.

Table 5 presents the zone-wise summary of subsurface conditions along the alignment based on borehole locations and chainage.

Table 5 Summary of Zone Divided for Stratification

Section	Zone	Chainage (km)	Boreholes	Predominant Soil	Intermediate Layer (≈5–20 m)	Deep Layer (>20 m)
4.1.1	Zone 1	0+000 to 1+004	BH-01 to BH-11	CL + ML	Stiff to Hard CL/ML strata	Dense to Very Dense SM
4.1.2	Zone 2	1+004 to 1+925	BH-12 to BH-21	CL + ML + CI	Interlayered CL, CI & ML	Dense to Very Dense SM
4.1.3	Zone 3	1+925 to 2+586	BH-22 to BH-27	ML Dominant	Thick Very Stiff to Hard ML strata	Dense to Very Dense SM

For ease of interpretation and comparison, a consolidated zone-wise summary based on borehole data and chainage is presented in subsection 4.1.1 to 4.1.3, highlighting the predominant soil type and stratification characteristics.

4.1.1 Zone 1: CH: 0+000 km to 1+004 km (BH-01 to BH-11)

The subsurface conditions within this stretch are predominantly characterized by cohesive alluvial deposits comprising inorganic silt (ML), inorganic clay of low plasticity (CL), and inorganic clay of intermediate plasticity (CI), underlain by silty sand (SM) strata at deeper levels. A thin layer of topsoil is encountered at the surface across all boreholes.

The shallow to intermediate strata, generally extending up to depths of approximately 17 m to 25 m below ground level, predominantly consist of stiff to hard inorganic silt (ML) and stiff to very stiff inorganic clay (CL/CI) with varying sand and gravel content. These strata exhibit moderate to high consistency and form the major subsurface deposit within the investigated depth range. Localized variation in clay plasticity and gravel content is observed across the boreholes.

The deeper strata, generally below depths of about 22 m to 25 m, comprise medium dense to very dense silty sand (SM) with occasional gravel content. This layer is relatively consistent across the boreholes and forms a competent bearing stratum suitable for pile foundation support.

The generalized subsurface stratification interpreted from the borehole data is summarized in the table below.

Table 6 Subsurface Stratification (BH-01 to BH-11)

Strata Type	Description	Top Depth Range (m)	Bottom Depth Range (m)	Thickness Variation (m)	Occurrence
Top Soil	Organic surface layer	0.00	0.75	~0.75	All Boreholes
Inorganic Silt (ML)	Stiff to Hard	0.75 – 10.00	17.25 – 25.00	Variable	BH-01 to BH-09
Inorganic Clay (CL)	Stiff to Very Stiff	8.25 – 17.25	19.00 – 24.25	Variable	BH-01 to BH-11
Inorganic Clay (CI)	Stiff	0.75 – 10.00	5.25 – 10.00	3.00 – 9.25	BH-07 to BH-10
Silty Sand (SM)	Medium Dense to Dense	20.25 – 25.00	26.25 – 30.00	Variable	BH-01, BH-04, BH-07, BH-10
Silty Sand (SM)	Dense to Very Dense	22.00 – 26.25	30.00	3.75 – 8.00	BH-01 to BH-11



Figure 5 Borehole Location Depot Station to Boraki MMTH (CH: 0+000 km to 1+004 km)

4.1.2 Zone 2: CH: 1+004 km to 1+925 km (BH-12 to BH-21)

The subsurface conditions within this stretch are predominantly characterized by cohesive alluvial deposits comprising inorganic clay of low plasticity (CL), inorganic clay of intermediate plasticity (CI), and inorganic silt of low compressibility (ML), underlain by dense to very dense silty sand (SM) strata at deeper levels. A thin layer of topsoil is encountered at the surface across all boreholes.

The shallow to intermediate strata, generally extending up to depths of approximately 17 m to 25 m below ground level, predominantly consist of stiff to hard inorganic clay (CL/CI) and inorganic silt (ML) with varying sand, silt, and gravel content. The cohesive strata exhibit moderate to high consistency and form the dominant subsurface deposit within the investigated depth range. Localized interbedding of ML and CL layers is observed, indicating variation in depositional conditions along the alignment.

Dense to very dense silty sand (SM), occasionally containing gravel, is generally encountered below depths of about 23 m to 27 m. In certain boreholes, medium dense silty sand layers are encountered at intermediate depths; however, the deeper dense to very dense silty sand forms the principal competent bearing stratum suitable for pile foundation support.

The generalized subsurface stratification interpreted from the borehole data is summarized in the table below.

Table 7 Subsurface Stratification (BH-12 to BH-21)

Strata Type	Description	Top Depth Range (m)	Bottom Depth Range (m)	Thickness Variation (m)	Occurrence
Top Soil	Organic surface layer	0.00	0.75	~0.75	All Boreholes
Inorganic Clay (CL)	Stiff to Hard	0.75 – 14.25	17.25 – 24.25	Variable	BH-12 to BH-21
Inorganic Clay (CI)	Medium Stiff to Hard	0.75 – 8.25	5.25 – 14.25	3.00 – 6.00	BH-17, BH-20, BH-21
Inorganic Silt (ML)	Stiff to Hard	0.75 – 17.25	19.00 – 27.25	Variable	All Boreholes
Silty Sand (SM)	Medium Dense	7.00 – 10.00	10.00 – 13.00	3.00	BH-16
Silty Sand (SM)	Dense to Very Dense	23.25 – 27.25	30.00	2.75 – 6.75	All Boreholes

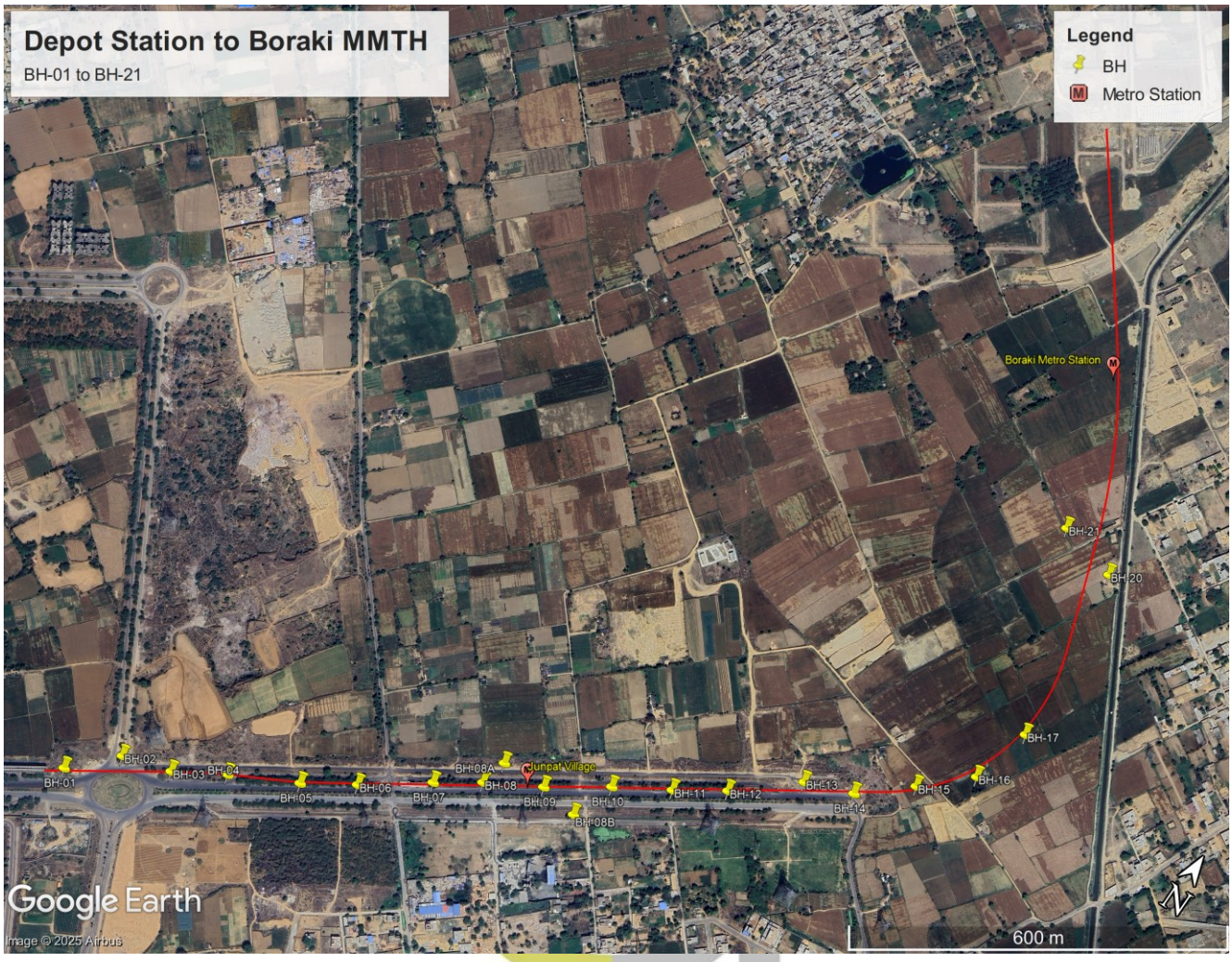


Figure 6 Borehole Location Depot Station to Boraki MMTH (CH: 1+004 km to 1+925 km)

4.1.3 Zone 3: CH: 1+925 km to 2+586 km (BH-22 to BH-27)

The subsurface conditions within this stretch are predominantly characterized by cohesive alluvial deposits comprising inorganic silt of low compressibility (ML) and localized inorganic clay of intermediate plasticity (CI), underlain by dense to very dense silty sand (SM) strata at deeper levels. A thin layer of topsoil is encountered at the ground surface across all boreholes.

The shallow to intermediate strata, generally extending up to depths of approximately 15 m to 28 m below ground level, predominantly consist of very stiff to hard inorganic silt (ML) with varying sand, gravel, and occasional clay content. Localized layers of inorganic clay of intermediate plasticity (CI) are encountered in boreholes BH-22 and BH-26 at shallow depths. These cohesive strata exhibit high consistency and form the dominant subsurface deposit within the investigated depth range.

Dense to very dense silty sand (SM), with occasional gravel content, is encountered at deeper levels, generally below depths of about 16 m to 28 m. In certain boreholes, interbedded silty sand and inorganic silt layers are observed, indicating localized variation in depositional conditions. The dense to very dense silty sand strata form a competent bearing layer suitable for pile foundation support.

The generalized subsurface stratification interpreted from the borehole data is summarized in the table below.

Table 8 Subsurface Stratification (BH-22 to BH-27)

Strata Type	Description	Top Depth Range (m)	Bottom Depth Range (m)	Thickness Variation (m)	Occurrence
Top Soil	Organic surface layer	0.00	0.75	~0.75	All Boreholes
Inorganic Clay (CI)	Stiff	0.75 – 5.25	4.00 – 5.25	3.25 – 4.50	BH-22, BH-26
Inorganic Silt (ML)	Very Stiff to Hard	0.75 – 16.00	18.25 – 28.00	Variable	All Boreholes
Inorganic Silt (ML)	Hard with Sand/Gravel/Clay	4.00 – 21.25	22.00 – 30.00	Variable	BH-23B, BH-24, BH-25, BH-27
Silty Sand (SM)	Medium Dense to Dense	8.25 – 23.25	16.00 – 28.00	Variable	BH-24, BH-25, BH-26
Silty Sand (SM)	Dense to Very Dense	15.25 – 28.00	30.00	2.00 – 10.75	All Boreholes

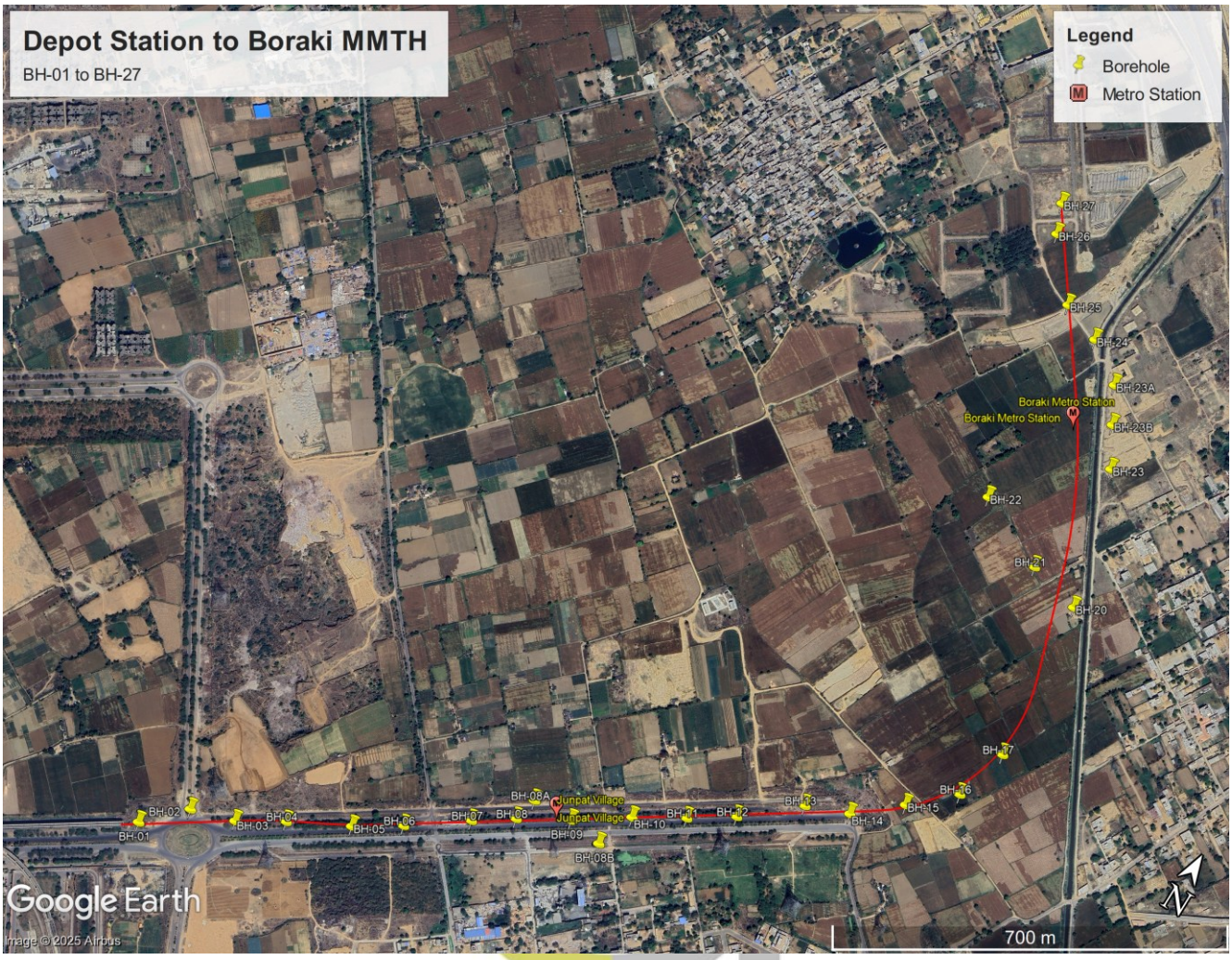


Figure 7 Borehole Location Depot Station to Boraki MMTH (CH: 1+925 km to 2+586 km)

4.2 Geotechnical Properties of Soil

The geotechnical parameters for the subsurface strata have been evaluated based on the results of field and laboratory testing carried out on soil samples obtained from the boreholes. The parameters have been derived in accordance with relevant Indian Standard (IS) codes and standard geotechnical engineering practices.

The field investigations include Standard Penetration Tests (SPT) conducted at regular depth intervals, which provide an indication of the in-situ soil density and strength characteristics. Laboratory tests were performed on representative disturbed and undisturbed samples to determine index and engineering properties such as grain size distribution, Atterberg limits, natural moisture content, unit weight, shear strength parameters, and compressibility characteristics.

Based on the test results, the soil strata have been classified as per the IS Classification System and appropriate design parameters have been adopted for each soil layer. Where required, the test results have been reviewed, and representative or conservative values have been considered to account for variability in subsurface conditions.

The derived geotechnical parameters have been used for the analysis of bearing capacity, settlement assessment, and foundation design considerations for the proposed structures. The adopted design parameters are summarized in the subsequent sections of this report.

4.2.1 Geotechnical Properties of soil - Zone 1: CH: 0+000 km to 1+004 km (BH-01 to BH-11)

Table 9 Geotechnical Properties of soil - Zone 1

SR No.	Layer	Classification	N -SPT	N -SPT (Corrected)	Gravel (%)	Sand (%)	Silt & Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Moisture Content (%)	Bulk Density (gm/cm^3)	Specific Gravity	Cohesion (c') (kg/cm$_2$)	Friction Angle (º)
1	Top Soil	TS	-	-	1.4	12.2	86.5	-	-	-	-	-	-	-	-
2	Stiff, Inorganic Clay of intermediate plasticity	CI	12	14	1.0	13.0	86.0	37	18	17	17.34	16.0	2.48	0.16	17.5
3	Stiff, Inorganic Clay of Low Compressibility	CL	14	9	4.7	14.5	80.8	29	16	13	20.7	17.6	2.47	0.15	22
4	Stiff to Very Stiff, Inorganic Clay of Low Compressibility	CL	23	14	4.8	7.0	88.2	31	16	15	21.0	17.9	2.53	0.16	22
5	Very Stiff to Hard, Inorganic Clay of Low Compressibility	CL	19	16	5.2	8.8	86.0	32	17	15	20.0	18.5	2.57	-	-
6	Stiff, Inorganic Silt of Low Compressibility	ML	14	13	6.1	13.6	80.3	30	NP	NP	15.4	16.4	2.62	0.06	25
7	Very Stiff to Hard, Inorganic Silt of Low Compressibility	ML	36	21	4.5	18.5	77.0	26	NP	NP	19.3	17.7	2.54	0.08	28
8	Medium-dense to dense, silty sand	SM	38	18	3.8	54.0	42.2	27	NP	NP	19.6	19.0	2.59	0.01	30
9	Dense to very dense, silty sand	SM	54	22	5.5	53.4	41.1	26	NP	NP	21.0	19.5	2.58	0.03	32

4.2.2 Geotechnical Properties of soil - Zone 2: CH: 1+004 km to 1+925 km (BH-12 to BH-21)

Table 10 Geotechnical Properties of soil - Zone 2

SR No.	Layer	Classification	N -SPT	N -SPT (Corrected)	Gravel (%)	Sand (%)	Silt & Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Moisture Content (%)	Bulk Density (gm/cm^3)	Specific Gravity	Cohesion (c') (kg/cm^2)	Friction Angle (°)
1	Very stiff to Hard, brownish, fine grained Inorganic Clay of Intermediate plasticity with gravel (CI)	CI	37	37	8.2	173	74.5	38	19	19	16.4	1.80	2.69	0.15	26
2	Medium stiff, yellow to brownish, fine grained Inorganic Clay of Intermediate plasticity with silt and sand (CI)	CI	8	9	1.2	6.9	91.9	37	19	18	19.6	1.60	2.68	0.18	21
3	Stiff to Very Stiff, yellow to brownish, fine grained Inorganic Clay of low plasticity with gravel (CL)	CL	19	16	3.7	12.1	84.2	31	17	14	19.9	1.72	2.56	0.13	25
4	Very Stiff to Hard, yellow to brownish, fine grained Inorganic Clay of low plasticity with silt and sand (CL)	CL	38	21	3.7	7.3	89.0	31	17	14	20.1	1.82	2.56	0.12	26
5	Medium stiff to Stiff, brownish, fine grained inorganic silt of low compressibility with sand (ML)	ML	13	13	1.2	8.6	90.2	25	NP	NP	20.7	1.63	2.41	0.11	22
6	Stiff to Very Stiff, yellow to brownish, fine grained inorganic silt of low compressibility with sand and gravel (ML)	ML	18	15	3.9	16.9	79.2	27	NP	NP	20.6	1.70	2.53	0.13	24
7	Very stiff to Hard, brownish, fine grained inorganic silt of low compressibility with sand (ML)	ML	52	33	1.7	15.1	83.2	26	NP	NP	20.7	1.96	2.57	0.06	30
8	Medium dense, brownish to grey, fine-grained silty sand (SM)	SM	29	26	0.6	51.2	51.8	23	NP	NP	25.7	-	2.41	0.08	27
9	Dense, brownish to grey, fine-grained silty sand with gravel (SM)	SM	38	18	11.4	54.3	34.3	25	NP	NP	18.9	1.92	2.53	0.00	30
10	Dense to very dense, brownish to grey, fine-grained silty sand (SM)	SM	66	28	7.2	50.8	42.0	25	NP	NP	20.1	2.09	2.61	0.00	31

4.2.3 Geotechnical Properties of soil - Zone 3: CH: 1+925 km to 2+586 km (BH-22 to BH-27)

Table 11 Geotechnical Properties of soil - Zone 3

SR No.	Layer	Classification	N -SPT	N -SPT (Corrected)	Gravel (%)	Sand (%)	Silt & Clay (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Moisture Content (%)	Bulk Density (gm/cm3)	Specific Gravity	Cohesion (c') (kg/cm2)	Friction Angle (º)
1.	Stiff, yellowish, fine grained Inorganic Clay of Intermediate plasticity with gravel (CI)	CI	11	13	2.3	6.9	90.8	37	19	18	17.36	1.68	2.58	0.11	25
2.	Stiff to very stiff, Brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML)	ML	14	16	1.0	20.8	78.2	26	NP	NP	20.53	1.72	2.59	0.11	27
3.	Very stiff, yellow to Brownish, fine grained inorganic silt of low compressibility with sand (ML)	ML	23	21	5.4	18.5	76.1	27	NP	NP	20.22	1.93	2.63	0.07	28
4.	Very stiff to hard, brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML)	ML	45	31	2.6	23.6	73 .8	26	NP	NP	19.70	1.92	2.61	0.06	29
5.	Hard, yellow to brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML)	ML	56	33	6.1	20.4	73.5	26	NP	NP	22.13	1.95	2.62	0.05	31
6.	Medium dense to dense, brownish, fine-grained silty sand with gravels (SM)	SM	37	21	5.1	46.9	48.0	25	NP	NP	20.22	1.76	2.66	0.09	27
7.	Dense to very dense, brownish, fine-grained silty sand with gravel (SM)	SM	75	35	3.9	53.4	42.7	26	NP	NP	19.19	2.04	2.60	0.06	31

4.3 Chemical Test Results of Soil and Groundwater

Chemical tests on selected soil and groundwater samples were carried out to evaluate the aggressiveness of the subsurface environment towards concrete and steel. The tests included determination of pH, sulphate content, and chloride content in accordance with relevant IS and BS standards.

The soil samples tested along the alignment indicate pH values ranging from approximately 7.03 to 8.66, representing neutral to moderately alkaline soil conditions. The sulphate content in soil varies from about 0.013% to 0.046%, while chloride content ranges from approximately 0.010% to 0.041%. The observed values indicate that the soil is generally non-aggressive to mildly aggressive towards buried concrete structures.

Groundwater samples indicate pH values ranging from approximately 6.68 to 7.43, which are within acceptable limits. The sulphate concentration in groundwater generally varies between about 298 mg/l and 974 mg/l, whereas chloride concentration ranges from approximately 239 mg/l to 9608 mg/l.

It is observed that groundwater samples from boreholes BH-01 to BH-11 exhibit comparatively high chloride concentrations, indicating localized aggressive groundwater conditions within this stretch. In the remaining alignment, chloride and sulphate concentrations are comparatively lower and within acceptable limits for normal reinforced concrete construction.

Overall, the chemical test results indicate that the subsurface environment along the project corridor is generally mild to moderately aggressive. Appropriate concrete grade, cement type, cover to reinforcement, and durability provisions as per IS 456:2000 shall be adopted during design and construction to ensure long-term durability of structures.

5 FOUNDATION ANALYSIS

An appropriate foundation for any structure should possess a sufficient margin of safety to prevent surpassing the bearing capacity of the supporting soils. Additionally, the vertical settlement caused by soil compression should remain within acceptable limits for the structure. We believe that following the recommendations provided here will ensure that the designed foundation meets these criteria.

5.1 Concepts for Foundation Analysis

5.1.1 Open Foundation on Soil

The assessment of bearing capacity for open foundations has been conducted following the broad guidelines outlined in IS: 6403 -1981.

The equation utilized for the bearing capacity is expressed as follows:

$$q_{net\,safe} = \frac{1}{F}\left[\,(c * N_c * s_c * d_c * i_c) + \left(q * (N_q - 1) * s_q * d_q * i_q\right) + \left(\frac{1}{2} * B * \gamma * N_\gamma * s_\gamma * d_\gamma * i_\gamma * W'\right)\right.$$

Where,

$q_{net\,safe}$ = Safe net bearing capacity of soil based on shear failure criterion,
F = Factor of safety, taken as 2.5 in accordance with IS: 1904 - 1986,
c = Cohesion
q = Overburden pressure,
B = Width of footing,
γ = Bulk unit weight of foundation soil,
W' = Water table correction factor,
N_c, N_q, N_γ = Bearing capacity factors,
s_c, s_q, s_γ = Shape factors
Continuous strip footing $s_c = s_q = s_\gamma = 1$,
Rectangular footing $s_c = s_q = \left(1 + 0.2 * \frac{B}{L}\right)$, $s_\gamma = \left(1 - 0.4 * \frac{B}{L}\right)$,
Square footing $s_c = 1.3$, $s_q = 1.2$, $s_\gamma = 0.8$,
Circular footing $s_c = 1.3$, $s_q = 1.2$, $s_\gamma = 0.6$,
d_c, d_q, d_γ = Depth factors
$d_c = 1 + 0.2 \tan\left(45 + \frac{\phi}{2}\right)\left(\frac{D}{B}\right)$,
For $\phi < 10$, $d_q = d_\gamma = 1$,
For $\phi > 10$, $d_q = d_\gamma = 1 + 0.1 \tan\left(45 + \frac{\phi}{2}\right)\left(\frac{D}{B}\right)$,
i_c, i_q, i_γ = inclination factors
$i_c = i_q = \left(1 - \frac{\alpha}{90}\right)^2$
$i_\gamma = \left(1 - \frac{\alpha}{\phi}\right)^2$
α = Inclination of the load at the vertical in degrees

The bearing capacity equation provided earlier has been applied with suitable values to calculate the secure net bearing capacity. These values underwent verification to assess the foundation settlement under the safe bearing pressure. The allowable bearing pressure has been determined as the lesser value between the two computed values: one derived from the bearing capacity shear failure criterion and the other computed based on the acceptable settlement criterion.

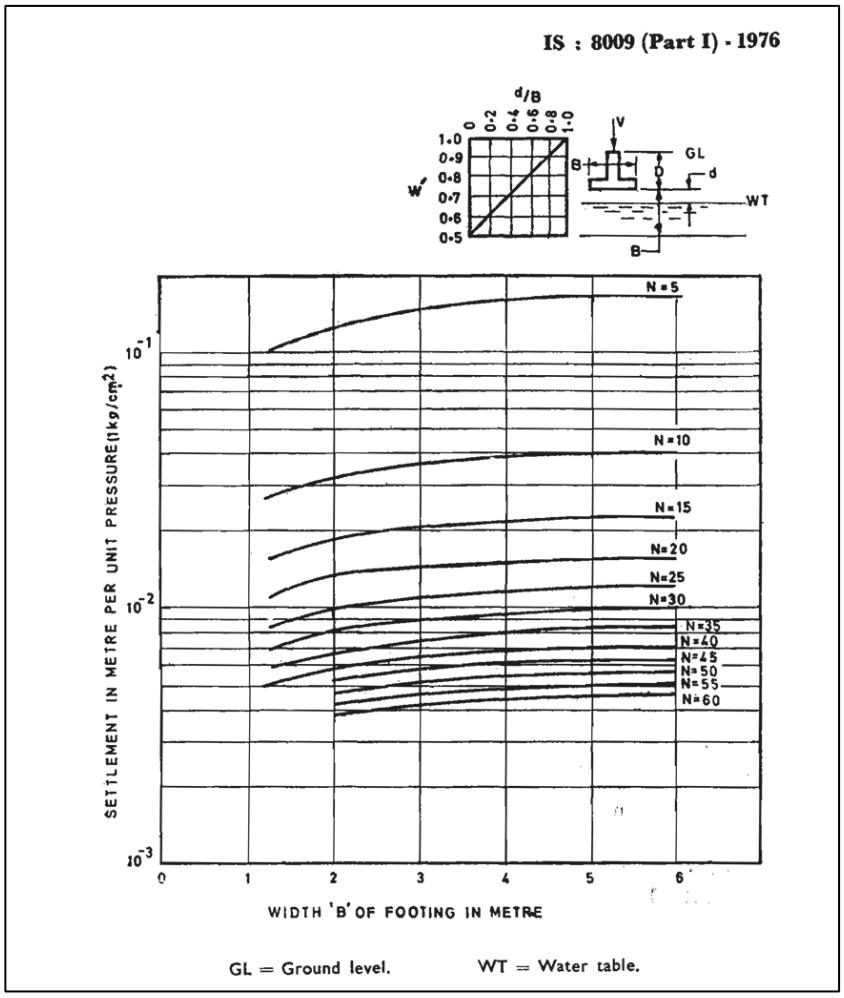


Figure 8 Settlement per Unit Pressure from Standard Penetration Resistance (Figure 9, IS 8009 (Part-1)-1976)

Settlement analysis was conducted based on SPT values following Clause 9.1.4 of IS 8009 (Part 1) - 1976. This was cross-verified against the settlement derived from classical analysis, which considers the sum of elastic and consolidation settlements.

5.1.2 Open Foundation on Rock

Analysis for allowable bearing capacity on rock has been done by following methods.

- Presumptive Bearing Pressure values (Table 2, Clause 5.2, IS: 12070 – 1987)
- Based on Rock Core Strength (Clause 6, IS: 12070 – 1987)
- Based on Rock Mass Rating (RMR) (Clause 5.3, IS: 12070 – 1987)

Presumptive values (As per IS: 12070 - 1987):

The classification of rock mass for assessing safe bearing pressure based on rock type is as follows:

Table 12 Net Safe Bearing Pressure (q_{ns}) based on Rock Classification

Sr No.	Material	q_{ns} (t/m^2)
1	Massive crystalline bedrock including granite, diarite, gnciss, trap rock	1000
2	Foliated rocks such as schist or slate in sound condition	400
3	Bedded limestone in sound condition	400
4	Sedimentary rock, including hard shales and sandstones	250
5	Soft or broken bedrock (excluding shale), and soft limestone	100
6	Soft shale	30

Reduction factors are to be applied on the above presumptive values for saturation and orientation of joints.

Based on Rock Core Strength (Clause 6, IS: 12070 – 1987):

As per IS 12070:1987, when the rock mass is sound and exhibits favorable characteristics, such as closed and favorably oriented discontinuities the safe bearing pressure (gross) for shallow foundations can be estimated using the uniaxial compressive strength of rock cores.

The methodology involves detailed identification and mapping of all discontinuities within the zone of influence of the foundation, along with evaluation of their mechanical behavior and the strength of the intact rock. If the rock surface is parallel to the base of the foundation and no tangential stress component exists, the safe bearing pressure (q_n) is determined by:

$$q_n = q_0 * N_j$$

Where:

- q_n = Safe bearing pressure (gross),
- q_o = Average uniaxial compressive strength of the rock core (MPa),
- N_j = Empirical coefficient based on spacing and condition of discontinuities

Rock Mass Rating (RMR) (Clause 5.3, IS: 12070 – 1987):

Analysis has been carried out using the RMR also known as Geo-mechanics classification by considering classification parameters and their ratings. Depending upon the quality of rock as assessed from the RMR values, the net safe bearing pressure are specified in IS: 12070 - 1987.

5.2 Load carrying Capacity Assessment of Pile Foundation

5.2.1 Pile Founded in Granular Soil

$$Q_u = A_p\left(1/2D\gamma N_\gamma + P_D N_q\right) + \sum_{i=1}^{n} K_i P_{Di} \tan\delta_i \, A_{si}$$

Where,

A_p = cross-sectional area of pile tip, in m^2
D = diameter of pile shaft, in m,
N_γ & N_q = bearing capacity factors depending upon the angle of internal friction, φ at pile tip,
P_D = effective overburden pressure at pile tip, in kN/m^2,
$\sum_{i=1}^{n}$ = summation for layers 1 to n in which pile is installed and which contribute to positive skin friction,
k_i = coefficient of earth pressure applicable for the ith layer,
P_{Di} = effective overburden pressure for the ith layer, in kN/m^2,
δ_i = angle of wall friction between pile and soil for the ith layer; and
A_{si} = surface area of pile shaft in the ith layer, in m^2,

The lateral load carrying capacity of pile has been computed based on Annex C of IS: 2911 (Part-I): 1979.

5.2.2 Pile Founded in Cohesive Soil

$$Q_u = A_p N_c c_p + \sum_{i=1}^{n} \alpha_i c_i A_{si}$$

A_p = cross-sectional area of pile tip, in m^2
D = diameter of pile shaft, in m,
N_c = bearing capacity factors, may be taken as 9,
C_p = average cohesion at pile tip, in kN/m^2,
C_i = average cohesion for the i^{th} layer, in kN/m^2,
$\sum_{i=1}^{n}$ = summation for layers 1 to n in which pile is installed and which contribute to positive skin friction,
α_i = adhesion factor depending on the consistency of soil for the i^{th} layer,
A_{si} = surface area of pile shaft in the ith layer, in m^2,

5.2.3 Bored Pile Socketed into Rock

The capacity of bored piles socketed into the rock has been computed in general accordance with IRC: 78-2014. The skin friction contribution above socket has been ignored. The total capacity of the pile is computed as the end bearing of the rock at the base plus the side socket shear along the length of the socket. The Methods used is as follows:

Method: 1

$$Q_u = R_e + R_{af} = K_{sp} * q_c * d_f * A_b + A_c * C_{us}$$

$$Q_{allow} = (R_e/3) + (R_{af}/6)$$

Q_u = Ultimate capacity of pile socketed into rock

Q_{allow} = Allowable capacity of pile

R_e = Ultimate end bearing

R_{af} = Ultimate side socket shear

K_{sp} = An empirical co-efficient whose value ranges from 0.3 to 1.2 as per the table below for the rocks where core recovery is reported, and cores tested for uniaxial compressive strength.

(CR+RQD)/2	K_{sp}
30%	0.30
100%	1.20

*** For intermediate values, K_{sp} shall be linearly interpolated.**

CR = Core recovery in %

RQD = Rock Quality Designation in % For intermediate values,

q_c = Average unconfined compressive strength of rock core below base of pile for the depth twice the diameter/least lateral dimensions of pile.

A_b = Cross-sectional area of base of pile.

D_f = Depth factor = 1+0.4 x Length of socket/dia of socket (not greater than 1.2).

A_s = Surface area of socket.

C_{us} = Ultimate shear strength along socket length=0.225√qc (restricted to shear capacity of concrete of the pile, to be taken as 3 MPa for M35 concrete).

Method: 2

This method is applicable when cores and/or core testing result are not available, or when geo-material is highly fragmented.

The shear strength of geo-material is obtained from its correlation with extrapolated SPT values for 300 mm of penetration as given in table below:

Shear Strength/Consistency	Moderately Weak	Weak	Very Weak
Approx. N Value	300 – 200	200 – 100	100 - 60
Shear Strength/Cohesion in MPa	3.3 – 1.9	1.9 – 0.7	0.7 – 0.4

$$Q_u = R_e + R_{af} = c_{ub} * N_c * A_b + A_c * C_{us}$$

$$Q_{allow} = (R_e/3) + (R_{af}/6)$$

Q_u = Ultimate capacity of pile socketed into rock

Q_{allow} = Allowable capacity of pile

R_e = Ultimate end bearing

R_{af} = Ultimate side socket shear

C_{ub} = Average shear strength below base of pile, for the depth equal to twice the diameter/least lateral dimension of pile, based on average 'N' value of this region.

C_{us} = Ultimate shear strength along socket length, to be obtained from table, based on average 'N' value of socket portion. This shall be restricted to shear capacity of concrete of the pile, to be taken as 3.0 MPa for M35 concrete in confined condition, which for other strengths of concrete can be modified by a factor $(f_{ck}/35)^{1/2}$ Intermediate values c_{ub} and c_{us} can be interpolated linearly.

A_s = Surface area of socket

N_c = 9

The extrapolated values of 'N' greater than 300 shall be limited to 300 while using this method. The lateral load carrying capacity of pile has been computed based on Annex C of IS: 2911 (Part-I): 1979.

5.2.4 Pile Founded in Weathered/Soft Rock

For pile founded in weathered/soft rock different empirical approaches are used to arrive at the socket length necessary for utilizing the full structural capacity of the pile. Since it is difficult to collect cores in weathered/soft rocks, the method suggested by Cole and Stroud using ‘N’ values is more widely used. The allowable load on the pile, Qa, in KN, by this approach, is given by

$$Qa = cu1Nc.\frac{\pi B2}{4Fs} + \alpha cu2.\frac{\pi BL}{Fs}$$

Where,

cu1 = Shear strength of rock below the base of the pile, in kN/m^2.
Nc = Bearing capacity factor taken as 9;
Fs = Factor of safety usually taken as 3;
A = 0.9 (recommended value);
cu2 = Average shear strength of rock in the socketed length of pile, in KN/m^2;

6 SEISMICITY AND TECTONIC SETTING

6.1 Earthquake History of the Region

The project area, located in Noida within the National Capital Region (NCR), has experienced seismic activity influenced primarily by the tectonic movements of the Himalayan region and associated fault systems.

Historically, several moderate to strong earthquakes have affected the Delhi–NCR region and surrounding areas. Although no major earthquake epicenter is located directly within Noida, the region has experienced ground shaking due to earthquakes originating from the Himalayan belt and nearby tectonic features.

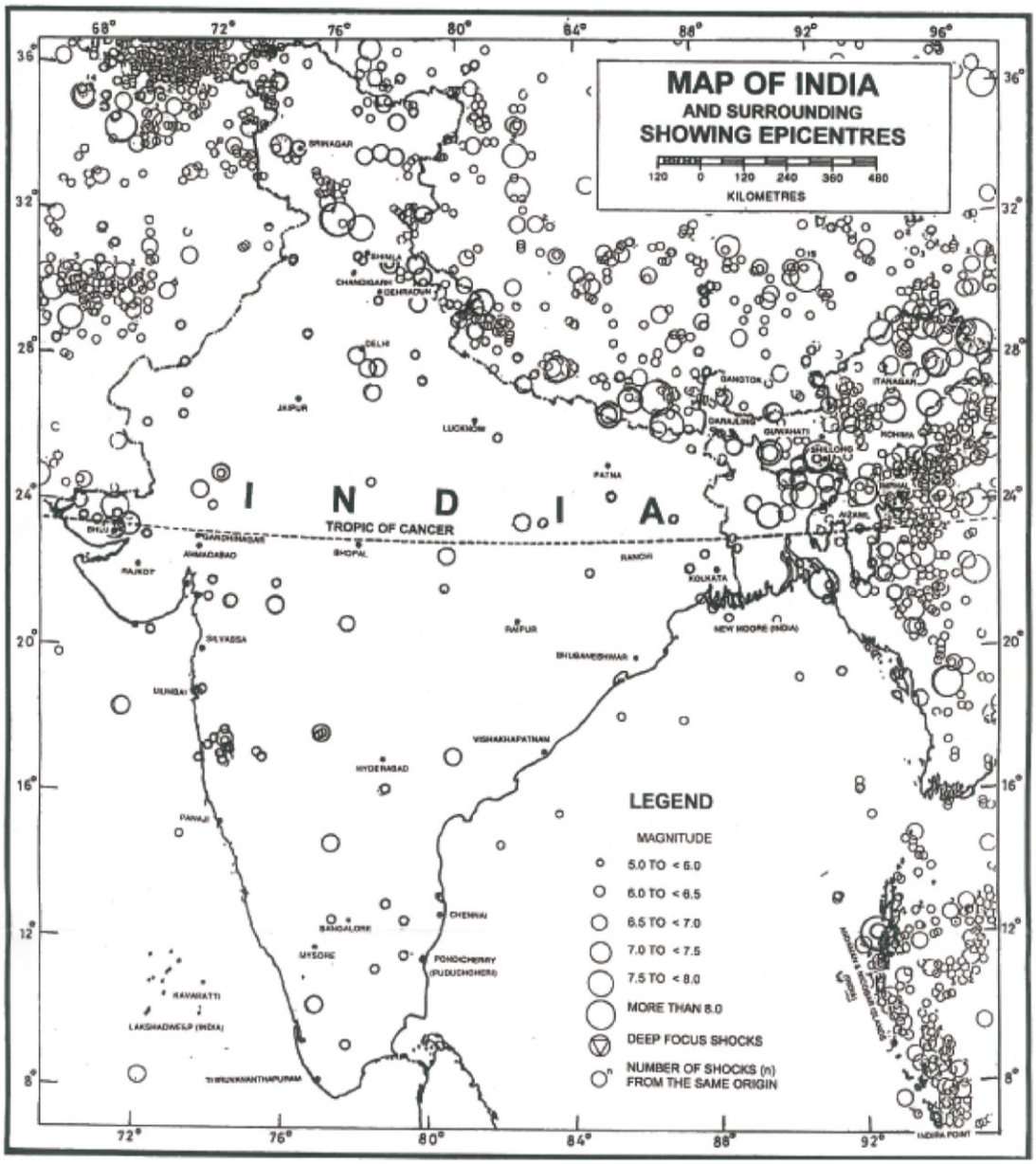


Figure 9 Epicentres of Past Earthquakes in India (Annex A, IS 1893 (Part-1) 2016)

Some of the notable earthquakes affecting the region include:

- **1905 Kangra Earthquake (Mw ~7.8)** – One of the most destructive earthquakes in northern India
- **1934 Bihar–Nepal Earthquake (Mw ~8.1)** – Caused widespread damage across northern India
- **1991 Uttarkashi Earthquake (Mw ~6.8)**
- **1999 Chamoli Earthquake (Mw ~6.6)**
- **2015 Nepal Earthquake (Mw ~7.8)** – Felt significantly in Delhi–NCR

In addition, the Delhi–NCR region has experienced several minor to moderate magnitude earthquakes in recent years, indicating continuous tectonic activity.

Based on seismic zoning as per IS 1893 (Part 1): 2016, the project area falls under **Seismic Zone IV**, indicating a region of high seismic risk.

6.2 Faulting and Tectonic Features

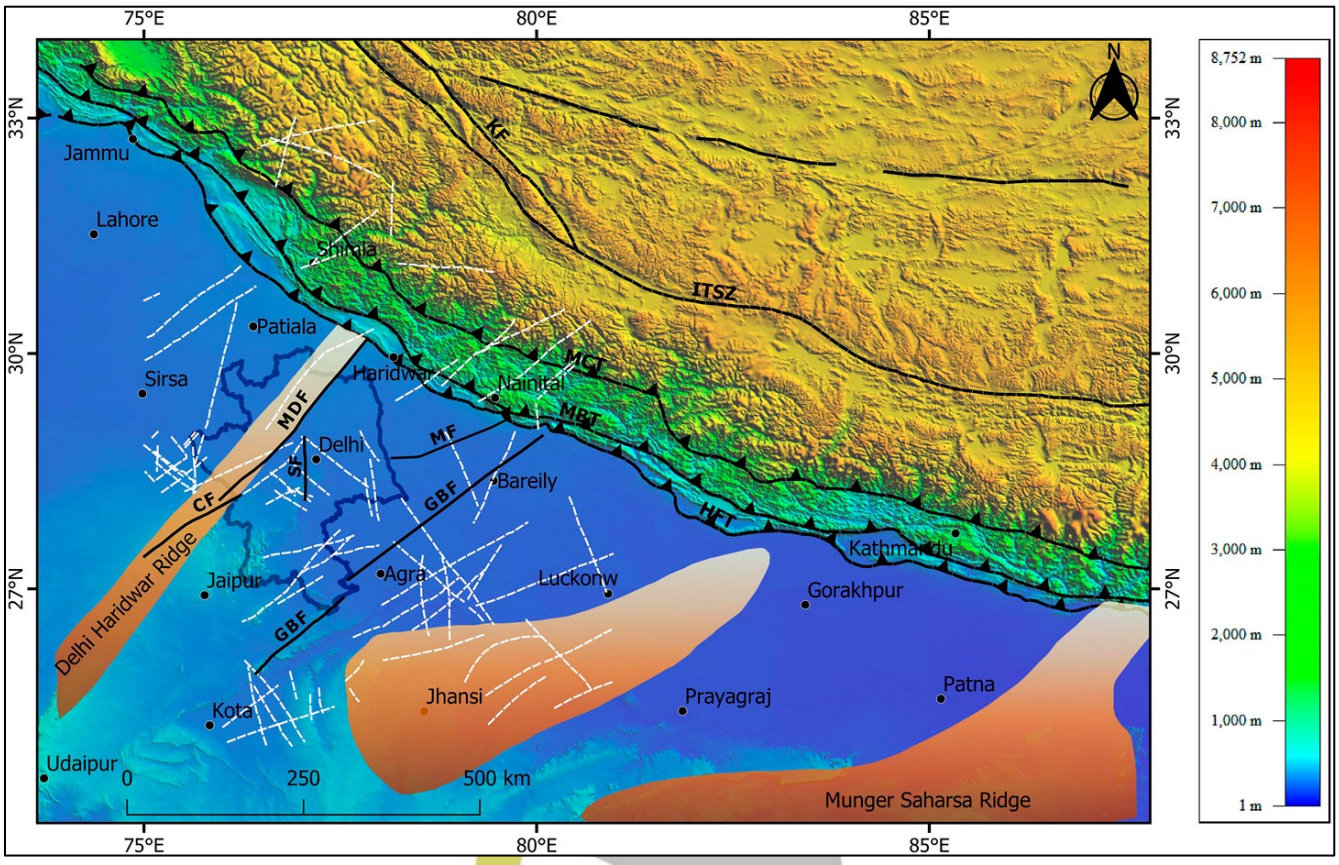
The project corridor lies within the Indo-Gangetic alluvial plains and is not directly located on any known major active surface fault. However, the region is influenced by several regional tectonic features associated with the Himalayan seismic system.

The major tectonic features influencing the Delhi–NCR region include:

- **Mahendragarh–Dehradun Fault (MDF)**
- **Delhi–Haridwar Ridge (DHR)**
- **Yamuna Tear Fault (YTF)**
- **Main Boundary Thrust (MBT)**
- **Main Central Thrust (MCT)**

These tectonic features are located at varying distances from the project site and contribute to the regional seismicity.

The Yamuna River alignment is also associated with geomorphic lineaments, which may indicate minor tectonic controls; however, no evidence of active surface faulting has been observed within the project alignment.



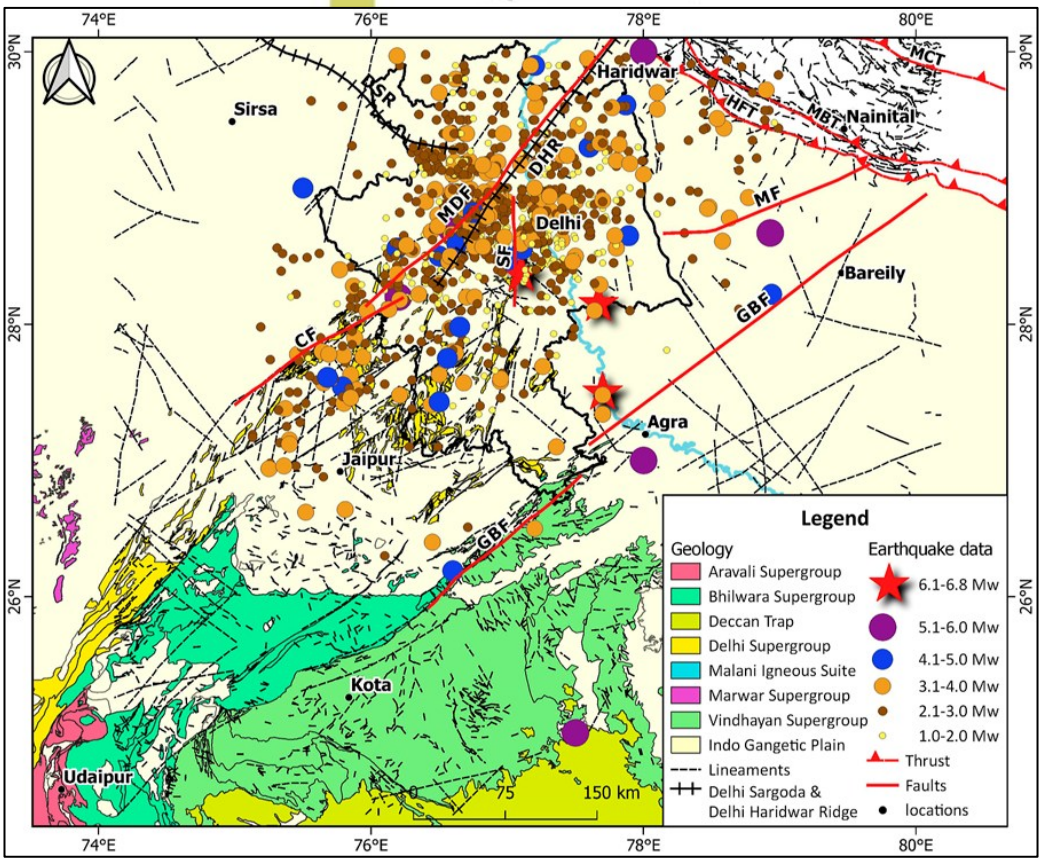


Figure 10 Major Tectonic Features of Delhi NCR

7 LIQUEFACTION POTENTIAL ASSESSMENT

7.1 Liquefaction Susceptibility Assessment

Liquefaction refers to the transition of a granular material from a solid to a liquefied state due to elevated pore-water pressure and decreased effective stress (Marcuson 1978[1]). The rise in pore pressure can be triggered by the tendency of granular materials to consolidate during cyclic shear deformation, such as during an earthquake.

The liquefaction potential at the site has been evaluated in accordance with Annex F of IS 1893 (Part 1): 2016. A brief description of the adopted methodology is presented in Section 7.2 below.

7.2 Methodology of Liquefaction Potential Assessment

7.2.1 Determination of Seismic Parameters

Seismic Zone Factor (Z): Based on the location as per IS 1893 seismic zoning map.
Importance Factor (I): Depends on the structure type (usually 1.0 to 1.5).
Response Reduction Factor (R): Based on structural system.
Design horizontal seismic coefficient (A_h):

$$A_h = \frac{z}{2} x \frac{I}{R}$$

Peak Ground Acceleration (PGA): $a_{max} = A_h \times g$

7.2.2 Determination of Vertical Stresses

At the depth of interest:

- Total vertical stress (σ_v):

$$\sigma_v = \gamma \times H$$

- Pore water pressure (u):

$$u = \gamma_w \times H_w$$

- Effective vertical stress (σ'_v):

$$\sigma'_v = \sigma_v - u$$

7.2.3 Stress Reduction Factor (r_d)

Accounts for flexibility and depth effects.

$$r_d = 1 - 0.00765_z \ (0 < z < 9.15m)$$

$$r_d = 1.174 - 0.0267_z \ (9.15m < z < 23.0m)$$

[1] Marcuson, W.F. (III) (1978), "***Definition of terms related to liquefaction***", J. Geotech Engg. Div, ASCE, 104(9), 1197-1200.

Typical values (as per Seed & Idriss, 1971 or empirical charts in IS 1893):

- 1.0 at surface
- 0.9 at 5 m
- 0.7 at 10 m
- 0.5 at 20 m

7.2.4 Calculation of Cyclic Stress Ratio (CSR)

$$CSR = 0.65\ x \frac{a_{max}}{g}\ x\ \frac{\sigma_v}{\sigma_{v'}}\ x\ r_d$$

Where

α_{max} = Peak ground acceleration (PGA) preferably in terms of g.

g = Acceleration due to gravity,

r_d = Stress reduction factor,

0.65 is a stress reduction coefficient for irregular cyclic loading. If value of PGA is not available, the ratio of (α_{max}/g) is taken equal to seismic zone factor as per Table 3, IS 1893 (Part-1): 2016.

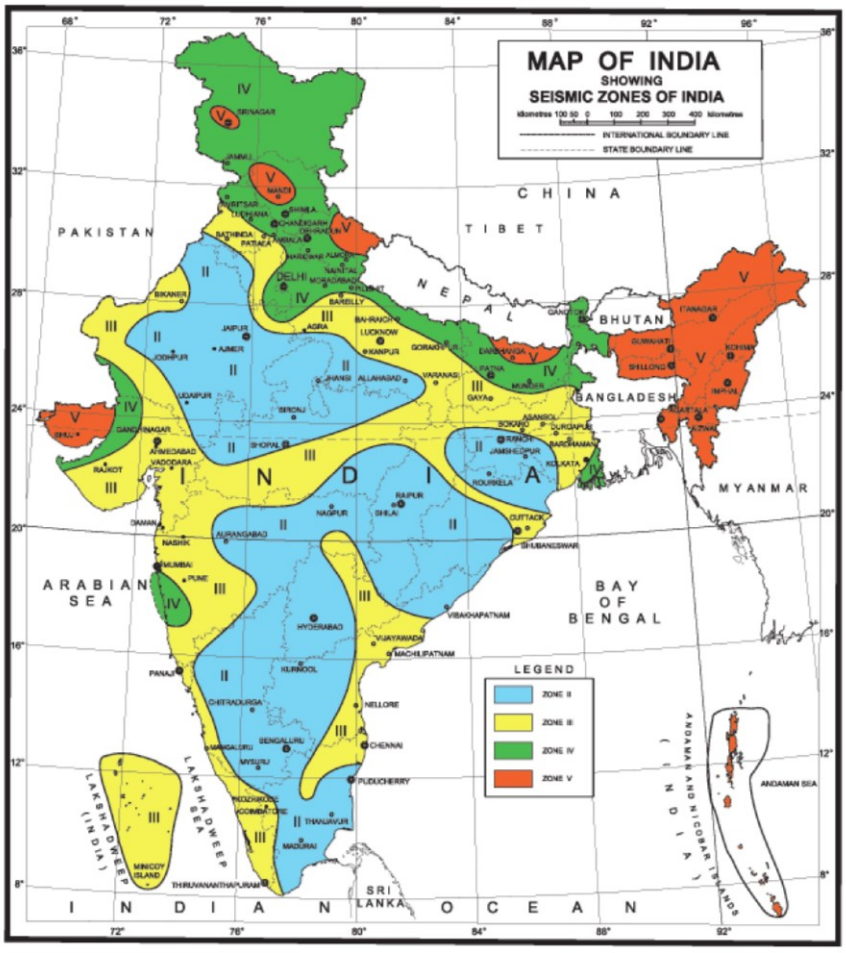


Figure 11 Seismic Zones of India (Figure-1, IS 1893 (Part-1) 2016)

7.2.5 Evaluation of Soil Resistance: Cyclic Resistance Ratio (CRR)

$$CRR = CRR_{7.5} \times MSF \times K_{\sigma} \times K_{\alpha}$$

Where

$CRR_{7.5}$ (standard cyclic ratio for 7.5 magnitude earthquake, calculated based on SPT N-value,

Based on corrected SPT N-values ($(N_1)_{60}$).

Corrections to SPT N-value:

$$(N_1)_{60} = N \times C_N \times C_E \times C_B \times C_R \times C_S$$

Where:

- C_N: Overburden correction factor,

$$C_N = \left(\frac{P_a}{\sigma'_v}\right)^{0.5}$$

- P_a: atmospheric pressure (≈100 kPa).
- C_E: Energy correction factor
- C_B: Borehole diameter correction factor
- C_R: Rod length correction factor
- C_S: Sampler correction factor

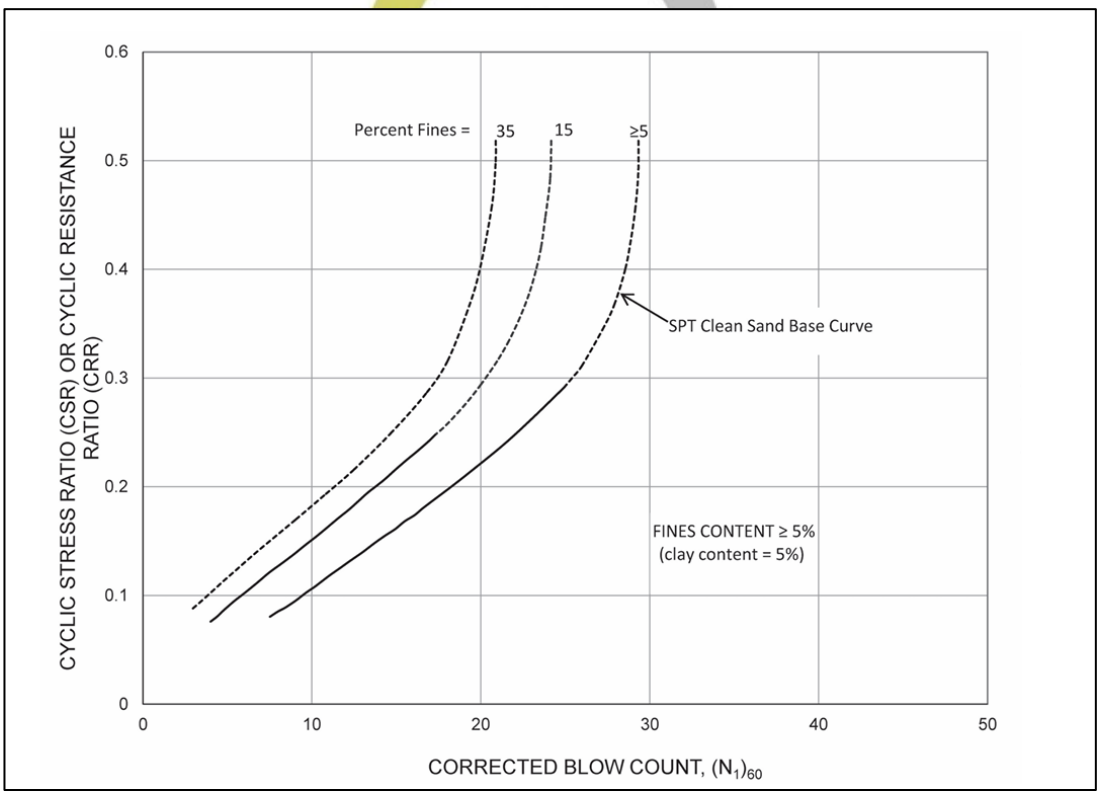


Figure 12 Relation Between $CRR_{7.5}$ and $(N_{1(60)})$ (Fig.8, Annex F, IS 1893 (Part-1): 2016)

Empirical CRR values for clean sands are obtained using Seed et al. (1985) charts for magnitude 7.5. Corrections for fines content are applied if necessary.

7.2.6 Magnitude Scaling Factor (MSF)

CRR values are valid for magnitude 7.5. To adjust for actual magnitude M_w:

$$MSF = 10^{[2.24/(M_w+2.56)]}$$

7.2.7 Overburden Stress Correction (K_σ)

$$K_\sigma = \left(\frac{\sigma'_{v0}}{P_a}\right)^{(f-1)}$$

Where,

K_σ = Overburden correction factor

σ'_{v0} = Effective vertical overburden stress

P_a = Atmospheric pressure (≈ 100 kPa)

f = Exponent depending on relative density / soil type

7.2.8 Static Shear Stress Correction (K_α)

The static shear stress correction is applicable sloping ground only, therefore the value Kα is considered unity.

7.2.9 Factor of Safety Against Liquefaction

$$\frac{CRR_M}{CSR}$$

Interpretation:

- FS ≥ 1.2: Liquefaction unlikely.
- FS < 1.0: Liquefaction potential exists; mitigation required.

7.2.10 Post-Liquefaction Effects

If FS < 1.0, evaluate:

- Settlements due to reconsolidation (using empirical relations such as Tokimatsu and Seed, or Ishihara & Yoshimine).
- Lateral spreading potential, especially near slopes, rivers, or free faces.

7.2.11 Consideration of Parameters for Liquefaction Assessment

The following information has been considered in the Liquefaction calculation

- Noida, Uttar Pradesh (Zone IV [IS-1893 Part-1: 2016 / Fig. 1]
- Peak Ground Acceleration = 0.24 [IS-1893 Part-1: 2016 / table: 3]
- Magnitude of Earthquake = 7.5 to 8.0 [IS-1893 Part-1: 2016 / Annex: 1]

7.3 Results of Liquefaction Analysis

The liquefaction assessment has been carried out for each borehole along the alignment in accordance with Annex F of IS 1893 (Part 1): 2016, as briefly methodology described in Section 7.2 of this report. The seismic parameters have been adopted as defined in Section 7.2.11. For a conservative evaluation, the groundwater level has been assumed at ground level; however, during the field investigation (December 2025 to March 2026), the groundwater table was observed to vary between approximately 9.0 m and 14.0 m below existing ground level (OGL).

The zone-wise maximum depth of liquefiable soil is summarized in the table below, while the detailed results of the liquefaction assessment are presented in Appendix B of this report.

Table 13 Summary of Liquefiable Soil Depth

Zone	Chainage (km)	Boreholes	Predominant Soil	Maximum Liquefiable Soil Depth (M)	Average Liquefiable Soil Depth (M)	Remarks
Zone 1	0+000 to 1+004	BH-01 to BH-11	CL + ML	4.50	2.50	BH-07 & 11
Zone 2	1+004 to 1+925	BH-12 to BH-21	CL + ML + CI	6.50	3.00	BH-17
Zone 3	1+925 to 2+586	BH-22 to BH-27	ML Dominant	3.50	2.30	BH-22 & 25

Note: Remarks indicate boreholes with greater estimated liquefiable depth within the zone.

In Zone 1, localized intermediate liquefiable layers were encountered within the depth range of approximately 9.50 m to 18.50 m in boreholes BH-01, BH-05, BH-07, BH-08A, BH-08B, and BH-11. Similarly, in Zone 2, discontinuous intermediate liquefiable strata were observed between depths of about 7.50 m and 16.50 m in boreholes BH-14, BH-15, BH-16, and BH-17. In Zone 3, localized liquefiable layers were encountered within the depth range of approximately 9.00 m to 16.50 m in boreholes BH-22 and BH-26. These liquefiable layers are not continuous in nature and are encountered intermittently within the stated depth ranges. Detailed liquefaction assessment results are presented in Appendix B of this report. In view of the potential reduction in effective stress and shear strength under liquefaction conditions, these layers have been treated as non-contributing strata. Accordingly, the positive shaft resistance and end bearing from these zones have not been considered in the pile capacity evaluation. This approach ensures a conservative estimation of pile performance under adverse subsurface conditions.

8 FOUNDATION RECOMMENDATIONS

Based on the geotechnical investigation, the subsurface profile along the alignment predominantly comprises silty sand (SM) with varying density and interbedded silt/clay layers, with dense to very dense strata at deeper levels. Considering the nature of the proposed elevated viaduct structures and variability in intermediate layers, **Pile Foundations** are recommended throughout the alignment.

8.1 Pile Design Considerations

The pile design shall consider the combined contribution of end bearing resistance in the dense to very dense strata and skin friction resistance along the pile shaft. Appropriate reduction in shaft resistance shall be accounted for within weaker strata such as inorganic silt (ML) layers and any potentially liquefiable layers, if present.

The piles shall be designed in accordance with the provisions of IS 2911 (Pile Foundations) as brief explained in Section 5.2.1 & 5.2.2 of this report.

The stratigraphy and geotechnical parameters derived from field investigations and laboratory testing have been conservatively adopted for the estimation of pile load capacities under compression, uplift (pull-out), and lateral loading conditions.

The assessment has been carried out considering two scenarios as suggested by DDC:

(i) groundwater level at ground level for conservative evaluation, and

(ii) groundwater level as encountered during the investigation.

The zone-wise summary of pile capacities for 1.0 m and 1.20 m diameter piles at a depth of 30.0 m below existing ground level (OGL) is presented below, while the detailed pile capacity summary with sample calculations is provided in Appendix A of this report.

Table 14 Summary of Pile Capacity

Zone	Chainage (km)	Boreholes	Diameter of Pile (m)	CASE_1 GW at Encountered Level		CASE_2 GW at Ground Level	
				Maximum Pile Axial Capacity (Tonne)	Minimum Pile Axial Capacity (Tonne)	Maximum Pile Axial Capacity (Tonne)	Minimum Pile Axial Capacity (Tonne)
Zone 1	0+000 to 1+004	BH-01 to BH-11	1.00	397	296	193	149
			1.20	585	419	321	234
Zone 2	1+004 to 1+925	BH-12 to BH-21	1.00	416	329	198	140
			1.20	590	473	310	229
Zone 3	1+925 to 2+586	BH-22 to BH-27	1.00	420	361	201	154
			1.20	589	517	311	245

The following points are highlighted with respect to the recommended pile capacities:

- The pile capacities stated above are intended for preliminary design purposes only. These should be verified through initial pile load tests conducted in accordance with IS: 2911 (Part IV), latest edition.
- Pile Integrity Tests (PIT) shall be carried out on selected working piles to evaluate the quality and continuity of pile construction.
- Pile load tests (initial and/or routine) shall be performed to validate the assumed load-carrying capacities, particularly for piles socketed in heterogeneous or variable rock strata.

8.2 Recommendation for Cement/Concrete

The chemical test results of the soil sample and ground water sample are presented in Appendix C of the report.

Based on the sulphate concentration in the soil and groundwater, the site is majorly classified as Class 2. Accordingly, minimum cement content = 330 kg/m³ and maximum water–cement ratio = 0.50 (Table 4, IS 456:2000).

For bored cast-in-situ piles, the minimum concrete grade shall be M25 and minimum cement content = 400 kg/m³ (Clause 7.3.3, IS 2911 (Part 1/Sec 2):2010). Use of Portland Pozzolana Cement (PPC) or Portland Slag Cement (PSC) is suggested.

The minimum cement content and maximum w/c ratio given in Table 4 of IS 456:2000 are durability requirements and apply irrespective of cement grade (OPC 33/43/53, PPC, PSC, etc.); these provisions are applicable to concrete grades M15 and above, since durability cannot be ensured for lower-strength concretes.

9 CONCLUSION

Total of 29 boreholes drilled at the proposed site. The subsurface stratigraphy is briefly described in Section 4.1, while the detailed stratigraphy along with test results is presented in Appendix C.

Based on the geotechnical investigation carried out along the proposed metro corridor, the subsurface conditions are predominantly characterized by alluvial deposits comprising inorganic silt (ML), inorganic clay (CL/CI), and silty sand (SM) with varying density and consistency. The stratification exhibits lateral variation within the shallow and intermediate depths; however, dense to very dense silty sand strata are generally encountered at deeper levels and form a competent bearing stratum throughout the investigated stretch.

The alignment has been divided into geotechnical zones based on borehole locations, chainage, and similarity in subsurface conditions. Localized intermediate liquefiable layers have been identified within certain boreholes; however, these layers are discontinuous in nature and are confined within specific depth ranges. The deeper dense strata exhibit adequate resistance against liquefaction and are considered suitable for foundation support.

Considering the nature of the proposed elevated viaduct structures and the prevailing subsurface conditions, pile foundations are recommended throughout the alignment. The pile foundations shall be designed considering the contribution of end bearing and shaft resistance, while appropriate reduction in capacity shall be considered within weaker and potentially liquefiable strata.

Chemical test results indicate that the soil and groundwater conditions are generally mild to moderately aggressive. However, localized higher chloride concentration in groundwater has been observed within certain stretches, and appropriate durability provisions as per relevant codes shall be adopted during design and construction.

The geotechnical parameters and pile capacities presented in this report are suitable for preliminary and detailed design considerations. Final foundation design shall be carried out considering structural loading, site-specific conditions, and relevant standards.

Appendix A Summary of Pile Load Carrying Capacity

A.1. Zone 1: CH: 0+000 km to 1+004 km (BH-01 to BH-11)

The following table presents the recommended safe capacities of bored cast-in-situ RCC piles, considering mobilization of both skin friction and end bearing, under compression, uplift, and lateral loading. The capacities are based on an assumed cut-off level at 2.5m below the existing ground level (EGL).

BH ID	Pile Dia	Total Depth of Pile	Effective Shaft Depth	Grip Length	CASE_1 GW at Encountered Level				CASE_2 GW at Ground Level			
					Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)
-	(m)	(m)	(m)	(m)	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne
BH-01	1.00	22.00	19.50	19.50	129.36	93.08	7.95	1.99	60.18	56.32	7.95	1.99
BH-01	1.00	23.50	21.00	21.00	141.38	103.15	7.95	1.99	65.72	61.85	7.95	1.99
BH-01	1.00	25.00	22.50	22.50	261.09	117.42	8.28	2.07	122.98	69.33	8.28	2.07
BH-01	1.00	26.50	24.00	24.00	277.50	131.70	8.48	2.12	129.67	76.80	8.48	2.12
BH-01	1.00	28.00	25.50	25.50	295.54	145.97	8.61	2.15	137.99	84.27	8.61	2.15
BH-01	1.00	29.50	27.00	27.00	313.58	160.25	8.61	2.15	146.31	91.75	8.61	2.15
BH-01	1.00	30.00	27.50	27.50	319.59	165.01	8.61	2.15	149.08	94.24	8.61	2.15
BH-01	1.20	22.00	19.50	19.50	185.44	124.35	10.42	2.60	85.80	76.45	10.42	2.60
BH-01	1.20	23.50	21.00	21.00	204.07	139.77	10.42	2.60	94.34	84.80	10.42	2.60
BH-01	1.20	25.00	22.50	22.50	420.63	161.72	10.85	2.71	197.04	96.13	10.85	2.71
BH-01	1.20	26.50	24.00	24.00	445.77	183.66	11.11	2.78	207.03	107.47	11.11	2.78
BH-01	1.20	28.00	25.50	25.50	473.73	205.60	11.28	2.82	219.83	118.80	11.28	2.82
BH-01	1.20	29.50	27.00	27.00	501.69	227.55	11.28	2.82	232.63	130.14	11.28	2.82
BH-01	1.20	30.00	27.50	27.50	511.00	234.86	11.28	2.82	236.90	133.92	11.28	2.82
BH-02	1.00	22.00	19.50	19.50	251.26	123.72	7.95	1.99	118.74	70.82	7.95	1.99
BH-02	1.00	23.50	21.00	21.00	268.93	137.74	7.95	1.99	127.03	78.28	7.95	1.99
BH-02	1.00	25.00	22.50	22.50	257.21	150.87	7.95	1.99	121.38	85.32	7.95	1.99
BH-02	1.00	26.50	24.00	24.00	273.61	164.00	8.28	2.07	129.08	92.36	8.28	2.07
BH-02	1.00	28.00	25.50	25.50	349.56	178.90	8.28	2.07	165.43	100.22	8.28	2.07
BH-02	1.00	29.50	27.00	27.00	368.49	193.80	8.61	2.15	174.31	108.09	8.61	2.15
BH-02	1.00	30.00	27.50	27.50	374.80	198.77	8.61	2.15	177.27	110.72	8.61	2.15

BH ID	Pile Dia	Total Depth of Pile	Effective Shaft Depth	Grip Length	CASE_1 GW at Encountered Level				CASE_2 GW at Ground Level			
					Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)
-	(m)	(m)	(m)	(m)	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne
BH-02	1.20	22.00	19.50	19.50	388.40	168.22	10.42	2.60	180.16	96.51	10.42	2.60
BH-02	1.20	23.50	21.00	21.00	415.13	189.30	10.42	2.60	192.37	107.43	10.42	2.60
BH-02	1.20	25.00	22.50	22.50	388.91	209.05	10.42	2.60	180.13	117.75	10.42	2.60
BH-02	1.20	26.50	24.00	24.00	413.72	228.80	10.85	2.71	191.47	128.06	10.85	2.71
BH-02	1.20	28.00	25.50	25.50	545.76	251.21	10.85	2.71	253.04	139.60	10.85	2.71
BH-02	1.20	29.50	27.00	27.00	574.39	273.63	11.28	2.82	266.13	151.13	11.28	2.82
BH-02	1.20	30.00	27.50	27.50	583.93	281.11	11.28	2.82	270.49	154.98	11.28	2.82
BH-03	1.00	22.00	19.50	19.50	263.81	123.69	9.25	2.31	119.73	68.94	9.25	2.31
BH-03	1.00	23.50	21.00	21.00	281.80	137.92	9.25	2.31	127.78	76.22	9.25	2.31
BH-03	1.00	25.00	22.50	22.50	299.78	152.16	9.25	2.31	135.82	83.50	9.25	2.31
BH-03	1.00	26.50	24.00	24.00	317.76	166.40	9.56	2.39	143.86	90.78	9.56	2.39
BH-03	1.00	28.00	25.50	25.50	335.74	180.63	9.56	2.39	151.90	98.06	9.56	2.39
BH-03	1.00	29.50	27.00	27.00	368.30	195.30	9.56	2.39	166.62	105.53	9.56	2.39
BH-03	1.00	30.00	27.50	27.50	374.50	200.19	9.56	2.39	169.39	108.02	9.56	2.39
BH-03	1.20	22.00	19.50	19.50	406.68	166.61	12.11	3.03	184.97	94.12	12.11	3.03
BH-03	1.20	23.50	21.00	21.00	433.60	187.83	12.11	3.03	197.03	104.94	12.11	3.03
BH-03	1.20	25.00	22.50	22.50	460.52	209.05	12.11	3.03	209.10	115.76	12.11	3.03
BH-03	1.20	26.50	24.00	24.00	487.44	230.27	12.52	3.13	221.16	126.59	12.52	3.13
BH-03	1.20	28.00	25.50	25.50	514.36	251.49	12.52	3.13	233.23	137.41	12.52	3.13
BH-03	1.20	29.50	27.00	27.00	567.27	273.36	12.52	3.13	257.20	148.52	12.52	3.13
BH-03	1.20	30.00	27.50	27.50	576.56	280.65	12.52	3.13	261.36	152.22	12.52	3.13
BH-04	1.00	22.00	19.50	19.50	245.75	122.78	8.93	2.23	105.61	66.32	8.93	2.23
BH-04	1.00	23.50	21.00	21.00	262.75	136.33	8.93	2.23	112.82	73.01	8.93	2.23
BH-04	1.00	25.00	22.50	22.50	279.75	149.88	8.93	2.23	120.03	79.71	8.93	2.23
BH-04	1.00	26.50	24.00	24.00	325.17	164.28	8.93	2.23	139.51	86.77	8.93	2.23
BH-04	1.00	28.00	25.50	25.50	344.15	178.68	8.93	2.23	148.01	93.83	8.93	2.23
BH-04	1.00	29.50	27.00	27.00	362.37	193.08	8.93	2.23	155.73	100.88	8.93	2.23

BH ID	Pile Dia	Total Depth of Pile	Effective Shaft Depth	Grip Length	CASE_1 GW at Encountered Level				CASE_2 GW at Ground Level			
					Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)
-	(m)	(m)	(m)	(m)	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne
BH-04	1.00	30.00	27.50	27.50	368.44	197.88	9.25	2.31	158.31	103.24	9.25	2.31
BH-04	1.20	22.00	19.50	19.50	380.10	167.14	11.70	2.93	161.84	90.97	11.70	2.93
BH-04	1.20	23.50	21.00	21.00	405.92	187.60	11.70	2.93	172.66	100.92	11.70	2.93
BH-04	1.20	25.00	22.50	22.50	431.75	208.05	11.70	2.93	183.47	110.86	11.70	2.93
BH-04	1.20	26.50	24.00	24.00	508.97	229.79	11.70	2.93	216.21	121.35	11.70	2.93
BH-04	1.20	28.00	25.50	25.50	537.97	251.54	11.70	2.93	229.12	131.84	11.70	2.93
BH-04	1.20	29.50	27.00	27.00	565.64	273.28	11.70	2.93	240.71	142.33	11.70	2.93
BH-04	1.20	30.00	27.50	27.50	574.86	280.53	12.11	3.03	244.57	145.82	12.11	3.03
BH-05	1.00	22.00	19.50	18.00	262.59	110.83	9.71	2.43	116.30	62.06	9.71	2.43
BH-05	1.00	23.50	21.00	19.50	281.63	125.81	9.71	2.43	124.62	69.53	9.71	2.43
BH-05	1.00	25.00	22.50	21.00	300.07	140.79	9.71	2.43	132.32	77.01	9.71	2.43
BH-05	1.00	26.50	24.00	22.50	319.11	155.77	9.71	2.43	140.64	84.48	9.71	2.43
BH-05	1.00	28.00	25.50	24.00	338.47	170.76	9.71	2.43	149.27	91.95	9.71	2.43
BH-05	1.00	29.50	27.00	25.50	357.52	185.74	9.71	2.43	157.59	99.43	9.71	2.43
BH-05	1.00	30.00	27.50	26.00	364.17	190.73	10.06	2.51	160.67	101.92	10.06	2.51
BH-05	1.20	22.00	19.50	18.00	372.21	142.05	12.64	3.16	182.10	84.08	12.64	3.16
BH-05	1.20	23.50	21.00	19.50	397.21	161.93	12.64	3.16	194.59	95.19	12.64	3.16
BH-05	1.20	25.00	22.50	21.00	421.14	181.80	12.64	3.16	206.00	106.30	12.64	3.16
BH-05	1.20	26.50	24.00	22.50	446.14	201.67	12.64	3.16	218.48	117.41	12.64	3.16
BH-05	1.20	28.00	25.50	24.00	471.67	221.55	12.64	3.16	231.50	128.52	12.64	3.16
BH-05	1.20	29.50	27.00	25.50	496.66	241.42	12.64	3.16	243.98	139.63	12.64	3.16
BH-05	1.20	30.00	27.50	26.00	505.53	248.04	13.09	3.27	248.67	143.34	13.09	3.27
BH-06	1.00	22.00	19.50	18.00	286.45	132.00	9.36	2.34	134.04	74.05	9.36	2.34
BH-06	1.00	23.50	21.00	19.50	247.23	144.61	9.36	2.34	115.06	80.75	9.36	2.34
BH-06	1.00	25.00	22.50	21.00	262.89	157.22	9.36	2.34	122.27	87.44	9.36	2.34
BH-06	1.00	26.50	24.00	22.50	278.74	169.83	9.36	2.34	129.67	94.14	9.36	2.34
BH-06	1.00	28.00	25.50	24.00	351.19	184.13	9.36	2.34	163.68	101.61	9.36	2.34

BH ID	Pile Dia	Total Depth of Pile	Effective Shaft Depth	Grip Length	CASE_1 GW at Encountered Level				CASE_2 GW at Ground Level			
					Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)
-	(m)	(m)	(m)	(m)	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne
BH-06	1.00	29.50	27.00	25.50	368.95	198.43	9.36	2.34	171.70	109.09	9.36	2.34
BH-06	1.00	30.00	27.50	26.00	374.97	203.19	9.71	2.43	174.47	111.58	9.71	2.43
BH-06	1.20	22.00	19.50	18.00	416.76	173.14	12.18	3.05	217.16	103.59	12.18	3.05
BH-06	1.20	23.50	21.00	19.50	347.49	190.62	12.18	3.05	179.06	113.97	12.18	3.05
BH-06	1.20	25.00	22.50	21.00	369.06	208.09	12.18	3.05	190.50	124.35	12.18	3.05
BH-06	1.20	26.50	24.00	22.50	390.95	225.57	12.18	3.05	202.25	134.73	12.18	3.05
BH-06	1.20	28.00	25.50	24.00	505.84	245.36	12.18	3.05	264.12	146.34	12.18	3.05
BH-06	1.20	29.50	27.00	25.50	530.19	265.16	12.18	3.05	276.79	157.95	12.18	3.05
BH-06	1.20	30.00	27.50	26.00	538.49	271.76	12.64	3.16	281.19	161.82	12.64	3.16
BH-07	1.00	22.00	19.50	18.00	240.63	99.47	8.25	2.06	109.73	57.46	8.25	2.06
BH-07	1.00	23.50	21.00	19.50	258.88	113.89	8.62	2.16	118.05	64.93	8.62	2.16
BH-07	1.00	25.00	22.50	21.00	277.40	128.31	8.62	2.16	126.64	72.41	8.62	2.16
BH-07	1.00	26.50	24.00	22.50	295.64	142.73	8.62	2.16	134.97	79.88	8.62	2.16
BH-07	1.00	28.00	25.50	24.00	314.35	157.15	8.99	2.25	143.75	87.36	8.99	2.25
BH-07	1.00	29.50	27.00	25.50	332.60	171.57	8.99	2.25	152.07	94.83	8.99	2.25
BH-07	1.00	30.00	27.50	26.00	338.68	176.38	8.99	2.25	154.84	97.32	8.99	2.25
BH-07	1.20	22.00	19.50	18.00	354.54	131.29	10.74	2.69	180.44	80.88	10.74	2.69
BH-07	1.20	23.50	21.00	19.50	379.27	150.98	11.23	2.81	193.26	92.23	11.23	2.81
BH-07	1.20	25.00	22.50	21.00	404.48	170.66	11.23	2.81	206.56	103.58	11.23	2.81
BH-07	1.20	26.50	24.00	22.50	429.21	190.35	11.23	2.81	219.38	114.93	11.23	2.81
BH-07	1.20	28.00	25.50	24.00	454.73	210.03	11.71	2.93	232.99	126.28	11.71	2.93
BH-07	1.20	29.50	27.00	25.50	479.46	229.72	11.71	2.93	245.81	137.62	11.71	2.93
BH-07	1.20	30.00	27.50	26.00	487.70	236.28	11.71	2.93	250.09	141.41	11.71	2.93
BH-08	1.00	22.00	19.50	18.00	132.46	93.25	9.36	2.34	58.65	54.72	9.36	2.34
BH-08	1.00	23.50	21.00	19.50	145.59	104.09	9.36	2.34	64.50	60.46	9.36	2.34
BH-08	1.00	25.00	22.50	21.00	244.13	118.61	9.36	2.34	109.58	67.84	9.36	2.34
BH-08	1.00	26.50	24.00	22.50	262.52	133.14	9.36	2.34	117.76	75.21	9.36	2.34

BH ID	Pile Dia	Total Depth of Pile	Effective Shaft Depth	Grip Length	CASE_1 GW at Encountered Level				CASE_2 GW at Ground Level			
					Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)
-	(m)	(m)	(m)	(m)	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne
BH-08	1.00	28.00	25.50	24.00	280.91	147.66	9.71	2.43	125.94	82.59	9.71	2.43
BH-08	1.00	29.50	27.00	25.50	330.15	163.10	9.71	2.43	148.15	90.37	9.71	2.43
BH-08	1.00	30.00	27.50	26.00	336.71	168.24	9.71	2.43	151.07	92.97	9.71	2.43
BH-08	1.20	22.00	19.50	18.00	167.20	113.43	12.18	3.05	80.05	71.34	12.18	3.05
BH-08	1.20	23.50	21.00	19.50	184.98	128.25	12.18	3.05	89.08	80.04	12.18	3.05
BH-08	1.20	25.00	22.50	21.00	340.32	148.06	12.18	3.05	169.89	91.27	12.18	3.05
BH-08	1.20	26.50	24.00	22.50	365.21	167.86	12.18	3.05	182.54	102.49	12.18	3.05
BH-08	1.20	28.00	25.50	24.00	390.11	187.66	12.64	3.16	195.19	113.72	12.64	3.16
BH-08	1.20	29.50	27.00	25.50	464.82	208.70	12.64	3.16	233.60	125.58	12.64	3.16
BH-08	1.20	30.00	27.50	26.00	473.71	215.72	12.64	3.16	238.12	129.54	12.64	3.16
BH-08A	1.00	22.00	19.50	18.00	177.47	114.02	10.40	2.60	79.54	64.22	10.40	2.60
BH-08A	1.00	23.50	21.00	19.50	192.21	125.99	10.40	2.60	86.14	70.49	10.40	2.60
BH-08A	1.00	25.00	22.50	21.00	309.71	141.71	10.40	2.60	140.06	78.45	10.40	2.60
BH-08A	1.00	26.50	24.00	22.50	329.81	157.43	10.73	2.68	149.06	86.40	10.73	2.68
BH-08A	1.00	28.00	25.50	24.00	349.92	173.15	11.06	2.77	158.07	94.35	11.06	2.77
BH-08A	1.00	29.50	27.00	25.50	370.02	188.87	11.06	2.77	167.07	102.30	11.06	2.77
BH-08A	1.00	30.00	27.50	26.00	376.72	194.11	11.38	2.85	170.07	104.95	11.38	2.85
BH-08A	1.20	22.00	19.50	18.00	242.82	148.92	13.53	3.38	118.86	89.17	13.53	3.38
BH-08A	1.20	23.50	21.00	19.50	262.76	165.26	13.53	3.38	129.04	98.67	13.53	3.38
BH-08A	1.20	25.00	22.50	21.00	448.27	186.66	13.53	3.38	225.66	110.75	13.53	3.38
BH-08A	1.20	26.50	24.00	22.50	475.46	208.07	13.97	3.49	239.53	122.84	13.97	3.49
BH-08A	1.20	28.00	25.50	24.00	502.65	229.48	14.39	3.60	253.40	134.92	14.39	3.60
BH-08A	1.20	29.50	27.00	25.50	529.84	250.89	14.39	3.60	267.28	147.01	14.39	3.60
BH-08A	1.20	30.00	27.50	26.00	538.90	258.02	14.81	3.70	271.90	151.03	14.81	3.70
BH-08B	1.00	22.00	19.50	18.00	227.68	121.36	8.62	2.16	110.45	70.70	8.62	2.16
BH-08B	1.00	23.50	21.00	19.50	245.61	135.57	8.99	2.25	119.13	78.43	8.99	2.25
BH-08B	1.00	25.00	22.50	21.00	328.48	151.70	8.99	2.25	159.87	87.09	8.99	2.25

BH ID	Pile Dia	Total Depth of Pile	Effective Shaft Depth	Grip Length	CASE_1 GW at Encountered Level				CASE_2 GW at Ground Level			
					Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)
-	(m)	(m)	(m)	(m)	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne
BH-08B	1.00	26.50	24.00	22.50	349.18	167.84	9.36	2.34	169.88	95.75	9.36	2.34
BH-08B	1.00	28.00	25.50	24.00	369.87	183.98	9.36	2.34	179.90	104.41	9.36	2.34
BH-08B	1.00	29.50	27.00	25.50	390.57	200.11	9.71	2.43	189.91	113.07	9.71	2.43
BH-08B	1.00	30.00	27.50	26.00	397.47	205.49	9.71	2.43	193.25	115.95	9.71	2.43
BH-08B	1.20	22.00	19.50	18.00	329.98	161.39	11.23	2.81	178.54	100.60	11.23	2.81
BH-08B	1.20	23.50	21.00	19.50	355.06	181.32	11.71	2.93	192.51	112.76	11.71	2.93
BH-08B	1.20	25.00	22.50	21.00	488.36	203.95	11.71	2.93	267.72	126.41	11.71	2.93
BH-08B	1.20	26.50	24.00	22.50	517.30	226.58	12.18	3.05	283.83	140.07	12.18	3.05
BH-08B	1.20	28.00	25.50	24.00	546.24	249.21	12.18	3.05	299.95	153.73	12.18	3.05
BH-08B	1.20	29.50	27.00	25.50	575.18	271.84	12.64	3.16	316.07	167.38	12.64	3.16
BH-08B	1.20	30.00	27.50	26.00	584.82	279.39	12.64	3.16	321.44	171.94	12.64	3.16
BH-09	1.00	22.00	19.50	19.50	152.31	98.35	7.60	1.90	75.70	60.59	7.60	1.90
BH-09	1.00	23.50	21.00	21.00	164.98	108.87	7.60	1.90	82.08	66.71	7.60	1.90
BH-09	1.00	25.00	22.50	22.50	177.61	119.38	7.60	1.90	88.42	72.82	7.60	1.90
BH-09	1.00	26.50	24.00	24.00	170.64	128.74	7.60	1.90	84.58	78.35	7.60	1.90
BH-09	1.00	28.00	25.50	25.50	181.65	138.10	7.60	1.90	90.13	83.89	7.60	1.90
BH-09	1.00	29.50	27.00	27.00	290.76	151.32	7.95	1.99	146.53	91.36	7.95	1.99
BH-09	1.00	30.00	27.50	27.50	296.27	155.72	7.95	1.99	149.30	93.85	7.95	1.99
BH-09	1.20	22.00	19.50	19.50	207.70	128.38	9.97	2.49	112.59	83.83	9.97	2.49
BH-09	1.20	23.50	21.00	21.00	224.54	142.55	9.97	2.49	122.16	92.90	9.97	2.49
BH-09	1.20	25.00	22.50	22.50	241.33	156.71	9.97	2.49	131.67	101.98	9.97	2.49
BH-09	1.20	26.50	24.00	24.00	227.19	169.34	9.97	2.49	123.15	110.18	9.97	2.49
BH-09	1.20	28.00	25.50	25.50	241.83	181.96	9.97	2.49	131.47	118.37	9.97	2.49
BH-09	1.20	29.50	27.00	27.00	411.90	199.71	10.42	2.60	230.27	129.49	10.42	2.60
BH-09	1.20	30.00	27.50	27.50	419.22	205.63	10.42	2.60	234.43	133.19	10.42	2.60
BH-10	1.00	22.00	19.50	16.50	130.25	95.56	8.38	2.09	64.80	59.54	8.38	2.09
BH-10	1.00	23.50	21.00	18.00	147.82	105.29	8.38	2.09	73.81	65.27	8.38	2.09

BH ID	Pile Dia	Total Depth of Pile	Effective Shaft Depth	Grip Length	CASE_1 GW at Encountered Level				CASE_2 GW at Ground Level			
					Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)
-	(m)	(m)	(m)	(m)	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne
BH-10	1.00	25.00	22.50	19.50	159.36	115.02	8.38	2.09	79.65	71.01	8.38	2.09
BH-10	1.00	26.50	24.00	21.00	262.44	128.21	8.79	2.20	133.14	78.49	8.79	2.20
BH-10	1.00	28.00	25.50	22.50	278.93	141.40	8.79	2.20	141.48	85.97	8.79	2.20
BH-10	1.00	29.50	27.00	24.00	295.17	154.60	9.20	2.30	149.57	93.46	9.20	2.30
BH-10	1.00	30.00	27.50	24.50	300.67	159.00	9.20	2.30	152.35	95.95	9.20	2.30
BH-10	1.20	22.00	19.50	16.50	175.09	125.23	10.88	2.72	93.20	82.01	10.88	2.72
BH-10	1.20	23.50	21.00	18.00	200.54	138.54	10.88	2.72	107.68	90.52	10.88	2.72
BH-10	1.20	25.00	22.50	19.50	216.16	151.85	10.88	2.72	116.46	99.04	10.88	2.72
BH-10	1.20	26.50	24.00	21.00	379.41	169.85	11.42	2.86	210.27	110.19	11.42	2.86
BH-10	1.20	28.00	25.50	22.50	401.73	187.85	11.42	2.86	222.81	121.34	11.42	2.86
BH-10	1.20	29.50	27.00	24.00	423.63	205.86	11.95	2.99	234.91	132.49	11.95	2.99
BH-10	1.20	30.00	27.50	24.50	431.07	211.86	11.95	2.99	239.09	136.20	11.95	2.99
BH-11	1.00	22.00	19.50	19.50	164.48	99.68	7.95	1.99	73.74	57.78	7.95	1.99
BH-11	1.00	23.50	21.00	21.00	179.98	112.17	7.95	1.99	80.67	64.28	7.95	1.99
BH-11	1.00	25.00	22.50	22.50	195.55	124.67	8.28	2.07	87.68	70.77	8.28	2.07
BH-11	1.00	26.50	24.00	24.00	290.38	139.99	8.28	2.07	131.00	78.54	8.28	2.07
BH-11	1.00	28.00	25.50	25.50	310.41	155.31	8.28	2.07	140.23	86.30	8.28	2.07
BH-11	1.00	29.50	27.00	27.00	345.81	171.11	8.61	2.15	156.24	94.27	8.61	2.15
BH-11	1.00	30.00	27.50	27.50	352.55	176.37	8.61	2.15	159.25	96.93	8.61	2.15
BH-11	1.20	22.00	19.50	19.50	230.69	131.87	10.42	2.60	114.39	81.58	10.42	2.60
BH-11	1.20	23.50	21.00	21.00	251.66	148.92	10.42	2.60	125.08	91.44	10.42	2.60
BH-11	1.20	25.00	22.50	22.50	272.78	165.97	10.85	2.71	135.92	101.30	10.85	2.71
BH-11	1.20	26.50	24.00	24.00	421.68	186.85	10.85	2.71	213.25	113.11	10.85	2.71
BH-11	1.20	28.00	25.50	25.50	448.98	207.74	10.85	2.71	227.59	124.92	10.85	2.71
BH-11	1.20	29.50	27.00	27.00	501.05	229.26	11.28	2.82	254.41	137.05	11.28	2.82
BH-11	1.20	30.00	27.50	27.50	510.17	236.43	11.28	2.82	259.06	141.10	11.28	2.82

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-01	-
Chainage	0+031	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	182.10	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	17.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-01	1.00	22.00	19.50	19.50	129.36	93.08	7.95	1.99
BH-01	1.00	23.50	21.00	21.00	141.38	103.15	7.95	1.99
BH-01	1.00	25.00	22.50	22.50	261.09	117.42	8.28	2.07
BH-01	1.00	26.50	24.00	24.00	277.50	131.70	8.48	2.12
BH-01	1.00	28.00	25.50	25.50	295.54	145.97	8.61	2.15
BH-01	1.00	29.50	27.00	27.00	313.58	160.25	8.61	2.15
BH-01	1.00	30.00	27.50	27.50	319.59	165.01	8.61	2.15

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	14.80	0.00	24	-	8.00	9.78	1.00	-	3.25	4.00	11.10	22.20	4.71	2.20	21.78	23.98	9.59	5.01
2	4.00	5.50	1.50	Granular	14.80	0.00	24	-	8.00	9.78	1.00	-	4.75	5.50	33.30	44.40	4.71	6.60	38.90	47.70	19.08	8.51
3	5.50	7.00	1.50	Granular	14.80	0.00	24	-	8.00	9.78	1.00	-	6.25	7.00	55.50	66.60	4.71	10.99	56.02	75.81	30.32	13.24
4	7.00	8.50	1.50	Granular	14.80	0.00	24	-	8.00	9.78	1.00	-	7.75	8.50	77.70	88.80	4.71	15.39	73.13	108.32	43.33	19.20
5	8.50	10.00	1.50	Granular	14.80	0.00	24	-	8.00	9.78	1.00	-	9.25	10.00	99.90	111.00	4.71	19.79	90.25	145.23	58.09	26.39
6	10.00	11.50	1.50	Granular	14.80	0.00	24	-	8.00	9.78	1.00	-	10.75	11.50	122.10	133.20	4.71	24.19	107.37	186.53	74.61	34.81
7	11.50	13.00	1.50	Granular	16.30	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	145.43	157.65	4.71	31.21	171.57	281.95	112.78	45.20
7	13.00	14.50	1.50	Granular	16.30	0.00	26	-	11.90	13.19	1.00	-	13.75	14.50	169.88	182.10	4.71	36.46	197.00	343.83	137.53	57.06
8	14.50	16.00	1.50	Granular	17.70	0.00	26	-	11.90	13.19	1.00	-	15.25	16.00	182.10	182.10	4.71	39.08	197.65	383.56	153.43	69.65
9	16.00	17.50	1.50	Granular	17.70	0.00	26	-	11.90	13.19	1.00	-	16.75	17.50	182.10	182.10	4.71	0.00	197.65	383.56	153.43	71.30
10	17.50	19.00	1.50	Granular	7.90	25.00	20	-	0.00	5.39	1.00	-	18.25	19.00	182.10	182.10	4.71	0.00	77.37	263.28	105.31	72.95
11	19.00	20.50	1.50	Granular	8.70	25.00	20	-	0.00	5.39	1.00	-	19.75	20.50	182.10	182.10	4.71	30.06	77.37	293.34	117.33	83.01
12	20.50	22.00	1.50	Granular	8.70	25.00	20	-	0.00	5.39	1.00	-	21.25	22.00	182.10	182.10	4.71	30.06	77.37	323.40	129.36	93.08
13	22.00	23.50	1.50	Granular	12.30	25.00	20	-	0.00	5.39	1.00	-	22.75	23.50	182.10	182.10	4.71	30.06	77.37	353.46	141.38	103.15
14	23.50	25.00	1.50	Granular	12.30	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	182.10	182.10	4.71	45.09	331.55	652.74	261.09	117.42
15	25.00	26.50	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	182.10	182.10	4.71	45.09	327.47	693.76	277.50	131.70
16	26.50	28.00	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	182.10	182.10	4.71	45.09	327.47	738.85	295.54	145.97
17	28.00	29.50	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	182.10	182.10	4.71	45.09	327.47	783.94	313.58	160.25
18	29.50	30.00	0.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	182.10	182.10	1.57	15.03	327.47	798.97	319.59	165.01

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.68	2.06	1.85	7.61	6.82	0.252	1.007	7.95	1.99	30.23	13.55	19.07	4.77	72.55	32.51
2	22.50	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.68	2.06	1.85	7.61	6.82	0.252	1.007	7.95	1.99	30.23	13.55	19.07	4.77	72.55	32.51
3	24.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
4	25.50	17	2.96E+07	4.91E-02	2.35E+03	3.62	0.69	2.06	1.85	7.44	6.68	0.236	0.943	8.48	2.12	31.57	14.16	20.35	5.09	75.76	33.98
5	27.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33
6	28.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33
7	30.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-01	-
Chainage	0+031	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	235.20	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	17.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-01	1.20	22.00	19.50	19.50	185.44	124.35	10.42	2.60
BH-01	1.20	23.50	21.00	21.00	204.07	139.77	10.42	2.60
BH-01	1.20	25.00	22.50	22.50	420.63	161.72	10.85	2.71
BH-01	1.20	26.50	24.00	24.00	445.77	183.66	11.11	2.78
BH-01	1.20	28.00	25.50	25.50	473.73	205.60	11.28	2.82
BH-01	1.20	29.50	27.00	27.00	501.69	227.55	11.28	2.82
BH-01	1.20	30.00	27.50	27.50	511.00	234.86	11.28	2.82

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	14.80	0.00	24	-	8.00	9.78	1.00	-	3.25	4.00	11.10	22.20	5.65	2.64	32.71	35.35	14.14	7.07
2	4.00	5.50	1.50	Granular	14.80	0.00	24	-	8.00	9.78	1.00	-	4.75	5.50	33.30	44.40	5.65	7.92	57.36	67.92	27.17	11.66
3	5.50	7.00	1.50	Granular	14.80	0.00	24	-	8.00	9.78	1.00	-	6.25	7.00	55.50	66.60	5.65	13.19	82.01	105.76	42.30	17.73
4	7.00	8.50	1.50	Granular	14.80	0.00	24	-	8.00	9.78	1.00	-	7.75	8.50	77.70	88.80	5.65	18.47	106.66	148.88	59.55	25.28
5	8.50	10.00	1.50	Granular	14.80	0.00	24	-	8.00	9.78	1.00	-	9.25	10.00	99.90	111.00	5.65	23.75	131.31	197.27	78.91	34.30
6	10.00	11.50	1.50	Granular	14.80	0.00	24	-	8.00	9.78	1.00	-	10.75	11.50	122.10	133.20	5.65	29.03	155.96	250.95	100.38	44.81
7	11.50	13.00	1.50	Granular	16.30	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	145.43	157.65	5.65	37.45	249.27	381.71	152.69	57.67
7	13.00	14.50	1.50	Granular	16.30	0.00	26	-	11.90	13.19	1.00	-	13.75	14.50	169.88	182.10	5.65	43.75	285.88	462.07	184.83	72.29
8	14.50	16.00	1.50	Granular	17.70	0.00	26	-	11.90	13.19	1.00	-	15.25	16.00	195.38	208.65	5.65	50.32	326.77	553.28	221.31	88.76
9	16.00	17.50	1.50	Granular	17.70	0.00	26	-	11.90	13.19	1.00	-	16.75	17.50	221.93	235.20	5.65	0.00	366.52	593.03	237.21	91.13
10	17.50	19.00	1.50	Granular	7.90	25.00	20	-	0.00	5.39	1.00	-	18.25	19.00	235.20	235.20	5.65	0.00	143.89	370.40	148.16	93.51
11	19.00	20.50	1.50	Granular	8.70	25.00	20	-	0.00	5.39	1.00	-	19.75	20.50	235.20	235.20	5.65	46.59	143.89	417.00	166.80	108.93
12	20.50	22.00	1.50	Granular	8.70	25.00	20	-	0.00	5.39	1.00	-	21.25	22.00	235.20	235.20	5.65	46.59	143.89	463.59	185.44	124.35
13	22.00	23.50	1.50	Granular	12.30	25.00	20	-	0.00	5.39	1.00	-	22.75	23.50	235.20	235.20	5.65	46.59	143.89	510.18	204.07	139.77
14	23.50	25.00	1.50	Granular	12.30	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	235.20	235.20	5.65	69.89	615.40	1051.58	420.63	161.72
15	25.00	26.50	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	235.20	235.20	5.65	69.89	608.36	1114.43	445.77	183.66
16	26.50	28.00	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	235.20	235.20	5.65	69.89	608.36	1184.32	473.73	205.60
17	28.00	29.50	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	235.20	235.20	5.65	69.89	608.36	1254.21	501.69	227.55
18	29.50	30.00	0.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	235.20	235.20	1.88	23.30	608.36	1277.51	511.00	234.86

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.59	2.08	1.85	8.86	7.91	0.192	0.768	10.42	2.60	46.16	20.59	25.00	6.25	110.80	49.43
2	22.50	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.59	2.08	1.85	8.86	7.91	0.192	0.768	10.42	2.60	46.16	20.59	25.00	6.25	110.80	49.43
3	24.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
4	25.50	17	2.96E+07	1.02E-01	2.35E+03	4.18	0.60	2.07	1.85	8.68	7.75	0.180	0.720	11.11	2.78	48.20	21.52	26.67	6.67	115.68	51.64
5	27.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17
6	28.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17
7	30.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-02	-
Chainage	0+124	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	191.10	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	17.50	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-02	1.00	22.00	19.50	19.50	251.26	123.72	7.95	1.99
BH-02	1.00	23.50	21.00	21.00	268.93	137.74	7.95	1.99
BH-02	1.00	25.00	22.50	22.50	257.21	150.87	7.95	1.99
BH-02	1.00	26.50	24.00	24.00	273.61	164.00	8.28	2.07
BH-02	1.00	28.00	25.50	25.50	349.56	178.90	8.28	2.07
BH-02	1.00	29.50	27.00	27.00	368.49	193.80	8.61	2.15
BH-02	1.00	30.00	27.50	27.50	374.80	198.77	8.61	2.15

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	15.00	0.00	25	-	10.00	10.88	1.00	-	3.25	4.00	11.25	22.50	4.71	2.32	25.21	27.53	11.01	5.05
2	4.00	5.50	1.50	Granular	15.00	0.00	25	-	10.00	10.88	1.00	-	4.75	5.50	33.75	45.00	4.71	6.96	44.50	53.79	21.52	8.65
3	5.50	7.00	1.50	Granular	15.00	0.00	25	-	10.00	10.88	1.00	-	6.25	7.00	56.25	67.50	4.71	11.61	63.80	84.69	33.88	13.55
4	7.00	8.50	1.50	Granular	15.00	0.00	25	-	10.00	10.88	1.00	-	7.75	8.50	78.75	90.00	4.71	16.25	83.09	120.24	48.10	19.75
5	8.50	10.00	1.50	Granular	15.00	0.00	25	-	10.00	10.88	1.00	-	9.25	10.00	101.25	112.50	4.71	20.89	102.39	160.43	64.17	27.25
6	10.00	11.50	1.50	Granular	15.00	0.00	25	-	10.00	10.88	1.00	-	10.75	11.50	123.75	135.00	4.71	25.54	121.69	205.26	82.10	36.05
7	11.50	13.00	1.50	Granular	18.70	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	149.03	163.05	4.71	31.98	178.31	293.87	117.55	46.65
7	13.00	14.50	1.50	Granular	18.70	0.00	26	-	11.90	13.19	1.00	-	13.75	14.50	177.08	191.10	4.71	38.00	207.48	361.04	144.42	58.94
8	14.50	16.00	1.50	Granular	16.60	0.00	27	-	13.80	15.50	1.00	-	15.25	16.00	191.10	191.10	4.71	42.59	242.56	438.71	175.49	72.51
9	16.00	17.50	1.50	Granular	16.60	0.00	27	-	13.80	15.50	1.00	-	16.75	17.50	191.10	191.10	4.71	42.59	242.56	481.30	192.52	86.09
10	17.50	19.00	1.50	Granular	6.80	0.00	23	-	6.00	8.68	1.00	-	18.25	19.00	191.10	191.10	4.71	36.28	132.41	407.43	162.97	97.90
11	19.00	20.50	1.50	Granular	6.80	0.00	23	-	6.00	8.68	1.00	-	19.75	20.50	191.10	191.10	4.71	36.28	132.41	443.71	177.49	109.70
12	20.50	22.00	1.50	Granular	7.00	0.00	28	-	15.70	17.82	1.00	-	21.25	22.00	191.10	191.10	4.71	44.17	272.69	628.16	251.26	123.72
13	22.00	23.50	1.50	Granular	7.00	0.00	28	-	15.70	17.82	1.00	-	22.75	23.50	191.10	191.10	4.71	44.17	272.69	672.33	268.93	137.74
14	23.50	25.00	1.50	Granular	7.80	0.00	26	-	11.90	13.19	1.00	-	24.25	25.00	191.10	191.10	4.71	41.01	202.37	643.01	257.21	150.87
15	25.00	26.50	1.50	Granular	7.80	0.00	26	-	11.90	13.19	1.00	-	25.75	26.50	191.10	191.10	4.71	41.01	202.37	684.03	273.61	164.00
16	26.50	28.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	191.10	191.10	4.71	47.32	344.93	873.91	349.56	178.90
17	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	191.10	191.10	4.71	47.32	344.93	921.23	368.49	193.80
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	191.10	191.10	1.57	15.77	344.93	937.00	374.80	198.77

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_r/T Ratio	L_r/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.68	2.06	1.85	7.61	6.82	0.252	1.007	7.95	1.99	30.23	13.55	19.07	4.77	72.55	32.51
2	22.50	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.68	2.06	1.85	7.61	6.82	0.252	1.007	7.95	1.99	30.23	13.55	19.07	4.77	72.55	32.51
3	24.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.68	2.06	1.85	7.61	6.82	0.252	1.007	7.95	1.99	30.23	13.55	19.07	4.77	72.55	32.51
4	25.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
5	27.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
6	28.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33
7	30.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-02	-
Chainage	0+124	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	240.90	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	17.50	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-02	1.20	22.00	19.50	19.50	388.40	168.22	10.42	2.60
BH-02	1.20	23.50	21.00	21.00	415.13	189.30	10.42	2.60
BH-02	1.20	25.00	22.50	22.50	388.91	209.05	10.42	2.60
BH-02	1.20	26.50	24.00	24.00	413.72	228.80	10.85	2.71
BH-02	1.20	28.00	25.50	25.50	545.76	251.21	10.85	2.71
BH-02	1.20	29.50	27.00	27.00	574.39	273.63	11.28	2.82
BH-02	1.20	30.00	27.50	27.50	583.93	281.11	11.28	2.82

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	15.00	0.00	25	-	10.00	10.88	1.00	-	3.25	4.00	11.25	22.50	5.65	2.79	38.00	40.79	16.31	7.11
2	4.00	5.50	1.50	Granular	15.00	0.00	25	-	10.00	10.88	1.00	-	4.75	5.50	33.75	45.00	5.65	8.36	65.79	76.93	30.77	11.83
3	5.50	7.00	1.50	Granular	15.00	0.00	25	-	10.00	10.88	1.00	-	6.25	7.00	56.25	67.50	5.65	13.93	93.57	118.65	47.46	18.10
4	7.00	8.50	1.50	Granular	15.00	0.00	25	-	10.00	10.88	1.00	-	7.75	8.50	78.75	90.00	5.65	19.50	121.36	165.93	66.37	25.94
5	8.50	10.00	1.50	Granular	15.00	0.00	25	-	10.00	10.88	1.00	-	9.25	10.00	101.25	112.50	5.65	25.07	149.14	218.79	87.52	35.33
6	10.00	11.50	1.50	Granular	15.00	0.00	25	-	10.00	10.88	1.00	-	10.75	11.50	123.75	135.00	5.65	30.64	176.93	277.22	110.89	46.29
7	11.50	13.00	1.50	Granular	18.70	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	149.03	163.05	5.65	38.38	259.30	397.97	159.19	59.41
7	13.00	14.50	1.50	Granular	18.70	0.00	26	-	11.90	13.19	1.00	-	13.75	14.50	177.08	191.10	5.65	45.60	301.30	485.57	194.23	74.55
8	14.50	16.00	1.50	Granular	16.60	0.00	27	-	13.80	15.50	1.00	-	15.25	16.00	203.55	216.00	5.65	54.44	395.71	634.42	253.77	92.17
9	16.00	17.50	1.50	Granular	16.60	0.00	27	-	13.80	15.50	1.00	-	16.75	17.50	228.45	240.90	5.65	61.10	439.53	739.34	295.73	111.65
10	17.50	19.00	1.50	Granular	6.80	0.00	23	-	6.00	8.68	1.00	-	18.25	19.00	240.90	240.90	5.65	54.88	240.23	594.91	237.97	129.40
11	19.00	20.50	1.50	Granular	6.80	0.00	23	-	6.00	8.68	1.00	-	19.75	20.50	240.90	240.90	5.65	54.88	240.23	649.79	259.92	147.14
12	20.50	22.00	1.50	Granular	7.00	0.00	28	-	15.70	17.82	1.00	-	21.25	22.00	240.90	240.90	5.65	66.81	494.63	971.01	388.40	168.22
13	22.00	23.50	1.50	Granular	7.00	0.00	28	-	15.70	17.82	1.00	-	22.75	23.50	240.90	240.90	5.65	66.81	494.63	1037.82	415.13	189.30
14	23.50	25.00	1.50	Granular	7.80	0.00	26	-	11.90	13.19	1.00	-	24.25	25.00	240.90	240.90	5.65	62.04	367.03	972.26	388.91	209.05
15	25.00	26.50	1.50	Granular	7.80	0.00	26	-	11.90	13.19	1.00	-	25.75	26.50	240.90	240.90	5.65	62.04	367.03	1034.30	413.72	228.80
16	26.50	28.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	240.90	240.90	5.65	71.58	625.53	1364.39	545.76	251.21
17	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	240.90	240.90	5.65	71.58	625.53	1435.97	574.39	273.63
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	240.90	240.90	1.88	23.86	625.53	1459.84	583.93	281.11

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.59	2.08	1.85	8.86	7.91	0.192	0.768	10.42	2.60	46.16	20.59	25.00	6.25	110.80	49.43
2	22.50	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.59	2.08	1.85	8.86	7.91	0.192	0.768	10.42	2.60	46.16	20.59	25.00	6.25	110.80	49.43
3	24.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.59	2.08	1.85	8.86	7.91	0.192	0.768	10.42	2.60	46.16	20.59	25.00	6.25	110.80	49.43
4	25.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
5	27.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
6	28.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17
7	30.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-03	-
Chainage	0+202	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	187.80	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	17.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-03	1.00	22.00	19.50	19.50	263.81	123.69	9.25	2.31
BH-03	1.00	23.50	21.00	21.00	281.80	137.92	9.25	2.31
BH-03	1.00	25.00	22.50	22.50	299.78	152.16	9.25	2.31
BH-03	1.00	26.50	24.00	24.00	317.76	166.40	9.56	2.39
BH-03	1.00	28.00	25.50	25.50	335.74	180.63	9.56	2.39
BH-03	1.00	29.50	27.00	27.00	368.30	195.30	9.56	2.39
BH-03	1.00	30.00	27.50	27.50	374.50	200.19	9.56	2.39

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	15.40	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	11.55	23.10	4.71	2.48	31.24	33.72	13.49	5.09
2	4.00	5.50	1.50	Granular	15.40	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	34.65	46.20	4.71	7.44	55.26	65.18	26.07	8.82
3	5.50	7.00	1.50	Granular	15.40	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	57.75	69.30	4.71	12.39	79.28	101.59	40.64	13.94
4	7.00	8.50	1.50	Granular	15.40	0.00	26	-	11.90	13.19	1.00	-	7.75	8.50	80.85	92.40	4.71	17.35	103.30	142.96	57.19	20.45
5	8.50	10.00	1.50	Granular	15.40	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	103.95	115.50	4.71	22.31	127.32	189.29	75.72	28.35
6	10.00	11.50	1.50	Granular	15.40	0.00	26	-	11.90	13.19	1.00	-	10.75	11.50	127.05	138.60	4.71	27.27	151.34	240.58	96.23	37.63
7	11.50	13.00	1.50	Granular	16.40	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	150.90	163.20	4.71	34.88	239.33	363.44	145.38	49.05
7	13.00	14.50	1.50	Granular	16.40	0.00	28	-	15.70	17.82	1.00	-	13.75	14.50	175.50	187.80	4.71	40.56	273.88	438.55	175.42	62.05
8	14.50	16.00	1.50	Granular	15.50	0.00	27	-	13.80	15.50	1.00	-	15.25	16.00	187.80	187.80	4.71	41.85	237.93	444.46	177.78	75.42
9	16.00	17.50	1.50	Granular	15.50	0.00	27	-	13.80	15.50	1.00	-	16.75	17.50	187.80	187.80	4.71	41.85	237.93	486.32	194.53	88.79
10	17.50	19.00	1.50	Granular	9.00	0.00	20	-	0.00	5.39	1.00	-	18.25	19.00	187.80	187.80	4.71	31.00	79.79	359.17	143.67	99.12
11	19.00	20.50	1.50	Granular	9.00	0.00	20	-	0.00	5.39	1.00	-	19.75	20.50	187.80	187.80	4.71	31.00	79.79	390.17	156.07	109.45
12	20.50	22.00	1.50	Granular	9.00	0.00	29	-	17.60	20.13	1.00	-	21.25	22.00	187.80	187.80	4.71	44.95	304.20	659.54	263.81	123.69
13	22.00	23.50	1.50	Granular	9.00	0.00	29	-	17.60	20.13	1.00	-	22.75	23.50	187.80	187.80	4.71	44.95	304.20	704.49	281.80	137.92
14	23.50	25.00	1.50	Granular	9.00	0.00	29	-	17.60	20.13	1.00	-	24.25	25.00	187.80	187.80	4.71	44.95	304.20	749.45	299.78	152.16
15	25.00	26.50	1.50	Granular	9.00	0.00	29	-	17.60	20.13	1.00	-	25.75	26.50	187.80	187.80	4.71	44.95	304.20	794.40	317.76	166.40
16	26.50	28.00	1.50	Granular	9.00	0.00	29	-	17.60	20.13	1.00	-	27.25	28.00	187.80	187.80	4.71	44.95	304.20	839.35	335.74	180.63
17	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	187.80	187.80	4.71	46.50	339.09	920.76	368.30	195.30
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	187.80	187.80	1.57	15.50	339.09	936.26	374.50	200.19

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_i/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	19	2.96E+07	4.91E-02	2.70E+03	3.52	0.71	2.06	1.85	7.23	6.49	0.216	0.865	9.25	2.31	33.44	15.01	22.19	5.55	80.26	36.03
2	22.50	19	2.96E+07	4.91E-02	2.70E+03	3.52	0.71	2.06	1.85	7.23	6.49	0.216	0.865	9.25	2.31	33.44	15.01	22.19	5.55	80.26	36.03
3	24.00	19	2.96E+07	4.91E-02	2.70E+03	3.52	0.71	2.06	1.85	7.23	6.49	0.216	0.865	9.25	2.31	33.44	15.01	22.19	5.55	80.26	36.03
4	25.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
5	27.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
6	28.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
7	30.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-03	-
Chainage	0+202	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	234.30	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	17.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-03	1.20	22.00	19.50	19.50	406.68	166.61	12.11	3.03
BH-03	1.20	23.50	21.00	21.00	433.60	187.83	12.11	3.03
BH-03	1.20	25.00	22.50	22.50	460.52	209.05	12.11	3.03
BH-03	1.20	26.50	24.00	24.00	487.44	230.27	12.52	3.13
BH-03	1.20	28.00	25.50	25.50	514.36	251.49	12.52	3.13
BH-03	1.20	29.50	27.00	27.00	567.27	273.36	12.52	3.13
BH-03	1.20	30.00	27.50	27.50	576.56	280.65	12.52	3.13

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	15.40	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	11.55	23.10	5.65	2.97	47.07	50.04	20.02	7.17
2	4.00	5.50	1.50	Granular	15.40	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	34.65	46.20	5.65	8.92	81.66	93.56	37.42	12.04
3	5.50	7.00	1.50	Granular	15.40	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	57.75	69.30	5.65	14.87	116.25	143.02	57.21	18.58
4	7.00	8.50	1.50	Granular	15.40	0.00	26	-	11.90	13.19	1.00	-	7.75	8.50	80.85	92.40	5.65	20.82	150.84	198.43	79.37	26.78
5	8.50	10.00	1.50	Granular	15.40	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	103.95	115.50	5.65	26.77	185.42	259.79	103.91	36.66
6	10.00	11.50	1.50	Granular	15.40	0.00	26	-	11.90	13.19	1.00	-	10.75	11.50	127.05	138.60	5.65	32.72	220.01	327.10	130.84	48.19
7	11.50	13.00	1.50	Granular	16.40	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	150.90	163.20	5.65	41.85	347.56	496.49	198.60	62.29
7	13.00	14.50	1.50	Granular	16.40	0.00	28	-	15.70	17.82	1.00	-	13.75	14.50	175.50	187.80	5.65	48.67	397.30	594.91	237.96	78.29
8	14.50	16.00	1.50	Granular	15.50	0.00	27	-	13.80	15.50	1.00	-	15.25	16.00	199.43	211.05	5.65	53.33	385.97	636.91	254.76	95.60
9	16.00	17.50	1.50	Granular	15.50	0.00	27	-	13.80	15.50	1.00	-	16.75	17.50	222.68	234.30	5.65	59.55	426.88	737.38	294.95	114.65
10	17.50	19.00	1.50	Granular	9.00	0.00	20	-	0.00	5.39	1.00	-	18.25	19.00	234.30	234.30	5.65	46.42	143.34	500.25	200.10	130.02
11	19.00	20.50	1.50	Granular	9.00	0.00	20	-	0.00	5.39	1.00	-	19.75	20.50	234.30	234.30	5.65	46.42	143.34	546.67	218.67	145.39
12	20.50	22.00	1.50	Granular	9.00	0.00	29	-	17.60	20.13	1.00	-	21.25	22.00	234.30	234.30	5.65	67.30	546.07	1016.70	406.68	166.61
13	22.00	23.50	1.50	Granular	9.00	0.00	29	-	17.60	20.13	1.00	-	22.75	23.50	234.30	234.30	5.65	67.30	546.07	1084.00	433.60	187.83
14	23.50	25.00	1.50	Granular	9.00	0.00	29	-	17.60	20.13	1.00	-	24.25	25.00	234.30	234.30	5.65	67.30	546.07	1151.31	460.52	209.05
15	25.00	26.50	1.50	Granular	9.00	0.00	29	-	17.60	20.13	1.00	-	25.75	26.50	234.30	234.30	5.65	67.30	546.07	1218.61	487.44	230.27
16	26.50	28.00	1.50	Granular	9.00	0.00	29	-	17.60	20.13	1.00	-	27.25	28.00	234.30	234.30	5.65	67.30	546.07	1285.91	514.36	251.49
17	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	234.30	234.30	5.65	69.62	608.72	1418.18	567.27	273.36
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	234.30	234.30	1.88	23.21	608.72	1441.39	576.56	280.65

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	19	2.96E+07	1.02E-01	2.70E+03	4.07	0.61	2.07	1.85	8.43	7.53	0.165	0.660	12.11	3.03	51.05	22.81	29.07	7.27	122.53	54.74
2	22.50	19	2.96E+07	1.02E-01	2.70E+03	4.07	0.61	2.07	1.85	8.43	7.53	0.165	0.660	12.11	3.03	51.05	22.81	29.07	7.27	122.53	54.74
3	24.00	19	2.96E+07	1.02E-01	2.70E+03	4.07	0.61	2.07	1.85	8.43	7.53	0.165	0.660	12.11	3.03	51.05	22.81	29.07	7.27	122.53	54.74
4	25.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
5	27.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
6	28.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
7	30.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-04	-
Chainage	0+291	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	183.90	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	17.10	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-04	1.00	22.00	19.50	19.50	245.75	122.78	8.93	2.23
BH-04	1.00	23.50	21.00	21.00	262.75	136.33	8.93	2.23
BH-04	1.00	25.00	22.50	22.50	279.75	149.88	8.93	2.23
BH-04	1.00	26.50	24.00	24.00	325.17	164.28	8.93	2.23
BH-04	1.00	28.00	25.50	25.50	344.15	178.68	8.93	2.23
BH-04	1.00	29.50	27.00	27.00	362.37	193.08	8.93	2.23
BH-04	1.00	30.00	27.50	27.50	368.44	197.88	9.25	2.31

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	15.00	0.00	27	-	13.80	15.50	1.00	-	3.25	4.00	11.25	22.50	4.71	2.51	35.65	38.16	15.26	5.10
2	4.00	5.50	1.50	Granular	15.00	0.00	27	-	13.80	15.50	1.00	-	4.75	5.50	33.75	45.00	4.71	7.52	63.15	73.18	29.27	8.86
3	5.50	7.00	1.50	Granular	15.00	0.00	27	-	13.80	15.50	1.00	-	6.25	7.00	56.25	67.50	4.71	12.54	90.65	113.21	45.29	14.02
4	7.00	8.50	1.50	Granular	15.00	0.00	27	-	13.80	15.50	1.00	-	7.75	8.50	78.75	90.00	4.71	17.55	118.14	158.26	63.30	20.58
5	8.50	10.00	1.50	Granular	15.00	0.00	27	-	13.80	15.50	1.00	-	9.25	10.00	101.25	112.50	4.71	22.57	145.64	208.32	83.33	28.55
6	10.00	11.50	1.50	Granular	15.00	0.00	28	-	15.70	17.82	1.00	-	10.75	11.50	123.75	135.00	4.71	28.60	198.86	290.14	116.06	38.20
7	11.50	13.00	1.50	Granular	16.30	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	147.23	159.45	4.71	34.03	234.00	359.31	143.72	49.38
7	13.00	14.50	1.50	Granular	16.30	0.00	24	-	8.00	9.78	1.00	-	13.75	14.50	171.68	183.90	4.71	34.01	146.93	306.25	122.50	60.55
8	14.50	16.00	1.50	Granular	16.30	0.00	24	-	8.00	9.78	1.00	-	15.25	16.00	183.90	183.90	4.71	36.43	146.93	342.68	137.07	72.40
9	16.00	17.50	1.50	Granular	16.30	0.00	23	-	6.00	8.68	1.00	-	16.75	17.50	183.90	183.90	4.71	34.91	129.73	360.40	144.16	83.83
10	17.50	19.00	1.50	Granular	6.50	0.00	23	-	6.00	8.68	1.00	-	18.25	19.00	183.90	183.90	4.71	34.91	127.42	392.99	157.20	95.25
11	19.00	20.50	1.50	Granular	6.50	0.00	29	-	17.60	20.13	1.00	-	19.75	20.50	183.90	183.90	4.71	44.02	296.27	605.87	242.35	109.23
12	20.50	22.00	1.50	Granular	6.50	0.00	28	-	15.70	17.82	1.00	-	21.25	22.00	183.90	183.90	4.71	42.50	262.27	614.37	245.75	122.78
13	22.00	23.50	1.50	Granular	6.50	0.00	28	-	15.70	17.82	1.00	-	22.75	23.50	183.90	183.90	4.71	42.50	262.27	656.88	262.75	136.33
14	23.50	25.00	1.50	Granular	6.50	0.00	28	-	15.70	17.82	1.00	-	24.25	25.00	183.90	183.90	4.71	42.50	262.27	699.38	279.75	149.88
15	25.00	26.50	1.50	Granular	6.50	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	183.90	183.90	4.71	45.54	330.27	812.92	325.17	164.28
16	26.50	28.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	183.90	183.90	4.71	45.54	332.19	860.38	344.15	178.68
17	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	183.90	183.90	4.71	45.54	332.19	905.92	362.37	193.08
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	183.90	183.90	1.57	15.18	332.19	921.10	368.44	197.88

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
2	22.50	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
3	24.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
4	25.50	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
5	27.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
6	28.50	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
7	30.00	19	2.96E+07	4.91E-02	2.70E+03	3.52	0.71	2.06	1.85	7.23	6.49	0.216	0.865	9.25	2.31	33.44	15.01	22.19	5.55	80.26	36.03

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-04	-
Chainage	0+291	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	232.80	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	17.10	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-04	1.20	22.00	19.50	19.50	380.10	167.14	11.70	2.93
BH-04	1.20	23.50	21.00	21.00	405.92	187.60	11.70	2.93
BH-04	1.20	25.00	22.50	22.50	431.75	208.05	11.70	2.93
BH-04	1.20	26.50	24.00	24.00	508.97	229.79	11.70	2.93
BH-04	1.20	28.00	25.50	25.50	537.97	251.54	11.70	2.93
BH-04	1.20	29.50	27.00	27.00	565.64	273.28	11.70	2.93
BH-04	1.20	30.00	27.50	27.50	574.86	280.53	12.11	3.03

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	15.00	0.00	27	-	13.80	15.50	1.00	-	3.25	4.00	11.25	22.50	5.65	3.01	53.69	56.70	22.68	7.18
2	4.00	5.50	1.50	Granular	15.00	0.00	27	-	13.80	15.50	1.00	-	4.75	5.50	33.75	45.00	5.65	9.03	93.29	105.32	42.13	12.08
3	5.50	7.00	1.50	Granular	15.00	0.00	27	-	13.80	15.50	1.00	-	6.25	7.00	56.25	67.50	5.65	15.04	132.88	159.96	63.98	18.67
4	7.00	8.50	1.50	Granular	15.00	0.00	27	-	13.80	15.50	1.00	-	7.75	8.50	78.75	90.00	5.65	21.06	172.48	220.62	88.25	26.94
5	8.50	10.00	1.50	Granular	15.00	0.00	27	-	13.80	15.50	1.00	-	9.25	10.00	101.25	112.50	5.65	27.08	212.07	287.29	114.92	36.89
6	10.00	11.50	1.50	Granular	15.00	0.00	28	-	15.70	17.82	1.00	-	10.75	11.50	123.75	135.00	5.65	34.32	289.03	398.57	159.43	48.88
7	11.50	13.00	1.50	Granular	16.30	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	147.23	159.45	5.65	40.83	339.87	490.24	196.10	62.69
7	13.00	14.50	1.50	Granular	16.30	0.00	24	-	8.00	9.78	1.00	-	13.75	14.50	171.68	183.90	5.65	40.81	213.06	404.25	161.70	76.49
8	14.50	16.00	1.50	Granular	16.30	0.00	24	-	8.00	9.78	1.00	-	15.25	16.00	196.13	208.35	5.65	46.62	240.21	478.02	191.21	91.92
9	16.00	17.50	1.50	Granular	16.30	0.00	23	-	6.00	8.68	1.00	-	16.75	17.50	220.58	232.80	5.65	50.25	236.13	524.18	209.67	108.36
10	17.50	19.00	1.50	Granular	6.50	0.00	23	-	6.00	8.68	1.00	-	18.25	19.00	232.80	232.80	5.65	53.04	232.12	573.21	229.29	125.59
11	19.00	20.50	1.50	Granular	6.50	0.00	29	-	17.60	20.13	1.00	-	19.75	20.50	232.80	232.80	5.65	66.87	539.65	947.61	379.05	146.69
12	20.50	22.00	1.50	Granular	6.50	0.00	28	-	15.70	17.82	1.00	-	21.25	22.00	232.80	232.80	5.65	64.57	477.72	950.25	380.10	167.14
13	22.00	23.50	1.50	Granular	6.50	0.00	28	-	15.70	17.82	1.00	-	22.75	23.50	232.80	232.80	5.65	64.57	477.72	1014.81	405.92	187.60
14	23.50	25.00	1.50	Granular	6.50	0.00	28	-	15.70	17.82	1.00	-	24.25	25.00	232.80	232.80	5.65	64.57	477.72	1079.38	431.75	208.05
15	25.00	26.50	1.50	Granular	6.50	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	232.80	232.80	5.65	69.18	601.58	1272.42	508.97	229.79
16	26.50	28.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	232.80	232.80	5.65	69.18	604.90	1344.92	537.97	251.54
17	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	232.80	232.80	5.65	69.18	604.90	1414.10	565.64	273.28
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	232.80	232.80	1.88	23.06	604.90	1437.16	574.86	280.53

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
2	22.50	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
3	24.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
4	25.50	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
5	27.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
6	28.50	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
7	30.00	19	2.96E+07	1.02E-01	2.70E+03	4.07	0.61	2.07	1.85	8.43	7.53	0.165	0.660	12.11	3.03	51.05	22.81	29.07	7.27	122.53	54.74

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-05	-
Chainage	0+410	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	192.30	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.00	mtr
Groundwater Level from OGL	14.60	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-05	1.00	22.00	19.50	18.00	262.59	110.83	9.71	2.43
BH-05	1.00	23.50	21.00	19.50	281.63	125.81	9.71	2.43
BH-05	1.00	25.00	22.50	21.00	300.07	140.79	9.71	2.43
BH-05	1.00	26.50	24.00	22.50	319.11	155.77	9.71	2.43
BH-05	1.00	28.00	25.50	24.00	338.47	170.76	9.71	2.43
BH-05	1.00	29.50	27.00	25.50	357.52	185.74	9.71	2.43
BH-05	1.00	30.00	27.50	26.00	364.17	190.73	10.06	2.51

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (Ki)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	16.00	0.00	27	-	13.80	15.50	1.00	-	3.25	4.00	12.00	24.00	4.71	0.00	0.00	0.00	0.00	4.40
2	4.00	5.50	1.50	Granular	16.00	0.00	27	-	13.80	15.50	1.00	-	4.75	5.50	36.00	48.00	4.71	8.02	67.36	75.38	30.15	8.29
3	5.50	7.00	1.50	Granular	16.00	0.00	27	-	13.80	15.50	1.00	-	6.25	7.00	60.00	72.00	4.71	13.37	96.69	118.09	47.23	13.69
4	7.00	8.50	1.50	Granular	16.00	0.00	27	-	13.80	15.50	1.00	-	7.75	8.50	84.00	96.00	4.71	18.72	126.02	166.14	66.45	20.58
5	8.50	10.00	1.50	Granular	16.00	0.00	29	-	17.60	20.13	1.00	-	9.25	10.00	108.00	120.00	4.71	25.85	201.48	267.45	106.98	29.47
6	10.00	11.50	1.50	Granular	16.00	0.00	29	-	17.60	20.13	1.00	-	10.75	11.50	132.00	144.00	4.71	31.60	239.56	337.13	134.85	39.96
7	11.50	13.00	1.50	Granular	16.10	0.00	30	-	19.50	22.44	1.00	-	12.25	13.00	156.08	168.15	4.71	38.65	309.79	446.01	178.40	52.43
7	13.00	14.50	1.50	Granular	16.10	0.00	30	-	19.50	22.44	1.00	-	13.75	14.50	180.23	192.30	4.71	44.63	352.51	533.35	213.34	66.58
8	14.50	16.00	1.50	Granular	6.00	0.00	21	-	2.00	6.49	1.00	-	15.25	16.00	192.30	192.30	4.71	33.33	98.82	312.99	125.20	77.56
9	16.00	17.50	1.50	Granular	6.00	0.00	21	-	2.00	6.49	1.00	-	16.75	17.50	192.30	192.30	4.71	0.00	98.82	312.99	125.20	79.21
10	17.50	19.00	1.50	Granular	6.00	0.00	30	-	19.50	22.44	1.00	-	18.25	19.00	192.30	192.30	4.71	0.00	344.75	558.92	223.57	80.86
11	19.00	20.50	1.50	Granular	6.00	0.00	30	-	19.50	22.44	1.00	-	19.75	20.50	192.30	192.30	4.71	47.62	344.75	606.54	242.62	95.84
12	20.50	22.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	21.25	22.00	192.30	192.30	4.71	47.62	347.05	656.47	262.59	110.83
13	22.00	23.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	192.30	192.30	4.71	47.62	347.05	704.09	281.63	125.81
14	23.50	25.00	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	192.30	192.30	4.71	47.62	345.52	750.17	300.07	140.79
15	25.00	26.50	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	192.30	192.30	4.71	47.62	345.52	797.79	319.11	155.77
16	26.50	28.00	1.50	Granular	8.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	192.30	192.30	4.71	47.62	346.28	846.17	338.47	170.76
17	28.00	29.50	1.50	Granular	8.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	192.30	192.30	4.71	47.62	346.28	893.79	357.52	185.74
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	192.30	192.30	1.57	15.87	347.05	910.43	364.17	190.73

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_i/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	1.12	2.00	1.83	7.12	6.50	0.206	0.824	9.71	2.43	34.55	15.79	23.30	5.83	82.92	37.90
2	22.50	18	2.96E+07	4.91E-02	2.55E+03	3.56	1.12	2.00	1.83	7.12	6.50	0.206	0.824	9.71	2.43	34.55	15.79	23.30	5.83	82.92	37.90
3	24.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	1.12	2.00	1.83	7.12	6.50	0.206	0.824	9.71	2.43	34.55	15.79	23.30	5.83	82.92	37.90
4	25.50	18	2.96E+07	4.91E-02	2.55E+03	3.56	1.12	2.00	1.83	7.12	6.50	0.206	0.824	9.71	2.43	34.55	15.79	23.30	5.83	82.92	37.90
5	27.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	1.12	2.00	1.83	7.12	6.50	0.206	0.824	9.71	2.43	34.55	15.79	23.30	5.83	82.92	37.90
6	28.50	18	2.96E+07	4.91E-02	2.55E+03	3.56	1.12	2.00	1.83	7.12	6.50	0.206	0.824	9.71	2.43	34.55	15.79	23.30	5.83	82.92	37.90
7	30.00	19	2.96E+07	4.91E-02	2.70E+03	3.52	1.14	2.00	1.83	7.03	6.43	0.199	0.795	10.06	2.51	35.37	16.17	24.14	6.03	84.88	38.81

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-05	-
Chainage	0+410	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	210.30	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.00	mtr
Groundwater Level from OGL	14.60	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-05	1.20	22.00	19.50	18.00	372.21	142.05	12.64	3.16
BH-05	1.20	23.50	21.00	19.50	397.21	161.93	12.64	3.16
BH-05	1.20	25.00	22.50	21.00	421.14	181.80	12.64	3.16
BH-05	1.20	26.50	24.00	22.50	446.14	201.67	12.64	3.16
BH-05	1.20	28.00	25.50	24.00	471.67	221.55	12.64	3.16
BH-05	1.20	29.50	27.00	25.50	496.66	241.42	12.64	3.16
BH-05	1.20	30.00	27.50	26.00	505.53	248.04	13.09	3.27

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	16.00	0.00	27	-	13.80	15.50	1.00	-	3.25	4.00	12.00	24.00	5.65	0.00	0.00	0.00	0.00	6.33
2	4.00	5.50	1.50	Granular	16.00	0.00	27	-	13.80	15.50	1.00	-	4.75	5.50	36.00	48.00	5.65	9.63	99.51	109.13	43.65	11.40
3	5.50	7.00	1.50	Granular	16.00	0.00	27	-	13.80	15.50	1.00	-	6.25	7.00	60.00	72.00	5.65	16.05	141.74	167.41	66.97	18.27
4	7.00	8.50	1.50	Granular	16.00	0.00	27	-	13.80	15.50	1.00	-	7.75	8.50	84.00	96.00	5.65	22.46	183.98	232.11	92.85	26.94
5	8.50	10.00	1.50	Granular	16.00	0.00	29	-	17.60	20.13	1.00	-	9.25	10.00	108.00	120.00	5.65	31.02	293.33	372.49	149.00	38.00
6	10.00	11.50	1.50	Granular	16.00	0.00	29	-	17.60	20.13	1.00	-	10.75	11.50	132.00	144.00	5.65	37.92	348.16	465.24	186.10	50.99
7	11.50	13.00	1.50	Granular	16.10	0.00	30	-	19.50	22.44	1.00	-	12.25	13.00	156.08	168.15	5.65	46.38	449.67	613.12	245.25	66.35
7	13.00	14.50	1.50	Granular	16.10	0.00	30	-	19.50	22.44	1.00	-	13.75	14.50	180.23	192.30	5.65	53.55	511.18	728.19	291.28	83.72
8	14.50	16.00	1.50	Granular	6.00	0.00	21	-	2.00	6.49	1.00	-	15.25	16.00	196.80	201.30	5.65	40.94	149.06	407.01	162.80	97.56
9	16.00	17.50	1.50	Granular	6.00	0.00	21	-	2.00	6.49	1.00	-	16.75	17.50	205.80	210.30	5.65	0.00	155.69	413.63	165.45	99.93
10	17.50	19.00	1.50	Granular	6.00	0.00	30	-	19.50	22.44	1.00	-	18.25	19.00	210.30	210.30	5.65	0.00	543.61	801.56	320.62	102.31
11	19.00	20.50	1.50	Granular	6.00	0.00	30	-	19.50	22.44	1.00	-	19.75	20.50	210.30	210.30	5.65	62.49	543.61	864.05	345.62	122.18
12	20.50	22.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	21.25	22.00	210.30	210.30	5.65	62.49	547.59	930.53	372.21	142.05
13	22.00	23.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	210.30	210.30	5.65	62.49	547.59	993.02	397.21	161.93
14	23.50	25.00	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	210.30	210.30	5.65	62.49	544.94	1052.85	421.14	181.80
15	25.00	26.50	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	210.30	210.30	5.65	62.49	544.94	1115.34	446.14	201.67
16	26.50	28.00	1.50	Granular	8.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	210.30	210.30	5.65	62.49	546.27	1179.16	471.67	221.55
17	28.00	29.50	1.50	Granular	8.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	210.30	210.30	5.65	62.49	546.27	1241.65	496.66	241.42
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	210.30	210.30	1.88	20.83	547.59	1263.81	505.53	248.04

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.97	2.02	1.83	8.31	7.55	0.158	0.633	12.64	3.16	52.53	23.86	30.34	7.58	126.06	57.27
2	22.50	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.97	2.02	1.83	8.31	7.55	0.158	0.633	12.64	3.16	52.53	23.86	30.34	7.58	126.06	57.27
3	24.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.97	2.02	1.83	8.31	7.55	0.158	0.633	12.64	3.16	52.53	23.86	30.34	7.58	126.06	57.27
4	25.50	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.97	2.02	1.83	8.31	7.55	0.158	0.633	12.64	3.16	52.53	23.86	30.34	7.58	126.06	57.27
5	27.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.97	2.02	1.83	8.31	7.55	0.158	0.633	12.64	3.16	52.53	23.86	30.34	7.58	126.06	57.27
6	28.50	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.97	2.02	1.83	8.31	7.55	0.158	0.633	12.64	3.16	52.53	23.86	30.34	7.58	126.06	57.27
7	30.00	19	2.96E+07	1.02E-01	2.70E+03	4.07	0.98	2.02	1.83	8.21	7.47	0.153	0.611	13.09	3.27	53.77	24.44	31.42	7.85	129.04	58.65

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-06	-
Chainage	0+501	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	182.40	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.00	mtr
Groundwater Level from OGL	14.50	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-06	1.00	22.00	19.50	18.00	286.45	132.00	9.36	2.34
BH-06	1.00	23.50	21.00	19.50	247.23	144.61	9.36	2.34
BH-06	1.00	25.00	22.50	21.00	262.89	157.22	9.36	2.34
BH-06	1.00	26.50	24.00	22.50	278.74	169.83	9.36	2.34
BH-06	1.00	28.00	25.50	24.00	351.19	184.13	9.36	2.34
BH-06	1.00	29.50	27.00	25.50	368.95	198.43	9.36	2.34
BH-06	1.00	30.00	27.50	26.00	374.97	203.19	9.71	2.43

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	15.00	0.00	27	-	13.80	15.50	1.00	-	3.25	4.00	11.25	22.50	4.71	0.00	0.00	0.00	0.00	4.40
2	4.00	5.50	1.50	Granular	15.00	0.00	27	-	13.80	15.50	1.00	-	4.75	5.50	33.75	45.00	4.71	7.52	63.15	70.67	28.27	8.15
3	5.50	7.00	1.50	Granular	15.00	0.00	27	-	13.80	15.50	1.00	-	6.25	7.00	56.25	67.50	4.71	12.54	90.65	110.71	44.28	13.31
4	7.00	8.50	1.50	Granular	15.00	0.00	27	-	13.80	15.50	1.00	-	7.75	8.50	78.75	90.00	4.71	17.55	118.14	155.75	62.30	19.88
5	8.50	10.00	1.50	Granular	15.00	0.00	27	-	13.80	15.50	1.00	-	9.25	10.00	101.25	112.50	4.71	22.57	145.64	205.81	82.33	27.84
6	10.00	11.50	1.50	Granular	15.00	0.00	27	-	13.80	15.50	1.00	-	10.75	11.50	123.75	135.00	4.71	27.58	173.14	260.89	104.36	37.22
7	11.50	13.00	1.50	Granular	15.80	0.00	29	-	17.60	20.13	1.00	-	12.25	13.00	146.85	158.70	4.71	35.15	262.74	385.65	154.26	48.71
7	13.00	14.50	1.50	Granular	15.80	0.00	29	-	17.60	20.13	1.00	-	13.75	14.50	170.55	182.40	4.71	40.83	300.34	464.08	185.63	61.79
8	14.50	16.00	1.50	Granular	9.00	0.00	27	-	13.80	15.50	1.00	-	15.25	16.00	182.40	182.40	4.71	40.65	227.80	432.18	172.87	74.82
9	16.00	17.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	16.75	17.50	182.40	182.40	4.71	45.17	329.54	579.09	231.64	89.12
10	17.50	19.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	18.25	19.00	182.40	182.40	4.71	45.17	329.54	624.26	249.70	103.41
11	19.00	20.50	1.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	19.75	20.50	182.40	182.40	4.71	45.17	331.08	670.96	268.38	117.71
12	20.50	22.00	1.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	21.25	22.00	182.40	182.40	4.71	45.17	331.08	716.13	286.45	132.00
13	22.00	23.50	1.50	Granular	9.00	0.00	26	-	11.90	13.19	1.00	-	22.75	23.50	182.40	182.40	4.71	39.15	193.89	618.08	247.23	144.61
14	23.50	25.00	1.50	Granular	9.00	0.00	26	-	11.90	13.19	1.00	-	24.25	25.00	182.40	182.40	4.71	39.15	193.89	657.23	262.89	157.22
15	25.00	26.50	1.50	Granular	10.00	0.00	26	-	11.90	13.19	1.00	-	25.75	26.50	182.40	182.40	4.71	39.15	194.35	696.84	278.74	169.83
16	26.50	28.00	1.50	Granular	10.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	182.40	182.40	4.71	45.17	330.31	877.96	351.19	184.13
17	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	182.40	182.40	4.71	45.17	329.54	922.36	368.95	198.43
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	182.40	182.40	1.57	15.06	329.54	937.42	374.97	203.19

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_i/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.11	2.00	1.83	7.20	6.58	0.214	0.855	9.36	2.34	33.70	15.40	22.46	5.61	80.89	36.95
2	22.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.11	2.00	1.83	7.20	6.58	0.214	0.855	9.36	2.34	33.70	15.40	22.46	5.61	80.89	36.95
3	24.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.11	2.00	1.83	7.20	6.58	0.214	0.855	9.36	2.34	33.70	15.40	22.46	5.61	80.89	36.95
4	25.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.11	2.00	1.83	7.20	6.58	0.214	0.855	9.36	2.34	33.70	15.40	22.46	5.61	80.89	36.95
5	27.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.11	2.00	1.83	7.20	6.58	0.214	0.855	9.36	2.34	33.70	15.40	22.46	5.61	80.89	36.95
6	28.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.11	2.00	1.83	7.20	6.58	0.214	0.855	9.36	2.34	33.70	15.40	22.46	5.61	80.89	36.95
7	30.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	1.12	2.00	1.83	7.12	6.50	0.206	0.824	9.71	2.43	34.55	15.79	23.30	5.83	82.92	37.90

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-06	-
Chainage	0+501	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	209.40	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.00	mtr
Groundwater Level from OGL	14.50	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-06	1.20	22.00	19.50	18.00	416.76	173.14	12.18	3.05
BH-06	1.20	23.50	21.00	19.50	347.49	190.62	12.18	3.05
BH-06	1.20	25.00	22.50	21.00	369.06	208.09	12.18	3.05
BH-06	1.20	26.50	24.00	22.50	390.95	225.57	12.18	3.05
BH-06	1.20	28.00	25.50	24.00	505.84	245.36	12.18	3.05
BH-06	1.20	29.50	27.00	25.50	530.19	265.16	12.18	3.05
BH-06	1.20	30.00	27.50	26.00	538.49	271.76	12.64	3.16

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	15.00	0.00	27	-	13.80	15.50	1.00	-	3.25	4.00	11.25	22.50	5.65	0.00	0.00	0.00	0.00	6.33
2	4.00	5.50	1.50	Granular	15.00	0.00	27	-	13.80	15.50	1.00	-	4.75	5.50	33.75	45.00	5.65	9.03	93.29	102.31	40.93	11.24
3	5.50	7.00	1.50	Granular	15.00	0.00	27	-	13.80	15.50	1.00	-	6.25	7.00	56.25	67.50	5.65	15.04	132.88	156.95	62.78	17.82
4	7.00	8.50	1.50	Granular	15.00	0.00	27	-	13.80	15.50	1.00	-	7.75	8.50	78.75	90.00	5.65	21.06	172.48	217.61	87.04	26.10
5	8.50	10.00	1.50	Granular	15.00	0.00	27	-	13.80	15.50	1.00	-	9.25	10.00	101.25	112.50	5.65	27.08	212.07	284.28	113.71	36.05
6	10.00	11.50	1.50	Granular	15.00	0.00	27	-	13.80	15.50	1.00	-	10.75	11.50	123.75	135.00	5.65	33.10	251.67	356.97	142.79	47.69
7	11.50	13.00	1.50	Granular	15.80	0.00	29	-	17.60	20.13	1.00	-	12.25	13.00	146.85	158.70	5.65	42.18	381.51	528.99	211.60	61.88
7	13.00	14.50	1.50	Granular	15.80	0.00	29	-	17.60	20.13	1.00	-	13.75	14.50	170.55	182.40	5.65	48.99	435.65	632.13	252.85	77.97
8	14.50	16.00	1.50	Granular	9.00	0.00	27	-	13.80	15.50	1.00	-	15.25	16.00	189.15	195.90	5.65	50.59	353.20	600.26	240.10	94.51
9	16.00	17.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	16.75	17.50	202.65	209.40	5.65	60.22	545.30	852.58	341.03	113.75
10	17.50	19.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	18.25	19.00	209.40	209.40	5.65	62.22	545.30	914.81	365.92	133.55
11	19.00	20.50	1.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	19.75	20.50	209.40	209.40	5.65	62.22	547.96	979.69	391.88	153.34
12	20.50	22.00	1.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	21.25	22.00	209.40	209.40	5.65	62.22	547.96	1041.91	416.76	173.14
13	22.00	23.50	1.50	Granular	9.00	0.00	26	-	11.90	13.19	1.00	-	22.75	23.50	209.40	209.40	5.65	53.93	320.84	868.72	347.49	190.62
14	23.50	25.00	1.50	Granular	9.00	0.00	26	-	11.90	13.19	1.00	-	24.25	25.00	209.40	209.40	5.65	53.93	320.84	922.65	369.06	208.09
15	25.00	26.50	1.50	Granular	10.00	0.00	26	-	11.90	13.19	1.00	-	25.75	26.50	209.40	209.40	5.65	53.93	321.65	977.39	390.95	225.57
16	26.50	28.00	1.50	Granular	10.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	209.40	209.40	5.65	62.22	546.63	1264.59	505.84	245.36
17	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	209.40	209.40	5.65	62.22	545.30	1325.49	530.19	265.16
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	209.40	209.40	1.88	20.74	545.30	1346.23	538.49	271.76

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.96	2.02	1.84	8.41	7.64	0.164	0.657	12.18	3.05	51.25	23.27	29.24	7.31	122.99	55.85
2	22.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.96	2.02	1.84	8.41	7.64	0.164	0.657	12.18	3.05	51.25	23.27	29.24	7.31	122.99	55.85
3	24.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.96	2.02	1.84	8.41	7.64	0.164	0.657	12.18	3.05	51.25	23.27	29.24	7.31	122.99	55.85
4	25.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.96	2.02	1.84	8.41	7.64	0.164	0.657	12.18	3.05	51.25	23.27	29.24	7.31	122.99	55.85
5	27.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.96	2.02	1.84	8.41	7.64	0.164	0.657	12.18	3.05	51.25	23.27	29.24	7.31	122.99	55.85
6	28.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.96	2.02	1.84	8.41	7.64	0.164	0.657	12.18	3.05	51.25	23.27	29.24	7.31	122.99	55.85
7	30.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.97	2.02	1.83	8.31	7.55	0.158	0.633	12.64	3.16	52.53	23.86	30.34	7.58	126.06	57.27

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-07	-
Chainage	0+622	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	184.20	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.00	mtr
Groundwater Level from OGL	13.40	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-07	1.00	22.00	19.50	18.00	240.63	99.47	8.25	2.06
BH-07	1.00	23.50	21.00	19.50	258.88	113.89	8.62	2.16
BH-07	1.00	25.00	22.50	21.00	277.40	128.31	8.62	2.16
BH-07	1.00	26.50	24.00	22.50	295.64	142.73	8.62	2.16
BH-07	1.00	28.00	25.50	24.00	314.35	157.15	8.99	2.25
BH-07	1.00	29.50	27.00	25.50	332.60	171.57	8.99	2.25
BH-07	1.00	30.00	27.50	26.00	338.68	176.38	8.99	2.25

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	16.50	0.00	20	-	0.00	5.39	1.00	-	3.25	4.00	12.38	24.75	4.71	0.00	0.00	0.00	0.00	4.40
2	4.00	5.50	1.50	Granular	16.50	0.00	20	-	0.00	5.39	1.00	-	4.75	5.50	37.13	49.50	4.71	6.13	21.03	27.16	10.86	7.76
3	5.50	7.00	1.50	Granular	16.50	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	61.88	74.25	4.71	13.28	84.95	104.35	41.74	13.13
4	7.00	8.50	1.50	Granular	16.50	0.00	26	-	11.90	13.19	1.00	-	7.75	8.50	86.63	99.00	4.71	18.59	110.68	148.68	59.47	19.99
5	8.50	10.00	1.50	Granular	16.50	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	111.38	123.75	4.71	23.90	136.42	198.32	79.33	28.33
6	10.00	11.50	1.50	Granular	16.50	0.00	23	-	6.00	8.68	1.00	-	10.75	11.50	136.13	148.50	4.71	25.84	105.55	193.29	77.32	37.21
7	11.50	13.00	1.50	Granular	16.80	0.00	23	-	6.00	8.68	1.00	-	12.25	13.00	161.10	173.70	4.71	30.58	122.87	241.20	96.48	47.43
7	13.00	14.50	1.50	Granular	7.00	0.00	23	-	6.00	8.68	1.00	-	13.75	14.50	178.95	184.20	4.71	0.00	127.74	246.07	98.43	49.08
8	14.50	16.00	1.50	Granular	7.00	0.00	23	-	6.00	8.68	1.00	-	15.25	16.00	184.20	184.20	4.71	0.00	127.74	246.07	98.43	50.72
9	16.00	17.50	1.50	Granular	8.90	0.00	23	-	6.00	8.68	1.00	-	16.75	17.50	184.20	184.20	4.71	34.97	128.19	281.49	112.59	62.17
10	17.50	19.00	1.50	Granular	8.90	0.00	23	-	6.00	8.68	1.00	-	18.25	19.00	184.20	184.20	4.71	34.97	128.19	316.46	126.58	73.61
11	19.00	20.50	1.50	Granular	8.90	0.00	23	-	6.00	8.68	1.00	-	19.75	20.50	184.20	184.20	4.71	34.97	128.19	351.43	140.57	85.05
12	20.50	22.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	21.25	22.00	184.20	184.20	4.71	45.61	332.73	601.58	240.63	99.47
13	22.00	23.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	184.20	184.20	4.71	45.61	332.73	647.19	258.88	113.89
14	23.50	25.00	1.50	Granular	9.90	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	184.20	184.20	4.71	45.61	333.42	693.50	277.40	128.31
15	25.00	26.50	1.50	Granular	9.90	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	184.20	184.20	4.71	45.61	333.42	739.11	295.64	142.73
16	26.50	28.00	1.50	Granular	11.40	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	184.20	184.20	4.71	45.61	334.57	785.87	314.35	157.15
17	28.00	29.50	1.50	Granular	11.40	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	184.20	184.20	4.71	45.61	334.57	831.49	332.60	171.57
18	29.50	30.00	0.50	Granular	11.40	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	184.20	184.20	1.57	15.20	334.57	846.69	338.68	176.38

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	14	2.96E+07	4.91E-02	1.98E+03	3.74	1.07	2.01	1.83	7.51	6.85	0.243	0.970	8.25	2.06	30.98	14.13	19.79	4.95	74.36	33.91
2	22.50	15	2.96E+07	4.91E-02	2.12E+03	3.69	1.08	2.01	1.83	7.40	6.76	0.232	0.928	8.62	2.16	31.92	14.57	20.70	5.17	76.62	34.96
3	24.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	1.08	2.01	1.83	7.40	6.76	0.232	0.928	8.62	2.16	31.92	14.57	20.70	5.17	76.62	34.96
4	25.50	15	2.96E+07	4.91E-02	2.12E+03	3.69	1.08	2.01	1.83	7.40	6.76	0.232	0.928	8.62	2.16	31.92	14.57	20.70	5.17	76.62	34.96
5	27.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	1.10	2.00	1.83	7.30	6.67	0.222	0.889	8.99	2.25	32.83	14.99	21.59	5.40	78.79	35.98
6	28.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	1.10	2.00	1.83	7.30	6.67	0.222	0.889	8.99	2.25	32.83	14.99	21.59	5.40	78.79	35.98
7	30.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	1.10	2.00	1.83	7.30	6.67	0.222	0.889	8.99	2.25	32.83	14.99	21.59	5.40	78.79	35.98

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-07	-
Chainage	0+622	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	208.05	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.00	mtr
Groundwater Level from OGL	13.40	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-07	1.20	22.00	19.50	18.00	354.54	131.29	10.74	2.69
BH-07	1.20	23.50	21.00	19.50	379.27	150.98	11.23	2.81
BH-07	1.20	25.00	22.50	21.00	404.48	170.66	11.23	2.81
BH-07	1.20	26.50	24.00	22.50	429.21	190.35	11.23	2.81
BH-07	1.20	28.00	25.50	24.00	454.73	210.03	11.71	2.93
BH-07	1.20	29.50	27.00	25.50	479.46	229.72	11.71	2.93
BH-07	1.20	30.00	27.50	26.00	487.70	236.28	11.71	2.93

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	16.50	0.00	20	-	0.00	5.39	1.00	-	3.25	4.00	12.38	24.75	5.65	0.00	0.00	0.00	0.00	6.33
2	4.00	5.50	1.50	Granular	16.50	0.00	20	-	0.00	5.39	1.00	-	4.75	5.50	37.13	49.50	5.65	7.35	30.28	37.64	15.06	10.77
3	5.50	7.00	1.50	Granular	16.50	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	61.88	74.25	5.65	15.93	124.55	147.84	59.14	17.60
4	7.00	8.50	1.50	Granular	16.50	0.00	26	-	11.90	13.19	1.00	-	7.75	8.50	86.63	99.00	5.65	22.31	161.61	207.21	82.88	26.23
5	8.50	10.00	1.50	Granular	16.50	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	111.38	123.75	5.65	28.68	198.67	272.95	109.18	36.63
6	10.00	11.50	1.50	Granular	16.50	0.00	23	-	6.00	8.68	1.00	-	10.75	11.50	136.13	148.50	5.65	31.01	153.11	258.41	103.36	47.69
7	11.50	13.00	1.50	Granular	16.80	0.00	23	-	6.00	8.68	1.00	-	12.25	13.00	161.10	173.70	5.65	36.70	178.08	320.07	128.03	60.34
7	13.00	14.50	1.50	Granular	7.00	0.00	23	-	6.00	8.68	1.00	-	13.75	14.50	178.95	184.20	5.65	0.00	184.42	326.42	130.57	62.72
8	14.50	16.00	1.50	Granular	7.00	0.00	23	-	6.00	8.68	1.00	-	15.25	16.00	189.45	194.70	5.65	0.00	194.77	336.77	134.71	65.09
9	16.00	17.50	1.50	Granular	8.90	0.00	23	-	6.00	8.68	1.00	-	16.75	17.50	201.38	208.05	5.65	45.88	208.71	396.58	158.63	80.31
10	17.50	19.00	1.50	Granular	8.90	0.00	23	-	6.00	8.68	1.00	-	18.25	19.00	208.05	208.05	5.65	47.40	208.71	443.97	177.59	95.96
11	19.00	20.50	1.50	Granular	8.90	0.00	23	-	6.00	8.68	1.00	-	19.75	20.50	208.05	208.05	5.65	47.40	208.71	491.37	196.55	111.61
12	20.50	22.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	21.25	22.00	208.05	208.05	5.65	61.82	541.86	886.35	354.54	131.29
13	22.00	23.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	208.05	208.05	5.65	61.82	541.86	948.18	379.27	150.98
14	23.50	25.00	1.50	Granular	9.90	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	208.05	208.05	5.65	61.82	543.06	1011.19	404.48	170.66
15	25.00	26.50	1.50	Granular	9.90	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	208.05	208.05	5.65	61.82	543.06	1073.02	429.21	190.35
16	26.50	28.00	1.50	Granular	11.40	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	208.05	208.05	5.65	61.82	545.05	1136.83	454.73	210.03
17	28.00	29.50	1.50	Granular	11.40	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	208.05	208.05	5.65	61.82	545.05	1198.65	479.46	229.72
18	29.50	30.00	0.50	Granular	11.40	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	208.05	208.05	1.88	20.61	545.05	1219.26	487.70	236.28

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	14	2.96E+07	1.02E-01	1.98E+03	4.33	0.92	2.03	1.84	8.77	7.96	0.186	0.745	10.74	2.69	47.12	21.36	25.78	6.44	113.09	51.27
2	22.50	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.94	2.02	1.84	8.64	7.84	0.178	0.712	11.23	2.81	48.55	22.02	26.96	6.74	116.52	52.85
3	24.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.94	2.02	1.84	8.64	7.84	0.178	0.712	11.23	2.81	48.55	22.02	26.96	6.74	116.52	52.85
4	25.50	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.94	2.02	1.84	8.64	7.84	0.178	0.712	11.23	2.81	48.55	22.02	26.96	6.74	116.52	52.85
5	27.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.95	2.02	1.84	8.52	7.74	0.171	0.683	11.71	2.93	49.92	22.66	28.11	7.03	119.81	54.38
6	28.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.95	2.02	1.84	8.52	7.74	0.171	0.683	11.71	2.93	49.92	22.66	28.11	7.03	119.81	54.38
7	30.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.95	2.02	1.84	8.52	7.74	0.171	0.683	11.71	2.93	49.92	22.66	28.11	7.03	119.81	54.38

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-08	-
Chainage	0+701	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	198.90	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.00	mtr
Groundwater Level from OGL	14.30	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-08	1.00	22.00	19.50	18.00	132.46	93.25	9.36	2.34
BH-08	1.00	23.50	21.00	19.50	145.59	104.09	9.36	2.34
BH-08	1.00	25.00	22.50	21.00	244.13	118.61	9.36	2.34
BH-08	1.00	26.50	24.00	22.50	262.52	133.14	9.36	2.34
BH-08	1.00	28.00	25.50	24.00	280.91	147.66	9.71	2.43
BH-08	1.00	29.50	27.00	25.50	330.15	163.10	9.71	2.43
BH-08	1.00	30.00	27.50	26.00	336.71	168.24	9.71	2.43

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	16.00	0.00	20	-	0.00	5.39	1.00	-	3.25	4.00	12.00	24.00	4.71	0.00	0.00	0.00	0.00	4.40
2	4.00	5.50	1.50	Granular	16.00	0.00	20	-	0.00	5.39	1.00	-	4.75	5.50	36.00	48.00	4.71	5.94	20.39	26.34	10.53	7.71
3	5.50	7.00	1.50	Granular	16.00	0.00	20	-	0.00	5.39	1.00	-	6.25	7.00	60.00	72.00	4.71	9.91	30.59	46.44	18.58	12.13
4	7.00	8.50	1.50	Granular	16.00	0.00	20	-	0.00	5.39	1.00	-	7.75	8.50	84.00	96.00	4.71	13.87	40.79	70.50	28.20	17.67
5	8.50	10.00	1.50	Granular	16.00	0.00	20	-	0.00	5.39	1.00	-	9.25	10.00	108.00	120.00	4.71	17.83	50.98	98.53	39.41	24.31
6	10.00	11.50	1.50	Granular	16.00	0.00	20	-	0.00	5.39	1.00	-	10.75	11.50	132.00	144.00	4.71	21.79	61.18	130.51	52.21	32.06
7	11.50	13.00	1.50	Granular	18.30	0.00	20	-	0.00	5.39	1.00	-	12.25	13.00	157.73	171.45	4.71	26.04	72.84	168.22	67.29	41.00
7	13.00	14.50	1.50	Granular	18.30	0.00	27	-	13.80	15.50	1.00	-	13.75	14.50	185.18	198.90	4.71	41.27	253.02	389.66	155.87	54.20
8	14.50	16.00	1.50	Granular	8.50	0.00	27	-	13.80	15.50	1.00	-	15.25	16.00	198.90	198.90	4.71	44.33	247.69	428.66	171.47	68.26
9	16.00	17.50	1.50	Granular	8.50	0.00	27	-	13.80	15.50	1.00	-	16.75	17.50	198.90	198.90	4.71	0.00	247.69	428.66	171.47	69.91
10	17.50	19.00	1.50	Granular	9.00	0.00	20	-	0.00	5.39	1.00	-	18.25	19.00	198.90	198.90	4.71	0.00	84.50	265.47	106.19	71.56
11	19.00	20.50	1.50	Granular	9.00	0.00	20	-	0.00	5.39	1.00	-	19.75	20.50	198.90	198.90	4.71	32.84	84.50	298.31	119.32	82.41
12	20.50	22.00	1.50	Granular	9.00	0.00	20	-	0.00	5.39	1.00	-	21.25	22.00	198.90	198.90	4.71	32.84	84.50	331.15	132.46	93.25
13	22.00	23.50	1.50	Granular	9.00	0.00	20	-	0.00	5.39	1.00	-	22.75	23.50	198.90	198.90	4.71	32.84	84.50	363.98	145.59	104.09
14	23.50	25.00	1.50	Granular	9.00	0.00	28	-	15.70	17.82	1.00	-	24.25	25.00	198.90	198.90	4.71	45.97	284.88	610.33	244.13	118.61
15	25.00	26.50	1.50	Granular	9.00	0.00	28	-	15.70	17.82	1.00	-	25.75	26.50	198.90	198.90	4.71	45.97	284.88	656.30	262.52	133.14
16	26.50	28.00	1.50	Granular	9.00	0.00	28	-	15.70	17.82	1.00	-	27.25	28.00	198.90	198.90	4.71	45.97	284.88	702.27	280.91	147.66
17	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	198.90	198.90	4.71	49.25	358.73	825.37	330.15	163.10
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	198.90	198.90	1.57	16.42	358.73	841.78	336.71	168.24

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.11	2.00	1.83	7.20	6.58	0.214	0.855	9.36	2.34	33.70	15.40	22.46	5.61	80.89	36.95
2	22.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.11	2.00	1.83	7.20	6.58	0.214	0.855	9.36	2.34	33.70	15.40	22.46	5.61	80.89	36.95
3	24.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.11	2.00	1.83	7.20	6.58	0.214	0.855	9.36	2.34	33.70	15.40	22.46	5.61	80.89	36.95
4	25.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.11	2.00	1.83	7.20	6.58	0.214	0.855	9.36	2.34	33.70	15.40	22.46	5.61	80.89	36.95
5	27.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	1.12	2.00	1.83	7.12	6.50	0.206	0.824	9.71	2.43	34.55	15.79	23.30	5.83	82.92	37.90
6	28.50	18	2.96E+07	4.91E-02	2.55E+03	3.56	1.12	2.00	1.83	7.12	6.50	0.206	0.824	9.71	2.43	34.55	15.79	23.30	5.83	82.92	37.90
7	30.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	1.12	2.00	1.83	7.12	6.50	0.206	0.824	9.71	2.43	34.55	15.79	23.30	5.83	82.92	37.90

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-08	-
Chainage	0+701	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	224.40	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.00	mtr
Groundwater Level from OGL	14.30	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-08	1.20	22.00	19.50	18.00	167.20	113.43	12.18	3.05
BH-08	1.20	23.50	21.00	19.50	184.98	128.25	12.18	3.05
BH-08	1.20	25.00	22.50	21.00	340.32	148.06	12.18	3.05
BH-08	1.20	26.50	24.00	22.50	365.21	167.86	12.18	3.05
BH-08	1.20	28.00	25.50	24.00	390.11	187.66	12.64	3.16
BH-08	1.20	29.50	27.00	25.50	464.82	208.70	12.64	3.16
BH-08	1.20	30.00	27.50	26.00	473.71	215.72	12.64	3.16

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	16.00	0.00	20	-	0.00	5.39	1.00	-	3.25	4.00	12.00	24.00	5.65	0.00	0.00	0.00	0.00	6.33
2	4.00	5.50	1.50	Granular	16.00	0.00	20	-	0.00	5.39	1.00	-	4.75	5.50	36.00	48.00	5.65	7.13	29.37	36.50	14.60	10.71
3	5.50	7.00	1.50	Granular	16.00	0.00	20	-	0.00	5.39	1.00	-	6.25	7.00	60.00	72.00	5.65	11.89	44.05	63.07	25.23	16.41
4	7.00	8.50	1.50	Granular	16.00	0.00	20	-	0.00	5.39	1.00	-	7.75	8.50	84.00	96.00	5.65	16.64	58.73	94.39	37.76	23.44
5	8.50	10.00	1.50	Granular	16.00	0.00	20	-	0.00	5.39	1.00	-	9.25	10.00	108.00	120.00	5.65	21.40	73.41	130.47	52.19	31.81
6	10.00	11.50	1.50	Granular	16.00	0.00	20	-	0.00	5.39	1.00	-	10.75	11.50	132.00	144.00	5.65	26.15	88.10	171.30	68.52	41.51
7	11.50	13.00	1.50	Granular	18.30	0.00	20	-	0.00	5.39	1.00	-	12.25	13.00	157.73	171.45	5.65	31.25	104.89	219.34	87.74	52.63
7	13.00	14.50	1.50	Granular	18.30	0.00	20	-	0.00	5.39	1.00	-	13.75	14.50	185.18	198.90	5.65	36.68	121.68	272.82	109.13	65.28
8	14.50	16.00	1.50	Granular	8.50	0.00	20	-	0.00	5.39	1.00	-	15.25	16.00	205.28	211.65	5.65	40.67	129.49	321.28	128.51	79.04
9	16.00	17.50	1.50	Granular	8.50	0.00	20	-	0.00	5.39	1.00	-	16.75	17.50	218.03	224.40	5.65	0.00	137.29	329.08	131.63	81.41
10	17.50	19.00	1.50	Granular	9.00	0.00	20	-	0.00	5.39	1.00	-	18.25	19.00	224.40	224.40	5.65	0.00	137.29	329.08	131.63	83.79
11	19.00	20.50	1.50	Granular	9.00	0.00	20	-	0.00	5.39	1.00	-	19.75	20.50	224.40	224.40	5.65	44.45	137.29	373.54	149.42	98.61
12	20.50	22.00	1.50	Granular	9.00	0.00	20	-	0.00	5.39	1.00	-	21.25	22.00	224.40	224.40	5.65	44.45	137.29	417.99	167.20	113.43
13	22.00	23.50	1.50	Granular	9.00	0.00	20	-	0.00	5.39	1.00	-	22.75	23.50	224.40	224.40	5.65	44.45	137.29	462.45	184.98	128.25
14	23.50	25.00	1.50	Granular	9.00	0.00	28	-	15.70	17.82	1.00	-	24.25	25.00	224.40	224.40	5.65	62.24	463.40	850.80	340.32	148.06
15	25.00	26.50	1.50	Granular	9.00	0.00	28	-	15.70	17.82	1.00	-	25.75	26.50	224.40	224.40	5.65	62.24	463.40	913.04	365.21	167.86
16	26.50	28.00	1.50	Granular	9.00	0.00	28	-	15.70	17.82	1.00	-	27.25	28.00	224.40	224.40	5.65	62.24	463.40	975.27	390.11	187.66
17	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	224.40	224.40	5.65	66.68	583.51	1162.06	464.82	208.70
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	224.40	224.40	1.88	22.23	583.51	1184.29	473.71	215.72

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.96	2.02	1.84	8.41	7.64	0.164	0.657	12.18	3.05	51.25	23.27	29.24	7.31	122.99	55.85
2	22.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.96	2.02	1.84	8.41	7.64	0.164	0.657	12.18	3.05	51.25	23.27	29.24	7.31	122.99	55.85
3	24.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.96	2.02	1.84	8.41	7.64	0.164	0.657	12.18	3.05	51.25	23.27	29.24	7.31	122.99	55.85
4	25.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.96	2.02	1.84	8.41	7.64	0.164	0.657	12.18	3.05	51.25	23.27	29.24	7.31	122.99	55.85
5	27.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.97	2.02	1.83	8.31	7.55	0.158	0.633	12.64	3.16	52.53	23.86	30.34	7.58	126.06	57.27
6	28.50	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.97	2.02	1.83	8.31	7.55	0.158	0.633	12.64	3.16	52.53	23.86	30.34	7.58	126.06	57.27
7	30.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.97	2.02	1.83	8.31	7.55	0.158	0.633	12.64	3.16	52.53	23.86	30.34	7.58	126.06	57.27

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-08A	-
Chainage	0+734	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	202.95	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.00	mtr
Groundwater Level from OGL	14.30	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-08A	1.00	22.00	19.50	18.00	177.47	114.02	10.40	2.60
BH-08A	1.00	23.50	21.00	19.50	192.21	125.99	10.40	2.60
BH-08A	1.00	25.00	22.50	21.00	309.71	141.71	10.40	2.60
BH-08A	1.00	26.50	24.00	22.50	329.81	157.43	10.73	2.68
BH-08A	1.00	28.00	25.50	24.00	349.92	173.15	11.06	2.77
BH-08A	1.00	29.50	27.00	25.50	370.02	188.87	11.06	2.77
BH-08A	1.00	30.00	27.50	26.00	376.72	194.11	11.38	2.85

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	15.90	0.00	24	-	8.00	9.78	1.00	-	3.25	4.00	11.93	23.85	4.71	0.00	0.00	0.00	0.00	4.40
2	4.00	5.50	1.50	Granular	15.90	0.00	24	-	8.00	9.78	1.00	-	4.75	5.50	35.78	47.70	4.71	7.09	41.79	48.88	19.55	8.03
3	5.50	7.00	1.50	Granular	15.90	0.00	24	-	8.00	9.78	1.00	-	6.25	7.00	59.63	71.55	4.71	11.81	60.18	79.08	31.63	12.99
4	7.00	8.50	1.50	Granular	15.90	0.00	24	-	8.00	9.78	1.00	-	7.75	8.50	83.48	95.40	4.71	0.00	78.57	97.47	38.99	14.64
5	8.50	10.00	1.50	Granular	17.45	0.00	24	-	8.00	9.78	1.00	-	9.25	10.00	108.49	121.58	4.71	21.49	99.24	139.63	55.85	22.30
6	10.00	11.50	1.50	Granular	17.45	0.00	24	-	8.00	9.78	1.00	-	10.75	11.50	134.66	147.75	4.71	26.68	119.42	186.49	74.60	31.42
7	11.50	13.00	1.50	Granular	18.40	0.00	24	-	8.00	9.78	1.00	-	12.25	13.00	161.55	175.35	4.71	32.00	141.00	240.07	96.03	42.03
7	13.00	14.50	1.50	Granular	18.40	0.00	24	-	8.00	9.78	1.00	-	13.75	14.50	189.15	202.95	4.71	37.47	162.28	298.83	119.53	54.18
8	14.50	16.00	1.50	Granular	8.60	0.00	22	-	4.00	7.59	1.00	-	15.25	16.00	202.95	202.95	4.71	36.85	122.71	296.11	118.44	66.14
9	16.00	17.50	1.50	Granular	8.60	0.00	22	-	4.00	7.59	1.00	-	16.75	17.50	202.95	202.95	4.71	36.85	122.71	332.96	133.18	78.11
10	17.50	19.00	1.50	Granular	8.60	0.00	22	-	4.00	7.59	1.00	-	18.25	19.00	202.95	202.95	4.71	36.85	122.71	369.82	147.93	90.08
11	19.00	20.50	1.50	Granular	8.60	0.00	22	-	4.00	7.59	1.00	-	19.75	20.50	202.95	202.95	4.71	36.85	122.71	406.67	162.67	102.05
12	20.50	22.00	1.50	Granular	9.60	0.00	22	-	4.00	7.59	1.00	-	21.25	22.00	202.95	202.95	4.71	36.85	122.87	443.68	177.47	114.02
13	22.00	23.50	1.50	Granular	9.60	0.00	22	-	4.00	7.59	1.00	-	22.75	23.50	202.95	202.95	4.71	36.85	122.87	480.54	192.21	125.99
14	23.50	25.00	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	202.95	202.95	4.71	50.26	366.35	774.28	309.71	141.71
15	25.00	26.50	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	202.95	202.95	4.71	50.26	366.35	824.53	329.81	157.43
16	26.50	28.00	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	202.95	202.95	4.71	50.26	366.35	874.79	349.92	173.15
17	28.00	29.50	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	202.95	202.95	4.71	50.26	366.35	925.05	370.02	188.87
18	29.50	30.00	0.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	202.95	202.95	1.57	16.75	366.35	941.80	376.72	194.11

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	1.15	2.00	1.83	6.96	6.36	0.192	0.769	10.40	2.60	36.16	16.54	24.95	6.24	86.78	39.70
2	22.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	1.15	2.00	1.83	6.96	6.36	0.192	0.769	10.40	2.60	36.16	16.54	24.95	6.24	86.78	39.70
3	24.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	1.15	2.00	1.83	6.96	6.36	0.192	0.769	10.40	2.60	36.16	16.54	24.95	6.24	86.78	39.70
4	25.50	21	2.96E+07	4.91E-02	2.98E+03	3.45	1.16	2.00	1.83	6.88	6.30	0.186	0.745	10.73	2.68	36.93	16.90	25.76	6.44	88.63	40.57
5	27.00	22	2.96E+07	4.91E-02	3.13E+03	3.41	1.17	2.00	1.83	6.81	6.24	0.181	0.723	11.06	2.77	37.68	17.25	26.54	6.64	90.43	41.41
6	28.50	22	2.96E+07	4.91E-02	3.13E+03	3.41	1.17	2.00	1.83	6.81	6.24	0.181	0.723	11.06	2.77	37.68	17.25	26.54	6.64	90.43	41.41
7	30.00	23	2.96E+07	4.91E-02	3.27E+03	3.38	1.18	1.99	1.83	6.75	6.18	0.176	0.703	11.38	2.85	38.41	17.59	27.32	6.83	92.19	42.23

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-08A	-
Chainage	0+734	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	228.75	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.00	mtr
Groundwater Level from OGL	14.30	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-08A	1.20	22.00	19.50	18.00	242.82	148.92	13.53	3.38
BH-08A	1.20	23.50	21.00	19.50	262.76	165.26	13.53	3.38
BH-08A	1.20	25.00	22.50	21.00	448.27	186.66	13.53	3.38
BH-08A	1.20	26.50	24.00	22.50	475.46	208.07	13.97	3.49
BH-08A	1.20	28.00	25.50	24.00	502.65	229.48	14.39	3.60
BH-08A	1.20	29.50	27.00	25.50	529.84	250.89	14.39	3.60
BH-08A	1.20	30.00	27.50	26.00	538.90	258.02	14.81	3.70

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	15.90	0.00	24	-	8.00	9.78	1.00	-	3.25	4.00	11.93	23.85	5.65	0.00	0.00	0.00	0.00	6.33
2	4.00	5.50	1.50	Granular	15.90	0.00	24	-	8.00	9.78	1.00	-	4.75	5.50	35.78	47.70	5.65	8.50	61.62	70.13	28.05	11.09
3	5.50	7.00	1.50	Granular	15.90	0.00	24	-	8.00	9.78	1.00	-	6.25	7.00	59.63	71.55	5.65	14.17	88.10	110.78	44.31	17.43
4	7.00	8.50	1.50	Granular	15.90	0.00	24	-	8.00	9.78	1.00	-	7.75	8.50	83.48	95.40	5.65	0.00	114.59	137.26	54.91	19.81
5	8.50	10.00	1.50	Granular	17.45	0.00	24	-	8.00	9.78	1.00	-	9.25	10.00	108.49	121.58	5.65	25.79	144.49	192.96	77.18	29.40
6	10.00	11.50	1.50	Granular	17.45	0.00	24	-	8.00	9.78	1.00	-	10.75	11.50	134.66	147.75	5.65	32.01	173.55	254.04	101.61	40.74
7	11.50	13.00	1.50	Granular	18.40	0.00	24	-	8.00	9.78	1.00	-	12.25	13.00	161.55	175.35	5.65	38.40	204.72	323.60	129.44	53.87
7	13.00	14.50	1.50	Granular	18.40	0.00	24	-	8.00	9.78	1.00	-	13.75	14.50	189.15	202.95	5.65	44.97	235.36	399.21	159.68	68.84
8	14.50	16.00	1.50	Granular	8.60	0.00	22	-	4.00	7.59	1.00	-	15.25	16.00	209.40	215.85	5.65	45.63	188.20	397.68	159.07	83.99
9	16.00	17.50	1.50	Granular	8.60	0.00	22	-	4.00	7.59	1.00	-	16.75	17.50	222.30	228.75	5.65	48.44	199.31	457.23	182.89	99.93
10	17.50	19.00	1.50	Granular	8.60	0.00	22	-	4.00	7.59	1.00	-	18.25	19.00	228.75	228.75	5.65	49.85	199.31	507.08	202.83	116.26
11	19.00	20.50	1.50	Granular	8.60	0.00	22	-	4.00	7.59	1.00	-	19.75	20.50	228.75	228.75	5.65	49.85	199.31	556.93	222.77	132.59
12	20.50	22.00	1.50	Granular	9.60	0.00	22	-	4.00	7.59	1.00	-	21.25	22.00	228.75	228.75	5.65	49.85	199.58	607.05	242.82	148.92
13	22.00	23.50	1.50	Granular	9.60	0.00	22	-	4.00	7.59	1.00	-	22.75	23.50	228.75	228.75	5.65	49.85	199.58	656.89	262.76	165.26
14	23.50	25.00	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	228.75	228.75	5.65	67.97	595.38	1120.67	448.27	186.66
15	25.00	26.50	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	228.75	228.75	5.65	67.97	595.38	1188.65	475.46	208.07
16	26.50	28.00	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	228.75	228.75	5.65	67.97	595.38	1256.62	502.65	229.48
17	28.00	29.50	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	228.75	228.75	5.65	67.97	595.38	1324.59	529.84	250.89
18	29.50	30.00	0.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	228.75	228.75	1.88	22.66	595.38	1347.25	538.90	258.02

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.99	2.02	1.83	8.12	7.39	0.148	0.591	13.53	3.38	54.97	24.99	32.48	8.12	131.92	59.98
2	22.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.99	2.02	1.83	8.12	7.39	0.148	0.591	13.53	3.38	54.97	24.99	32.48	8.12	131.92	59.98
3	24.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.99	2.02	1.83	8.12	7.39	0.148	0.591	13.53	3.38	54.97	24.99	32.48	8.12	131.92	59.98
4	25.50	21	2.96E+07	1.02E-01	2.98E+03	3.99	1.00	2.02	1.83	8.04	7.31	0.143	0.573	13.97	3.49	56.14	25.53	33.52	8.38	134.73	61.28
5	27.00	22	2.96E+07	1.02E-01	3.13E+03	3.95	1.01	2.01	1.83	7.96	7.24	0.139	0.556	14.39	3.60	57.27	26.06	34.54	8.64	137.45	62.55
6	28.50	22	2.96E+07	1.02E-01	3.13E+03	3.95	1.01	2.01	1.83	7.96	7.24	0.139	0.556	14.39	3.60	57.27	26.06	34.54	8.64	137.45	62.55
7	30.00	23	2.96E+07	1.02E-01	3.27E+03	3.92	1.02	2.01	1.83	7.88	7.18	0.135	0.540	14.81	3.70	58.38	26.57	35.55	8.89	140.11	63.78

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-08B	-
Chainage	0+847	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	208.95	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.00	mtr
Groundwater Level from OGL	14.50	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-08B	1.00	22.00	19.50	18.00	227.68	121.36	8.62	2.16
BH-08B	1.00	23.50	21.00	19.50	245.61	135.57	8.99	2.25
BH-08B	1.00	25.00	22.50	21.00	328.48	151.70	8.99	2.25
BH-08B	1.00	26.50	24.00	22.50	349.18	167.84	9.36	2.34
BH-08B	1.00	28.00	25.50	24.00	369.87	183.98	9.36	2.34
BH-08B	1.00	29.50	27.00	25.50	390.57	200.11	9.71	2.43
BH-08B	1.00	30.00	27.50	26.00	397.47	205.49	9.71	2.43

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	15.50	0.00	23	-	6.00	8.68	1.00	-	3.25	4.00	11.63	23.25	4.71	0.00	0.00	0.00	0.00	4.40
2	4.00	5.50	1.50	Granular	15.50	0.00	23	-	6.00	8.68	1.00	-	4.75	5.50	34.88	46.50	4.71	6.62	35.49	42.12	16.85	7.90
3	5.50	7.00	1.50	Granular	15.50	0.00	24	-	8.00	9.78	1.00	-	6.25	7.00	58.13	69.75	4.71	11.51	58.67	76.80	30.72	12.77
4	7.00	8.50	1.50	Granular	15.50	0.00	24	-	8.00	9.78	1.00	-	7.75	8.50	81.38	93.00	4.71	0.00	76.59	94.73	37.89	14.42
5	8.50	10.00	1.50	Granular	15.50	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	104.63	116.25	4.71	0.00	128.15	146.29	58.51	16.07
6	10.00	11.50	1.50	Granular	20.60	0.00	26	-	11.90	13.19	1.00	-	10.75	11.50	131.70	147.15	4.71	28.26	162.67	209.07	83.63	25.64
7	11.50	13.00	1.50	Granular	20.60	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	162.60	178.05	4.71	34.90	194.80	276.10	110.44	37.06
7	13.00	14.50	1.50	Granular	20.60	0.00	26	-	11.90	13.19	1.00	-	13.75	14.50	193.50	208.95	4.71	41.53	226.93	349.76	139.90	50.33
8	14.50	16.00	1.50	Granular	11.50	0.00	26	-	11.90	13.19	1.00	-	15.25	16.00	208.95	208.95	4.71	44.84	222.67	390.33	156.13	64.54
9	16.00	17.50	1.50	Granular	11.50	0.00	26	-	11.90	13.19	1.00	-	16.75	17.50	208.95	208.95	4.71	44.84	222.67	435.17	174.07	78.74
10	17.50	19.00	1.50	Granular	11.50	0.00	26	-	11.90	13.19	1.00	-	18.25	19.00	208.95	208.95	4.71	44.84	222.67	480.02	192.01	92.95
11	19.00	20.50	1.50	Granular	11.50	0.00	26	-	11.90	13.19	1.00	-	19.75	20.50	208.95	208.95	4.71	44.84	222.67	524.86	209.94	107.16
12	20.50	22.00	1.50	Granular	10.40	0.00	26	-	11.90	13.19	1.00	-	21.25	22.00	208.95	208.95	4.71	44.84	222.15	569.19	227.68	121.36
13	22.00	23.50	1.50	Granular	10.40	0.00	26	-	11.90	13.19	1.00	-	22.75	23.50	208.95	208.95	4.71	44.84	222.15	614.03	245.61	135.57
14	23.50	25.00	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	208.95	208.95	4.71	51.74	377.58	821.20	328.48	151.70
15	25.00	26.50	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	208.95	208.95	4.71	51.74	377.58	872.94	349.18	167.84
16	26.50	28.00	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	208.95	208.95	4.71	51.74	377.58	924.69	369.87	183.98
17	28.00	29.50	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	208.95	208.95	4.71	51.74	377.58	976.43	390.57	200.11
18	29.50	30.00	0.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	208.95	208.95	1.57	17.25	377.58	993.68	397.47	205.49

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	1.08	2.01	1.83	7.40	6.76	0.232	0.928	8.62	2.16	31.92	14.57	20.70	5.17	76.62	34.96
2	22.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	1.10	2.00	1.83	7.30	6.67	0.222	0.889	8.99	2.25	32.83	14.99	21.59	5.40	78.79	35.98
3	24.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	1.10	2.00	1.83	7.30	6.67	0.222	0.889	8.99	2.25	32.83	14.99	21.59	5.40	78.79	35.98
4	25.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.11	2.00	1.83	7.20	6.58	0.214	0.855	9.36	2.34	33.70	15.40	22.46	5.61	80.89	36.95
5	27.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.11	2.00	1.83	7.20	6.58	0.214	0.855	9.36	2.34	33.70	15.40	22.46	5.61	80.89	36.95
6	28.50	18	2.96E+07	4.91E-02	2.55E+03	3.56	1.12	2.00	1.83	7.12	6.50	0.206	0.824	9.71	2.43	34.55	15.79	23.30	5.83	82.92	37.90
7	30.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	1.12	2.00	1.83	7.12	6.50	0.206	0.824	9.71	2.43	34.55	15.79	23.30	5.83	82.92	37.90

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-08B	-
Chainage	0+847	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	243.45	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.00	mtr
Groundwater Level from OGL	14.50	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-08B	1.20	22.00	19.50	18.00	329.98	161.39	11.23	2.81
BH-08B	1.20	23.50	21.00	19.50	355.06	181.32	11.71	2.93
BH-08B	1.20	25.00	22.50	21.00	488.36	203.95	11.71	2.93
BH-08B	1.20	26.50	24.00	22.50	517.30	226.58	12.18	3.05
BH-08B	1.20	28.00	25.50	24.00	546.24	249.21	12.18	3.05
BH-08B	1.20	29.50	27.00	25.50	575.18	271.84	12.64	3.16
BH-08B	1.20	30.00	27.50	26.00	584.82	279.39	12.64	3.16

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	15.50	0.00	23	-	6.00	8.68	1.00	-	3.25	4.00	11.63	23.25	5.65	0.00	0.00	0.00	0.00	6.33
2	4.00	5.50	1.50	Granular	15.50	0.00	23	-	6.00	8.68	1.00	-	4.75	5.50	34.88	46.50	5.65	7.95	52.17	60.11	24.04	10.93
3	5.50	7.00	1.50	Granular	15.50	0.00	24	-	8.00	9.78	1.00	-	6.25	7.00	58.13	69.75	5.65	13.82	85.89	107.65	43.06	17.18
4	7.00	8.50	1.50	Granular	15.50	0.00	24	-	8.00	9.78	1.00	-	7.75	8.50	81.38	93.00	5.65	0.00	111.70	133.47	53.39	19.55
5	8.50	10.00	1.50	Granular	15.50	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	104.63	116.25	5.65	0.00	186.63	208.39	83.36	21.93
6	10.00	11.50	1.50	Granular	20.60	0.00	26	-	11.90	13.19	1.00	-	10.75	11.50	131.70	147.15	5.65	33.92	237.03	292.71	117.08	33.80
7	11.50	13.00	1.50	Granular	20.60	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	162.60	178.05	5.65	41.87	283.30	380.85	152.34	47.90
7	13.00	14.50	1.50	Granular	20.60	0.00	26	-	11.90	13.19	1.00	-	13.75	14.50	193.50	208.95	5.65	49.83	329.57	476.95	190.78	64.23
8	14.50	16.00	1.50	Granular	11.50	0.00	26	-	11.90	13.19	1.00	-	15.25	16.00	217.58	226.20	5.65	56.03	348.02	551.44	220.58	82.29
9	16.00	17.50	1.50	Granular	11.50	0.00	26	-	11.90	13.19	1.00	-	16.75	17.50	234.83	243.45	5.65	60.48	373.85	637.75	255.10	101.60
10	17.50	19.00	1.50	Granular	11.50	0.00	26	-	11.90	13.19	1.00	-	18.25	19.00	243.45	243.45	5.65	62.70	373.85	700.44	280.18	121.53
11	19.00	20.50	1.50	Granular	11.50	0.00	26	-	11.90	13.19	1.00	-	19.75	20.50	243.45	243.45	5.65	62.70	373.85	763.14	305.26	141.46
12	20.50	22.00	1.50	Granular	10.40	0.00	26	-	11.90	13.19	1.00	-	21.25	22.00	243.45	243.45	5.65	62.70	372.96	824.94	329.98	161.39
13	22.00	23.50	1.50	Granular	10.40	0.00	26	-	11.90	13.19	1.00	-	22.75	23.50	243.45	243.45	5.65	62.70	372.96	887.64	355.06	181.32
14	23.50	25.00	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	243.45	243.45	5.65	72.34	633.89	1220.91	488.36	203.95
15	25.00	26.50	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	243.45	243.45	5.65	72.34	633.89	1293.25	517.30	226.58
16	26.50	28.00	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	243.45	243.45	5.65	72.34	633.89	1365.60	546.24	249.21
17	28.00	29.50	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	243.45	243.45	5.65	72.34	633.89	1437.94	575.18	271.84
18	29.50	30.00	0.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	243.45	243.45	1.88	24.11	633.89	1462.05	584.82	279.39

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.94	2.02	1.84	8.64	7.84	0.178	0.712	11.23	2.81	48.55	22.02	26.96	6.74	116.52	52.85
2	22.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.95	2.02	1.84	8.52	7.74	0.171	0.683	11.71	2.93	49.92	22.66	28.11	7.03	119.81	54.38
3	24.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.95	2.02	1.84	8.52	7.74	0.171	0.683	11.71	2.93	49.92	22.66	28.11	7.03	119.81	54.38
4	25.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.96	2.02	1.84	8.41	7.64	0.164	0.657	12.18	3.05	51.25	23.27	29.24	7.31	122.99	55.85
5	27.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.96	2.02	1.84	8.41	7.64	0.164	0.657	12.18	3.05	51.25	23.27	29.24	7.31	122.99	55.85
6	28.50	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.97	2.02	1.83	8.31	7.55	0.158	0.633	12.64	3.16	52.53	23.86	30.34	7.58	126.06	57.27
7	30.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.97	2.02	1.83	8.31	7.55	0.158	0.633	12.64	3.16	52.53	23.86	30.34	7.58	126.06	57.27

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-09	-
Chainage	0+802	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	166.80	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	13.70	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-09	1.00	22.00	19.50	19.50	152.31	98.35	7.60	1.90
BH-09	1.00	23.50	21.00	21.00	164.98	108.87	7.60	1.90
BH-09	1.00	25.00	22.50	22.50	177.61	119.38	7.60	1.90
BH-09	1.00	26.50	24.00	24.00	170.64	128.74	7.60	1.90
BH-09	1.00	28.00	25.50	25.50	181.65	138.10	7.60	1.90
BH-09	1.00	29.50	27.00	27.00	290.76	151.32	7.95	1.99
BH-09	1.00	30.00	27.50	27.50	296.27	155.72	7.95	1.99

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	14.90	0.00	20	-	0.00	5.39	1.00	-	3.25	4.00	11.18	22.35	4.71	1.84	9.50	11.34	4.54	4.91
2	4.00	5.50	1.50	Granular	14.90	0.00	20	-	0.00	5.39	1.00	-	4.75	5.50	33.53	44.70	4.71	5.53	18.99	26.37	10.55	8.11
3	5.50	7.00	1.50	Granular	14.90	0.00	24	-	8.00	9.78	1.00	-	6.25	7.00	55.88	67.05	4.71	0.00	56.40	63.78	25.51	9.76
4	7.00	8.50	1.50	Granular	14.90	0.00	24	-	8.00	9.78	1.00	-	7.75	8.50	78.23	89.40	4.71	15.50	73.63	96.50	38.60	15.75
5	8.50	10.00	1.50	Granular	14.90	0.00	20	-	0.00	5.39	1.00	-	9.25	10.00	100.58	111.75	4.71	16.60	47.48	86.96	34.78	22.05
6	10.00	11.50	1.50	Granular	14.90	0.00	20	-	0.00	5.39	1.00	-	10.75	11.50	122.93	134.10	4.71	20.29	56.97	116.75	46.70	29.38
7	11.50	13.00	1.50	Granular	15.80	0.00	20	-	0.00	5.39	1.00	-	12.25	13.00	145.95	157.80	4.71	24.09	67.04	150.91	60.36	37.78
7	13.00	14.50	1.50	Granular	6.00	0.00	20	-	0.00	5.39	1.00	-	13.75	14.50	162.30	166.80	4.71	26.79	70.87	181.53	72.61	46.93
8	14.50	16.00	1.50	Granular	6.00	0.00	20	-	0.00	5.39	1.00	-	15.25	16.00	166.80	166.80	4.71	27.54	70.87	209.06	83.62	56.29
9	16.00	17.50	1.50	Granular	6.00	0.00	23	-	6.00	8.68	1.00	-	16.75	17.50	166.80	166.80	4.71	31.67	115.59	285.46	114.18	66.80
10	17.50	19.00	1.50	Granular	6.00	0.00	23	-	6.00	8.68	1.00	-	18.25	19.00	166.80	166.80	4.71	31.67	115.59	317.12	126.85	77.32
11	19.00	20.50	1.50	Granular	6.00	0.00	23	-	6.00	8.68	1.00	-	19.75	20.50	166.80	166.80	4.71	31.67	115.59	348.79	139.52	87.84
12	20.50	22.00	1.50	Granular	7.35	0.00	23	-	6.00	8.68	1.00	-	21.25	22.00	166.80	166.80	4.71	31.67	115.91	380.78	152.31	98.35
13	22.00	23.50	1.50	Granular	7.35	0.00	23	-	6.00	8.68	1.00	-	22.75	23.50	166.80	166.80	4.71	31.67	115.91	412.44	164.98	108.87
14	23.50	25.00	1.50	Granular	7.00	0.00	23	-	6.00	8.68	1.00	-	24.25	25.00	166.80	166.80	4.71	31.67	115.83	444.03	177.61	119.38
15	25.00	26.50	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	25.75	26.50	166.80	166.80	4.71	27.54	70.87	426.60	170.64	128.74
16	26.50	28.00	1.50	Granular	9.50	0.00	20	-	0.00	5.39	1.00	-	27.25	28.00	166.80	166.80	4.71	27.54	70.87	454.13	181.65	138.10
17	28.00	29.50	1.50	Granular	9.50	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	166.80	166.80	4.71	41.30	302.33	726.91	290.76	151.32
18	29.50	30.00	0.50	Granular	9.50	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	166.80	166.80	1.57	13.77	302.33	740.67	296.27	155.72

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_r/T Ratio	L_r/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	14	2.96E+07	4.91E-02	1.98E+03	3.74	0.67	2.06	1.85	7.72	6.92	0.263	1.052	7.60	1.90	29.35	13.15	18.24	4.56	70.43	31.55
2	22.50	14	2.96E+07	4.91E-02	1.98E+03	3.74	0.67	2.06	1.85	7.72	6.92	0.263	1.052	7.60	1.90	29.35	13.15	18.24	4.56	70.43	31.55
3	24.00	14	2.96E+07	4.91E-02	1.98E+03	3.74	0.67	2.06	1.85	7.72	6.92	0.263	1.052	7.60	1.90	29.35	13.15	18.24	4.56	70.43	31.55
4	25.50	14	2.96E+07	4.91E-02	1.98E+03	3.74	0.67	2.06	1.85	7.72	6.92	0.263	1.052	7.60	1.90	29.35	13.15	18.24	4.56	70.43	31.55
5	27.00	14	2.96E+07	4.91E-02	1.98E+03	3.74	0.67	2.06	1.85	7.72	6.92	0.263	1.052	7.60	1.90	29.35	13.15	18.24	4.56	70.43	31.55
6	28.50	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.68	2.06	1.85	7.61	6.82	0.252	1.007	7.95	1.99	30.23	13.55	19.07	4.77	72.55	32.51
7	30.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.68	2.06	1.85	7.61	6.82	0.252	1.007	7.95	1.99	30.23	13.55	19.07	4.77	72.55	32.51

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-09	-
Chainage	0+802	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	184.80	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	13.70	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-09	1.20	22.00	19.50	19.50	207.70	128.38	9.97	2.49
BH-09	1.20	23.50	21.00	21.00	224.54	142.55	9.97	2.49
BH-09	1.20	25.00	22.50	22.50	241.33	156.71	9.97	2.49
BH-09	1.20	26.50	24.00	24.00	227.19	169.34	9.97	2.49
BH-09	1.20	28.00	25.50	25.50	241.83	181.96	9.97	2.49
BH-09	1.20	29.50	27.00	27.00	411.90	199.71	10.42	2.60
BH-09	1.20	30.00	27.50	27.50	419.22	205.63	10.42	2.60

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	14.90	0.00	20	-	0.00	5.39	1.00	-	3.25	4.00	11.18	22.35	5.65	2.21	13.67	15.89	6.35	6.95
2	4.00	5.50	1.50	Granular	14.90	0.00	20	-	0.00	5.39	1.00	-	4.75	5.50	33.53	44.70	5.65	6.64	27.35	36.20	14.48	11.19
3	5.50	7.00	1.50	Granular	14.90	0.00	24	-	8.00	9.78	1.00	-	6.25	7.00	55.88	67.05	5.65	0.00	82.56	91.42	36.57	13.56
4	7.00	8.50	1.50	Granular	14.90	0.00	24	-	8.00	9.78	1.00	-	7.75	8.50	78.23	89.40	5.65	18.60	107.38	134.83	53.93	21.14
5	8.50	10.00	1.50	Granular	14.90	0.00	20	-	0.00	5.39	1.00	-	9.25	10.00	100.58	111.75	5.65	19.92	68.37	115.74	46.30	29.10
6	10.00	11.50	1.50	Granular	14.90	0.00	20	-	0.00	5.39	1.00	-	10.75	11.50	122.93	134.10	5.65	24.35	82.04	153.77	61.51	38.29
7	11.50	13.00	1.50	Granular	15.80	0.00	20	-	0.00	5.39	1.00	-	12.25	13.00	145.95	157.80	5.65	28.91	96.54	197.18	78.87	48.76
7	13.00	14.50	1.50	Granular	6.00	0.00	20	-	0.00	5.39	1.00	-	13.75	14.50	162.30	166.80	5.65	32.15	102.05	234.84	93.94	60.14
8	14.50	16.00	1.50	Granular	6.00	0.00	20	-	0.00	5.39	1.00	-	15.25	16.00	171.30	175.80	5.65	33.93	107.55	274.28	109.71	72.02
9	16.00	17.50	1.50	Granular	6.00	0.00	23	-	6.00	8.68	1.00	-	16.75	17.50	180.30	184.80	5.65	41.08	184.60	392.41	156.96	85.89
10	17.50	19.00	1.50	Granular	6.00	0.00	23	-	6.00	8.68	1.00	-	18.25	19.00	184.80	184.80	5.65	42.10	184.60	434.51	173.80	100.06
11	19.00	20.50	1.50	Granular	6.00	0.00	23	-	6.00	8.68	1.00	-	19.75	20.50	184.80	184.80	5.65	42.10	184.60	476.61	190.64	114.22
12	20.50	22.00	1.50	Granular	7.35	0.00	23	-	6.00	8.68	1.00	-	21.25	22.00	184.80	184.80	5.65	42.10	185.16	519.26	207.70	128.38
13	22.00	23.50	1.50	Granular	7.35	0.00	23	-	6.00	8.68	1.00	-	22.75	23.50	184.80	184.80	5.65	42.10	185.16	561.36	224.54	142.55
14	23.50	25.00	1.50	Granular	7.00	0.00	23	-	6.00	8.68	1.00	-	24.25	25.00	184.80	184.80	5.65	42.10	185.01	603.32	241.33	156.71
15	25.00	26.50	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	25.75	26.50	184.80	184.80	5.65	36.61	113.06	567.97	227.19	169.34
16	26.50	28.00	1.50	Granular	9.50	0.00	20	-	0.00	5.39	1.00	-	27.25	28.00	184.80	184.80	5.65	36.61	113.06	604.58	241.83	181.96
17	28.00	29.50	1.50	Granular	9.50	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	184.80	184.80	5.65	54.91	483.31	1029.75	411.90	199.71
18	29.50	30.00	0.50	Granular	9.50	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	184.80	184.80	1.88	18.30	483.31	1048.05	419.22	205.63

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	14	2.96E+07	1.02E-01	1.98E+03	4.33	0.58	2.08	1.85	9.00	8.02	0.201	0.803	9.97	2.49	44.83	19.99	23.92	5.98	107.58	47.97
2	22.50	14	2.96E+07	1.02E-01	1.98E+03	4.33	0.58	2.08	1.85	9.00	8.02	0.201	0.803	9.97	2.49	44.83	19.99	23.92	5.98	107.58	47.97
3	24.00	14	2.96E+07	1.02E-01	1.98E+03	4.33	0.58	2.08	1.85	9.00	8.02	0.201	0.803	9.97	2.49	44.83	19.99	23.92	5.98	107.58	47.97
4	25.50	14	2.96E+07	1.02E-01	1.98E+03	4.33	0.58	2.08	1.85	9.00	8.02	0.201	0.803	9.97	2.49	44.83	19.99	23.92	5.98	107.58	47.97
5	27.00	14	2.96E+07	1.02E-01	1.98E+03	4.33	0.58	2.08	1.85	9.00	8.02	0.201	0.803	9.97	2.49	44.83	19.99	23.92	5.98	107.58	47.97
6	28.50	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.59	2.08	1.85	8.86	7.91	0.192	0.768	10.42	2.60	46.16	20.59	25.00	6.25	110.80	49.43
7	30.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.59	2.08	1.85	8.86	7.91	0.192	0.768	10.42	2.60	46.16	20.59	25.00	6.25	110.80	49.43

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-10	-
Chainage	0+907	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	166.50	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	5.50	mtr
Groundwater Level from OGL	13.50	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-10	1.00	22.00	19.50	16.50	130.25	95.56	8.38	2.09
BH-10	1.00	23.50	21.00	18.00	147.82	105.29	8.38	2.09
BH-10	1.00	25.00	22.50	19.50	159.36	115.02	8.38	2.09
BH-10	1.00	26.50	24.00	21.00	262.44	128.21	8.79	2.20
BH-10	1.00	28.00	25.50	22.50	278.93	141.40	8.79	2.20
BH-10	1.00	29.50	27.00	24.00	295.17	154.60	9.20	2.30
BH-10	1.00	30.00	27.50	24.50	300.67	159.00	9.20	2.30

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	14.50	0.00	20	-	0.00	5.39	1.00	-	3.25	4.00	10.88	21.75	4.71	0.00	0.00	0.00	0.00	4.40
2	4.00	5.50	1.50	Granular	14.50	0.00	20	-	0.00	5.39	1.00	-	4.75	5.50	32.63	43.50	4.71	0.00	0.00	0.00	0.00	6.05
3	5.50	7.00	1.50	Granular	14.50	0.00	20	-	0.00	5.39	1.00	-	6.25	7.00	54.38	65.25	4.71	8.98	27.72	36.70	14.68	10.21
4	7.00	8.50	1.50	Granular	14.50	0.00	20	-	0.00	5.39	1.00	-	7.75	8.50	76.13	87.00	4.71	12.57	36.96	58.51	23.40	15.38
5	8.50	10.00	1.50	Granular	14.50	0.00	20	-	0.00	5.39	1.00	-	9.25	10.00	97.88	108.75	4.71	16.16	46.20	83.90	33.56	21.55
6	10.00	11.50	1.50	Granular	14.50	0.00	22	-	4.00	7.59	1.00	-	10.75	11.50	119.63	130.50	4.71	21.72	80.32	139.74	55.90	29.28
7	11.50	13.00	1.50	Granular	16.90	0.00	22	-	4.00	7.59	1.00	-	12.25	13.00	143.18	155.85	4.71	26.00	95.85	181.28	72.51	38.21
7	13.00	14.50	1.50	Granular	7.10	0.00	22	-	4.00	7.59	1.00	-	13.75	14.50	161.18	166.50	4.71	29.27	100.68	215.37	86.15	48.06
8	14.50	16.00	1.50	Granular	7.10	0.00	22	-	4.00	7.59	1.00	-	15.25	16.00	166.50	166.50	4.71	30.24	100.68	245.61	98.24	58.17
9	16.00	17.50	1.50	Granular	7.10	0.00	20	-	0.00	5.39	1.00	-	16.75	17.50	166.50	166.50	4.71	27.49	70.74	243.15	97.26	67.52
10	17.50	19.00	1.50	Granular	7.10	0.00	20	-	0.00	5.39	1.00	-	18.25	19.00	166.50	166.50	4.71	27.49	70.74	270.64	108.26	76.86
11	19.00	20.50	1.50	Granular	7.10	0.00	20	-	0.00	5.39	1.00	-	19.75	20.50	166.50	166.50	4.71	27.49	70.74	298.13	119.25	86.21
12	20.50	22.00	1.50	Granular	7.10	0.00	20	-	0.00	5.39	1.00	-	21.25	22.00	166.50	166.50	4.71	27.49	70.74	325.61	130.25	95.56
13	22.00	23.50	1.50	Granular	8.40	0.00	21	-	2.00	6.49	1.00	-	22.75	23.50	166.50	166.50	4.71	28.86	85.81	369.55	147.82	105.29
14	23.50	25.00	1.50	Granular	8.40	0.00	21	-	2.00	6.49	1.00	-	24.25	25.00	166.50	166.50	4.71	28.86	85.81	398.41	159.36	115.02
15	25.00	26.50	1.50	Granular	10.10	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	166.50	166.50	4.71	41.23	302.26	656.09	262.44	128.21
16	26.50	28.00	1.50	Granular	10.10	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	166.50	166.50	4.71	41.23	302.26	697.32	278.93	141.40
17	28.00	29.50	1.50	Granular	9.30	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	166.50	166.50	4.71	41.23	301.65	737.94	295.17	154.60
18	29.50	30.00	0.50	Granular	9.30	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	166.50	166.50	1.57	13.74	301.65	751.68	300.67	159.00

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	13	2.96E+07	4.91E-02	1.83E+03	3.80	1.45	1.97	1.82	7.48	6.91	0.239	0.955	8.38	2.09	31.31	14.47	20.10	5.03	75.14	34.73
2	22.50	13	2.96E+07	4.91E-02	1.83E+03	3.80	1.45	1.97	1.82	7.48	6.91	0.239	0.955	8.38	2.09	31.31	14.47	20.10	5.03	75.14	34.73
3	24.00	13	2.96E+07	4.91E-02	1.83E+03	3.80	1.45	1.97	1.82	7.48	6.91	0.239	0.955	8.38	2.09	31.31	14.47	20.10	5.03	75.14	34.73
4	25.50	14	2.96E+07	4.91E-02	1.98E+03	3.74	1.47	1.96	1.82	7.36	6.80	0.227	0.910	8.79	2.20	32.34	14.96	21.10	5.28	77.61	35.89
5	27.00	14	2.96E+07	4.91E-02	1.98E+03	3.74	1.47	1.96	1.82	7.36	6.80	0.227	0.910	8.79	2.20	32.34	14.96	21.10	5.28	77.61	35.89
6	28.50	15	2.96E+07	4.91E-02	2.12E+03	3.69	1.49	1.96	1.82	7.25	6.71	0.217	0.870	9.20	2.30	33.32	15.42	22.08	5.52	79.98	37.01
7	30.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	1.49	1.96	1.82	7.25	6.71	0.217	0.870	9.20	2.30	33.32	15.42	22.08	5.52	79.98	37.01

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-10	-
Chainage	0+907	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	187.80	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	5.50	mtr
Groundwater Level from OGL	13.50	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-10	1.20	22.00	19.50	16.50	175.09	125.23	10.88	2.72
BH-10	1.20	23.50	21.00	18.00	200.54	138.54	10.88	2.72
BH-10	1.20	25.00	22.50	19.50	216.16	151.85	10.88	2.72
BH-10	1.20	26.50	24.00	21.00	379.41	169.85	11.42	2.86
BH-10	1.20	28.00	25.50	22.50	401.73	187.85	11.42	2.86
BH-10	1.20	29.50	27.00	24.00	423.63	205.86	11.95	2.99
BH-10	1.20	30.00	27.50	24.50	431.07	211.86	11.95	2.99

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	14.50	0.00	20	-	0.00	5.39	1.00	-	3.25	4.00	10.88	21.75	5.65	0.00	0.00	0.00	0.00	6.33
2	4.00	5.50	1.50	Granular	14.50	0.00	20	-	0.00	5.39	1.00	-	4.75	5.50	32.63	43.50	5.65	0.00	0.00	0.00	0.00	8.71
3	5.50	7.00	1.50	Granular	14.50	0.00	20	-	0.00	5.39	1.00	-	6.25	7.00	54.38	65.25	5.65	10.77	39.92	50.69	20.28	14.10
4	7.00	8.50	1.50	Granular	14.50	0.00	20	-	0.00	5.39	1.00	-	7.75	8.50	76.13	87.00	5.65	15.08	53.23	79.08	31.63	20.70
5	8.50	10.00	1.50	Granular	14.50	0.00	20	-	0.00	5.39	1.00	-	9.25	10.00	97.88	108.75	5.65	19.39	66.53	111.77	44.71	28.50
6	10.00	11.50	1.50	Granular	14.50	0.00	22	-	4.00	7.59	1.00	-	10.75	11.50	119.63	130.50	5.65	26.07	116.32	187.63	75.05	38.18
7	11.50	13.00	1.50	Granular	16.90	0.00	22	-	4.00	7.59	1.00	-	12.25	13.00	143.18	155.85	5.65	31.20	138.80	241.31	96.52	49.29
7	13.00	14.50	1.50	Granular	7.10	0.00	22	-	4.00	7.59	1.00	-	13.75	14.50	161.18	166.50	5.65	35.12	145.30	282.93	113.17	61.50
8	14.50	16.00	1.50	Granular	7.10	0.00	22	-	4.00	7.59	1.00	-	15.25	16.00	171.83	177.15	5.65	37.44	154.47	329.54	131.82	74.35
9	16.00	17.50	1.50	Granular	7.10	0.00	20	-	0.00	5.39	1.00	-	16.75	17.50	182.48	187.80	5.65	36.15	114.89	326.12	130.45	86.85
10	17.50	19.00	1.50	Granular	7.10	0.00	20	-	0.00	5.39	1.00	-	18.25	19.00	187.80	187.80	5.65	37.20	114.89	363.32	145.33	99.64
11	19.00	20.50	1.50	Granular	7.10	0.00	20	-	0.00	5.39	1.00	-	19.75	20.50	187.80	187.80	5.65	37.20	114.89	400.52	160.21	112.44
12	20.50	22.00	1.50	Granular	7.10	0.00	20	-	0.00	5.39	1.00	-	21.25	22.00	187.80	187.80	5.65	37.20	114.89	437.73	175.09	125.23
13	22.00	23.50	1.50	Granular	8.40	0.00	21	-	2.00	6.49	1.00	-	22.75	23.50	187.80	187.80	5.65	39.06	139.44	501.34	200.54	138.54
14	23.50	25.00	1.50	Granular	8.40	0.00	21	-	2.00	6.49	1.00	-	24.25	25.00	187.80	187.80	5.65	39.06	139.44	540.41	216.16	151.85
15	25.00	26.50	1.50	Granular	10.10	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	187.80	187.80	5.65	55.81	491.75	948.51	379.41	169.85
16	26.50	28.00	1.50	Granular	10.10	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	187.80	187.80	5.65	55.81	491.75	1004.32	401.73	187.85
17	28.00	29.50	1.50	Granular	9.30	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	187.80	187.80	5.65	55.81	490.68	1059.06	423.63	205.86
18	29.50	30.00	0.50	Granular	9.30	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	187.80	187.80	1.88	18.60	490.68	1077.66	431.07	211.86

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	13	2.96E+07	1.02E-01	1.83E+03	4.40	1.25	1.99	1.82	8.74	8.02	0.184	0.735	10.88	2.72	47.54	21.83	26.12	6.53	114.09	52.39
2	22.50	13	2.96E+07	1.02E-01	1.83E+03	4.40	1.25	1.99	1.82	8.74	8.02	0.184	0.735	10.88	2.72	47.54	21.83	26.12	6.53	114.09	52.39
3	24.00	13	2.96E+07	1.02E-01	1.83E+03	4.40	1.25	1.99	1.82	8.74	8.02	0.184	0.735	10.88	2.72	47.54	21.83	26.12	6.53	114.09	52.39
4	25.50	14	2.96E+07	1.02E-01	1.98E+03	4.33	1.27	1.98	1.82	8.60	7.90	0.175	0.700	11.42	2.86	49.10	22.56	27.42	6.85	117.84	54.15
5	27.00	14	2.96E+07	1.02E-01	1.98E+03	4.33	1.27	1.98	1.82	8.60	7.90	0.175	0.700	11.42	2.86	49.10	22.56	27.42	6.85	117.84	54.15
6	28.50	15	2.96E+07	1.02E-01	2.12E+03	4.27	1.29	1.98	1.82	8.47	7.79	0.167	0.669	11.95	2.99	50.60	23.26	28.68	7.17	121.43	55.83
7	30.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	1.29	1.98	1.82	8.47	7.79	0.167	0.669	11.95	2.99	50.60	23.26	28.68	7.17	121.43	55.83

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-11	-
Chainage	1+004	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	204.00	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	14.70	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-11	1.00	22.00	19.50	19.50	164.48	99.68	7.95	1.99
BH-11	1.00	23.50	21.00	21.00	179.98	112.17	7.95	1.99
BH-11	1.00	25.00	22.50	22.50	195.55	124.67	8.28	2.07
BH-11	1.00	26.50	24.00	24.00	290.38	139.99	8.28	2.07
BH-11	1.00	28.00	25.50	25.50	310.41	155.31	8.28	2.07
BH-11	1.00	29.50	27.00	27.00	345.81	171.11	8.61	2.15
BH-11	1.00	30.00	27.50	27.50	352.55	176.37	8.61	2.15

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	16.00	0.00	22	-	4.00	7.59	1.00	-	3.25	4.00	12.00	24.00	4.71	2.18	16.87	19.05	7.62	5.01
2	4.00	5.50	1.50	Granular	16.00	0.00	22	-	4.00	7.59	1.00	-	4.75	5.50	36.00	48.00	4.71	6.54	31.22	39.94	15.98	8.49
3	5.50	7.00	1.50	Granular	16.00	0.00	22	-	4.00	7.59	1.00	-	6.25	7.00	60.00	72.00	4.71	10.90	45.57	65.19	26.07	13.19
4	7.00	8.50	1.50	Granular	16.00	0.00	22	-	4.00	7.59	1.00	-	7.75	8.50	84.00	96.00	4.71	15.25	59.93	94.79	37.92	19.11
5	8.50	10.00	1.50	Granular	17.50	0.00	22	-	4.00	7.59	1.00	-	9.25	10.00	109.13	122.25	4.71	19.82	75.86	130.54	52.22	26.31
6	10.00	11.50	1.50	Granular	17.50	0.00	22	-	4.00	7.59	1.00	-	10.75	11.50	135.38	148.50	4.71	0.00	91.55	146.24	58.49	27.96
7	11.50	13.00	1.50	Granular	18.50	0.00	20	-	0.00	5.39	1.00	-	12.25	13.00	162.38	176.25	4.71	0.00	74.88	129.56	51.83	29.61
7	13.00	14.50	1.50	Granular	18.50	0.00	20	-	0.00	5.39	1.00	-	13.75	14.50	190.13	204.00	4.71	31.39	86.67	172.74	69.10	40.04
8	14.50	16.00	1.50	Granular	8.70	0.00	20	-	0.00	5.39	1.00	-	15.25	16.00	204.00	204.00	4.71	33.68	86.67	206.42	82.57	51.12
9	16.00	17.50	1.50	Granular	8.70	0.00	20	-	0.00	5.39	1.00	-	16.75	17.50	204.00	204.00	4.71	33.68	86.67	240.09	96.04	62.20
10	17.50	19.00	1.50	Granular	8.70	0.00	23	-	6.00	8.68	1.00	-	18.25	19.00	204.00	204.00	4.71	38.73	141.69	333.85	133.54	74.69
11	19.00	20.50	1.50	Granular	8.70	0.00	23	-	6.00	8.68	1.00	-	19.75	20.50	204.00	204.00	4.71	38.73	141.69	372.58	149.03	87.19
12	20.50	22.00	1.50	Granular	8.30	0.00	23	-	6.00	8.68	1.00	-	21.25	22.00	204.00	204.00	4.71	38.73	141.60	411.21	164.48	99.68
13	22.00	23.50	1.50	Granular	8.30	0.00	23	-	6.00	8.68	1.00	-	22.75	23.50	204.00	204.00	4.71	38.73	141.60	449.94	179.98	112.17
14	23.50	25.00	1.50	Granular	9.20	0.00	23	-	6.00	8.68	1.00	-	24.25	25.00	204.00	204.00	4.71	38.73	141.81	488.88	195.55	124.67
15	25.00	26.50	1.50	Granular	9.20	0.00	29	-	17.60	20.13	1.00	-	25.75	26.50	204.00	204.00	4.71	48.83	330.04	725.94	290.38	139.99
16	26.50	28.00	1.50	Granular	11.00	0.00	29	-	17.60	20.13	1.00	-	27.25	28.00	204.00	204.00	4.71	48.83	331.28	776.02	310.41	155.31
17	28.00	29.50	1.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	204.00	204.00	4.71	50.52	369.28	864.54	345.81	171.11
18	29.50	30.00	0.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	204.00	204.00	1.57	16.84	369.28	881.37	352.55	176.37

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.68	2.06	1.85	7.61	6.82	0.252	1.007	7.95	1.99	30.23	13.55	19.07	4.77	72.55	32.51
2	22.50	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.68	2.06	1.85	7.61	6.82	0.252	1.007	7.95	1.99	30.23	13.55	19.07	4.77	72.55	32.51
3	24.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
4	25.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
5	27.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
6	28.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33
7	30.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-11	-
Chainage	1+004	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	230.10	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	14.70	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-11	1.20	22.00	19.50	19.50	230.69	131.87	10.42	2.60
BH-11	1.20	23.50	21.00	21.00	251.66	148.92	10.42	2.60
BH-11	1.20	25.00	22.50	22.50	272.78	165.97	10.85	2.71
BH-11	1.20	26.50	24.00	24.00	421.68	186.85	10.85	2.71
BH-11	1.20	28.00	25.50	25.50	448.98	207.74	10.85	2.71
BH-11	1.20	29.50	27.00	27.00	501.05	229.26	11.28	2.82
BH-11	1.20	30.00	27.50	27.50	510.17	236.43	11.28	2.82

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	16.00	0.00	22	-	4.00	7.59	1.00	-	3.25	4.00	12.00	24.00	5.65	2.61	25.02	27.64	11.06	7.07
2	4.00	5.50	1.50	Granular	16.00	0.00	22	-	4.00	7.59	1.00	-	4.75	5.50	36.00	48.00	5.65	7.84	45.69	56.15	22.46	11.64
3	5.50	7.00	1.50	Granular	16.00	0.00	22	-	4.00	7.59	1.00	-	6.25	7.00	60.00	72.00	5.65	13.07	66.35	89.89	35.96	17.67
4	7.00	8.50	1.50	Granular	16.00	0.00	22	-	4.00	7.59	1.00	-	7.75	8.50	84.00	96.00	5.65	18.30	87.02	128.86	51.54	25.17
5	8.50	10.00	1.50	Granular	17.50	0.00	22	-	4.00	7.59	1.00	-	9.25	10.00	109.13	122.25	5.65	23.78	110.03	175.65	70.26	34.21
6	10.00	11.50	1.50	Granular	17.50	0.00	22	-	4.00	7.59	1.00	-	10.75	11.50	135.38	148.50	5.65	0.00	132.63	198.25	79.30	36.58
7	11.50	13.00	1.50	Granular	18.50	0.00	20	-	0.00	5.39	1.00	-	12.25	13.00	162.38	176.25	5.65	0.00	107.83	173.45	69.38	38.96
7	13.00	14.50	1.50	Granular	18.50	0.00	20	-	0.00	5.39	1.00	-	13.75	14.50	190.13	204.00	5.65	37.66	124.80	228.09	91.24	51.88
8	14.50	16.00	1.50	Granular	8.70	0.00	20	-	0.00	5.39	1.00	-	15.25	16.00	210.53	217.05	5.65	41.71	132.79	277.78	111.11	65.93
9	16.00	17.50	1.50	Granular	8.70	0.00	20	-	0.00	5.39	1.00	-	16.75	17.50	223.58	230.10	5.65	44.29	140.77	330.05	132.02	80.71
10	17.50	19.00	1.50	Granular	8.70	0.00	23	-	6.00	8.68	1.00	-	18.25	19.00	230.10	230.10	5.65	52.42	230.36	472.06	188.82	97.76
11	19.00	20.50	1.50	Granular	8.70	0.00	23	-	6.00	8.68	1.00	-	19.75	20.50	230.10	230.10	5.65	52.42	230.36	524.48	209.79	114.81
12	20.50	22.00	1.50	Granular	8.30	0.00	23	-	6.00	8.68	1.00	-	21.25	22.00	230.10	230.10	5.65	52.42	230.19	576.74	230.69	131.87
13	22.00	23.50	1.50	Granular	8.30	0.00	23	-	6.00	8.68	1.00	-	22.75	23.50	230.10	230.10	5.65	52.42	230.19	629.16	251.66	148.92
14	23.50	25.00	1.50	Granular	9.20	0.00	23	-	6.00	8.68	1.00	-	24.25	25.00	230.10	230.10	5.65	52.42	230.56	681.95	272.78	165.97
15	25.00	26.50	1.50	Granular	9.20	0.00	29	-	17.60	20.13	1.00	-	25.75	26.50	230.10	230.10	5.65	66.10	536.72	1054.20	421.68	186.85
16	26.50	28.00	1.50	Granular	11.00	0.00	29	-	17.60	20.13	1.00	-	27.25	28.00	230.10	230.10	5.65	66.10	538.88	1122.45	448.98	207.74
17	28.00	29.50	1.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	230.10	230.10	5.65	68.38	600.68	1252.63	501.05	229.26
18	29.50	30.00	0.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	230.10	230.10	1.88	22.79	600.68	1275.43	510.17	236.43

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.59	2.08	1.85	8.86	7.91	0.192	0.768	10.42	2.60	46.16	20.59	25.00	6.25	110.80	49.43
2	22.50	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.59	2.08	1.85	8.86	7.91	0.192	0.768	10.42	2.60	46.16	20.59	25.00	6.25	110.80	49.43
3	24.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
4	25.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
5	27.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
6	28.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17
7	30.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-01	-
Chainage	0+031	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	84.00	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-01	1.00	22.00	19.50	19.50	60.18	56.32	7.95	1.99
BH-01	1.00	23.50	21.00	21.00	65.72	61.85	7.95	1.99
BH-01	1.00	25.00	22.50	22.50	122.98	69.33	8.28	2.07
BH-01	1.00	26.50	24.00	24.00	129.67	76.80	8.48	2.12
BH-01	1.00	28.00	25.50	25.50	137.99	84.27	8.61	2.15
BH-01	1.00	29.50	27.00	27.00	146.31	91.75	8.61	2.15
BH-01	1.00	30.00	27.50	27.50	149.08	94.24	8.61	2.15

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	3.25	4.00	5.25	10.50	4.71	1.04	10.30	11.34	4.54	4.69
2	4.00	5.50	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	4.75	5.50	15.75	21.00	4.71	3.12	18.40	22.56	9.02	7.21
3	5.50	7.00	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	6.25	7.00	26.25	31.50	4.71	5.20	26.49	35.86	14.34	10.32
4	7.00	8.50	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	7.75	8.50	36.75	42.00	4.71	7.28	34.59	51.23	20.49	14.01
5	8.50	10.00	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	9.25	10.00	47.25	52.50	4.71	9.36	42.69	68.69	27.48	18.28
6	10.00	11.50	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	10.75	11.50	57.75	63.00	4.71	11.44	50.78	88.22	35.29	23.13
7	11.50	13.00	1.50	Granular	7.00	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	68.25	73.50	4.71	14.65	79.71	131.80	52.72	28.88
7	13.00	14.50	1.50	Granular	7.00	0.00	26	-	11.90	13.19	1.00	-	13.75	14.50	78.75	84.00	4.71	16.90	90.63	159.62	63.85	35.26
8	14.50	16.00	1.50	Granular	7.90	0.00	26	-	11.90	13.19	1.00	-	15.25	16.00	84.00	84.00	4.71	18.03	91.05	178.07	71.23	41.96
9	16.00	17.50	1.50	Granular	7.90	0.00	26	-	11.90	13.19	1.00	-	16.75	17.50	84.00	84.00	4.71	0.00	91.05	178.07	71.23	43.61
10	17.50	19.00	1.50	Granular	7.90	25.00	20	-	0.00	5.39	1.00	-	18.25	19.00	84.00	84.00	4.71	0.00	35.69	122.70	49.08	45.26
11	19.00	20.50	1.50	Granular	8.70	25.00	20	-	0.00	5.39	1.00	-	19.75	20.50	84.00	84.00	4.71	13.87	35.69	136.57	54.63	50.79
12	20.50	22.00	1.50	Granular	8.70	25.00	20	-	0.00	5.39	1.00	-	21.25	22.00	84.00	84.00	4.71	13.87	35.69	150.44	60.18	56.32
13	22.00	23.50	1.50	Granular	12.30	25.00	20	-	0.00	5.39	1.00	-	22.75	23.50	84.00	84.00	4.71	13.87	35.69	164.31	65.72	61.85
14	23.50	25.00	1.50	Granular	12.30	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	84.00	84.00	4.71	20.80	158.03	307.45	122.98	69.33
15	25.00	26.50	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	84.00	84.00	4.71	20.80	153.96	324.18	129.67	76.80
16	26.50	28.00	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	84.00	84.00	4.71	20.80	153.96	344.98	137.99	84.27
17	28.00	29.50	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	84.00	84.00	4.71	20.80	153.96	365.78	146.31	91.75
18	29.50	30.00	0.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	84.00	84.00	1.57	6.93	153.96	372.71	149.08	94.24

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.68	2.06	1.85	7.61	6.82	0.252	1.007	7.95	1.99	30.23	13.55	19.07	4.77	72.55	32.51
2	22.50	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.68	2.06	1.85	7.61	6.82	0.252	1.007	7.95	1.99	30.23	13.55	19.07	4.77	72.55	32.51
3	24.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
4	25.50	17	2.96E+07	4.91E-02	2.35E+03	3.62	0.69	2.06	1.85	7.44	6.68	0.236	0.943	8.48	2.12	31.57	14.16	20.35	5.09	75.76	33.98
5	27.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33
6	28.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33
7	30.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-01	-
Chainage	0+031	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	107.70	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-01	1.20	22.00	19.50	19.50	85.80	76.45	10.42	2.60
BH-01	1.20	23.50	21.00	21.00	94.34	84.80	10.42	2.60
BH-01	1.20	25.00	22.50	22.50	197.04	96.13	10.85	2.71
BH-01	1.20	26.50	24.00	24.00	207.03	107.47	11.11	2.78
BH-01	1.20	28.00	25.50	25.50	219.83	118.80	11.28	2.82
BH-01	1.20	29.50	27.00	27.00	232.63	130.14	11.28	2.82
BH-01	1.20	30.00	27.50	27.50	236.90	133.92	11.28	2.82

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (Ki)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	3.25	4.00	5.25	10.50	5.65	1.25	15.47	16.72	6.69	6.68
2	4.00	5.50	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	4.75	5.50	15.75	21.00	5.65	3.74	27.13	32.12	12.85	10.11
3	5.50	7.00	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	6.25	7.00	26.25	31.50	5.65	6.24	38.79	50.02	20.01	14.23
4	7.00	8.50	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	7.75	8.50	36.75	42.00	5.65	8.74	50.45	70.42	28.17	19.05
5	8.50	10.00	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	9.25	10.00	47.25	52.50	5.65	11.23	62.10	93.31	37.32	24.57
6	10.00	11.50	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	10.75	11.50	57.75	63.00	5.65	13.73	73.76	118.69	47.48	30.79
7	11.50	13.00	1.50	Granular	7.00	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	68.25	73.50	5.65	17.58	115.73	178.23	71.29	38.09
7	13.00	14.50	1.50	Granular	7.00	0.00	26	-	11.90	13.19	1.00	-	13.75	14.50	78.75	84.00	5.65	20.28	131.45	214.24	85.70	46.14
8	14.50	16.00	1.50	Granular	7.90	0.00	26	-	11.90	13.19	1.00	-	15.25	16.00	89.93	95.85	5.65	23.16	149.92	255.87	102.35	55.00
9	16.00	17.50	1.50	Granular	7.90	0.00	26	-	11.90	13.19	1.00	-	16.75	17.50	101.78	107.70	5.65	0.00	167.67	273.61	109.45	57.37
10	17.50	19.00	1.50	Granular	7.90	25.00	20	-	0.00	5.39	1.00	-	18.25	19.00	107.70	107.70	5.65	0.00	65.89	171.84	68.73	59.75
11	19.00	20.50	1.50	Granular	8.70	25.00	20	-	0.00	5.39	1.00	-	19.75	20.50	107.70	107.70	5.65	21.34	65.89	193.17	77.27	68.10
12	20.50	22.00	1.50	Granular	8.70	25.00	20	-	0.00	5.39	1.00	-	21.25	22.00	107.70	107.70	5.65	21.34	65.89	214.51	85.80	76.45
13	22.00	23.50	1.50	Granular	12.30	25.00	20	-	0.00	5.39	1.00	-	22.75	23.50	107.70	107.70	5.65	21.34	65.89	235.84	94.34	84.80
14	23.50	25.00	1.50	Granular	12.30	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	107.70	107.70	5.65	32.00	290.65	492.61	197.04	96.13
15	25.00	26.50	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	107.70	107.70	5.65	32.00	283.61	517.57	207.03	107.47
16	26.50	28.00	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	107.70	107.70	5.65	32.00	283.61	549.58	219.83	118.80
17	28.00	29.50	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	107.70	107.70	5.65	32.00	283.61	581.58	232.63	130.14
18	29.50	30.00	0.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	107.70	107.70	1.88	10.67	283.61	592.25	236.90	133.92

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_t/T Ratio	L_t/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.59	2.08	1.85	8.86	7.91	0.192	0.768	10.42	2.60	46.16	20.59	25.00	6.25	110.80	49.43
2	22.50	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.59	2.08	1.85	8.86	7.91	0.192	0.768	10.42	2.60	46.16	20.59	25.00	6.25	110.80	49.43
3	24.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
4	25.50	17	2.96E+07	1.02E-01	2.35E+03	4.18	0.60	2.07	1.85	8.68	7.75	0.180	0.720	11.11	2.78	48.20	21.52	26.67	6.67	115.68	51.64
5	27.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17
6	28.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17
7	30.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-02	-
Chainage	0+124	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	89.70	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-02	1.00	22.00	19.50	19.50	118.74	70.82	7.95	1.99
BH-02	1.00	23.50	21.00	21.00	127.03	78.28	7.95	1.99
BH-02	1.00	25.00	22.50	22.50	121.38	85.32	7.95	1.99
BH-02	1.00	26.50	24.00	24.00	129.08	92.36	8.28	2.07
BH-02	1.00	28.00	25.50	25.50	165.43	100.22	8.28	2.07
BH-02	1.00	29.50	27.00	27.00	174.31	108.09	8.61	2.15
BH-02	1.00	30.00	27.50	27.50	177.27	110.72	8.61	2.15

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (Ki)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.00	0.00	25	-	10.00	10.88	1.00	-	3.25	4.00	5.25	10.50	4.71	1.08	11.76	12.85	5.14	4.70
2	4.00	5.50	1.50	Granular	7.00	0.00	25	-	10.00	10.88	1.00	-	4.75	5.50	15.75	21.00	4.71	3.25	20.77	25.10	10.04	7.26
3	5.50	7.00	1.50	Granular	7.00	0.00	25	-	10.00	10.88	1.00	-	6.25	7.00	26.25	31.50	4.71	5.42	29.77	39.52	15.81	10.43
4	7.00	8.50	1.50	Granular	7.00	0.00	25	-	10.00	10.88	1.00	-	7.75	8.50	36.75	42.00	4.71	7.58	38.78	56.11	22.44	14.20
5	8.50	10.00	1.50	Granular	7.00	0.00	25	-	10.00	10.88	1.00	-	9.25	10.00	47.25	52.50	4.71	9.75	47.78	74.87	29.95	18.58
6	10.00	11.50	1.50	Granular	7.00	0.00	25	-	10.00	10.88	1.00	-	10.75	11.50	57.75	63.00	4.71	11.92	56.79	95.79	38.32	23.57
7	11.50	13.00	1.50	Granular	8.90	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	69.68	76.35	4.71	14.95	83.56	137.52	55.01	29.40
7	13.00	14.50	1.50	Granular	8.90	0.00	26	-	11.90	13.19	1.00	-	13.75	14.50	83.03	89.70	4.71	17.82	97.45	169.22	67.69	36.04
8	14.50	16.00	1.50	Granular	6.80	0.00	27	-	13.80	15.50	1.00	-	15.25	16.00	89.70	89.70	4.71	19.99	113.32	205.08	82.03	43.29
9	16.00	17.50	1.50	Granular	6.80	0.00	27	-	13.80	15.50	1.00	-	16.75	17.50	89.70	89.70	4.71	19.99	113.32	225.07	90.03	50.53
10	17.50	19.00	1.50	Granular	6.80	0.00	23	-	6.00	8.68	1.00	-	18.25	19.00	89.70	89.70	4.71	17.03	63.01	191.79	76.72	56.95
11	19.00	20.50	1.50	Granular	6.80	0.00	23	-	6.00	8.68	1.00	-	19.75	20.50	89.70	89.70	4.71	17.03	63.01	208.82	83.53	63.37
12	20.50	22.00	1.50	Granular	7.00	0.00	28	-	15.70	17.82	1.00	-	21.25	22.00	89.70	89.70	4.71	20.73	130.30	296.84	118.74	70.82
13	22.00	23.50	1.50	Granular	7.00	0.00	28	-	15.70	17.82	1.00	-	22.75	23.50	89.70	89.70	4.71	20.73	130.30	317.57	127.03	78.28
14	23.50	25.00	1.50	Granular	7.80	0.00	26	-	11.90	13.19	1.00	-	24.25	25.00	89.70	89.70	4.71	19.25	96.93	303.46	121.38	85.32
15	25.00	26.50	1.50	Granular	7.80	0.00	26	-	11.90	13.19	1.00	-	25.75	26.50	89.70	89.70	4.71	19.25	96.93	322.71	129.08	92.36
16	26.50	28.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	89.70	89.70	4.71	22.21	165.58	413.57	165.43	100.22
17	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	89.70	89.70	4.71	22.21	165.58	435.78	174.31	108.09
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	89.70	89.70	1.57	7.40	165.58	443.18	177.27	110.72

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.68	2.06	1.85	7.61	6.82	0.252	1.007	7.95	1.99	30.23	13.55	19.07	4.77	72.55	32.51
2	22.50	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.68	2.06	1.85	7.61	6.82	0.252	1.007	7.95	1.99	30.23	13.55	19.07	4.77	72.55	32.51
3	24.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.68	2.06	1.85	7.61	6.82	0.252	1.007	7.95	1.99	30.23	13.55	19.07	4.77	72.55	32.51
4	25.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
5	27.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
6	28.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33
7	30.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-02	-
Chainage	0+124	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	110.10	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-02	1.20	22.00	19.50	19.50	180.16	96.51	10.42	2.60
BH-02	1.20	23.50	21.00	21.00	192.37	107.43	10.42	2.60
BH-02	1.20	25.00	22.50	22.50	180.13	117.75	10.42	2.60
BH-02	1.20	26.50	24.00	24.00	191.47	128.06	10.85	2.71
BH-02	1.20	28.00	25.50	25.50	253.04	139.60	10.85	2.71
BH-02	1.20	29.50	27.00	27.00	266.13	151.13	11.28	2.82
BH-02	1.20	30.00	27.50	27.50	270.49	154.98	11.28	2.82

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.00	0.00	25	-	10.00	10.88	1.00	-	3.25	4.00	5.25	10.50	5.65	1.30	17.73	19.03	7.61	6.70
2	4.00	5.50	1.50	Granular	7.00	0.00	25	-	10.00	10.88	1.00	-	4.75	5.50	15.75	21.00	5.65	3.90	30.70	35.90	14.36	10.16
3	5.50	7.00	1.50	Granular	7.00	0.00	25	-	10.00	10.88	1.00	-	6.25	7.00	26.25	31.50	5.65	6.50	43.67	55.37	22.15	14.36
4	7.00	8.50	1.50	Granular	7.00	0.00	25	-	10.00	10.88	1.00	-	7.75	8.50	36.75	42.00	5.65	9.10	56.63	77.43	30.97	19.28
5	8.50	10.00	1.50	Granular	7.00	0.00	25	-	10.00	10.88	1.00	-	9.25	10.00	47.25	52.50	5.65	11.70	69.60	102.10	40.84	24.93
6	10.00	11.50	1.50	Granular	7.00	0.00	25	-	10.00	10.88	1.00	-	10.75	11.50	57.75	63.00	5.65	14.30	82.57	129.37	51.75	31.31
7	11.50	13.00	1.50	Granular	8.90	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	69.68	76.35	5.65	17.94	121.54	186.28	74.51	38.71
7	13.00	14.50	1.50	Granular	8.90	0.00	26	-	11.90	13.19	1.00	-	13.75	14.50	83.03	89.70	5.65	21.38	141.53	227.65	91.06	47.07
8	14.50	16.00	1.50	Granular	6.80	0.00	27	-	13.80	15.50	1.00	-	15.25	16.00	94.80	99.90	5.65	25.35	182.19	293.67	117.47	56.55
9	16.00	17.50	1.50	Granular	6.80	0.00	27	-	13.80	15.50	1.00	-	16.75	17.50	105.00	110.10	5.65	28.08	200.14	339.70	135.88	66.79
10	17.50	19.00	1.50	Granular	6.80	0.00	23	-	6.00	8.68	1.00	-	18.25	19.00	110.10	110.10	5.65	25.08	111.30	275.95	110.38	76.18
11	19.00	20.50	1.50	Granular	6.80	0.00	23	-	6.00	8.68	1.00	-	19.75	20.50	110.10	110.10	5.65	25.08	111.30	301.03	120.41	85.58
12	20.50	22.00	1.50	Granular	7.00	0.00	28	-	15.70	17.82	1.00	-	21.25	22.00	110.10	110.10	5.65	30.54	230.13	450.39	180.16	96.51
13	22.00	23.50	1.50	Granular	7.00	0.00	28	-	15.70	17.82	1.00	-	22.75	23.50	110.10	110.10	5.65	30.54	230.13	480.93	192.37	107.43
14	23.50	25.00	1.50	Granular	7.80	0.00	26	-	11.90	13.19	1.00	-	24.25	25.00	110.10	110.10	5.65	28.35	171.18	450.33	180.13	117.75
15	25.00	26.50	1.50	Granular	7.80	0.00	26	-	11.90	13.19	1.00	-	25.75	26.50	110.10	110.10	5.65	28.35	171.18	478.69	191.47	128.06
16	26.50	28.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	110.10	110.10	5.65	32.72	292.38	632.60	253.04	139.60
17	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	110.10	110.10	5.65	32.72	292.38	665.32	266.13	151.13
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	110.10	110.10	1.88	10.91	292.38	676.23	270.49	154.98

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.59	2.08	1.85	8.86	7.91	0.192	0.768	10.42	2.60	46.16	20.59	25.00	6.25	110.80	49.43
2	22.50	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.59	2.08	1.85	8.86	7.91	0.192	0.768	10.42	2.60	46.16	20.59	25.00	6.25	110.80	49.43
3	24.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.59	2.08	1.85	8.86	7.91	0.192	0.768	10.42	2.60	46.16	20.59	25.00	6.25	110.80	49.43
4	25.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
5	27.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
6	28.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17
7	30.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-03	-
Chainage	0+202	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	84.00	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-03	1.00	22.00	19.50	19.50	119.73	68.94	9.25	2.31
BH-03	1.00	23.50	21.00	21.00	127.78	76.22	9.25	2.31
BH-03	1.00	25.00	22.50	22.50	135.82	83.50	9.25	2.31
BH-03	1.00	26.50	24.00	24.00	143.86	90.78	9.56	2.39
BH-03	1.00	28.00	25.50	25.50	151.90	98.06	9.56	2.39
BH-03	1.00	29.50	27.00	27.00	166.62	105.53	9.56	2.39
BH-03	1.00	30.00	27.50	27.50	169.39	108.02	9.56	2.39

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.00	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	5.25	10.50	4.71	1.13	14.20	15.33	6.13	4.71
2	4.00	5.50	1.50	Granular	7.00	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	15.75	21.00	4.71	3.38	25.12	29.63	11.85	7.31
3	5.50	7.00	1.50	Granular	7.00	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	26.25	31.50	4.71	5.63	36.04	46.18	18.47	10.54
4	7.00	8.50	1.50	Granular	7.00	0.00	26	-	11.90	13.19	1.00	-	7.75	8.50	36.75	42.00	4.71	7.89	46.96	64.98	25.99	14.39
5	8.50	10.00	1.50	Granular	7.00	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	47.25	52.50	4.71	10.14	57.87	86.04	34.42	18.88
6	10.00	11.50	1.50	Granular	7.00	0.00	26	-	11.90	13.19	1.00	-	10.75	11.50	57.75	63.00	4.71	12.39	68.79	109.35	43.74	24.00
7	11.50	13.00	1.50	Granular	7.00	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	68.25	73.50	4.71	15.77	107.55	163.88	65.55	30.07
7	13.00	14.50	1.50	Granular	7.00	0.00	28	-	15.70	17.82	1.00	-	13.75	14.50	78.75	84.00	4.71	18.20	122.29	196.83	78.73	36.81
8	14.50	16.00	1.50	Granular	7.00	0.00	27	-	13.80	15.50	1.00	-	15.25	16.00	84.00	84.00	4.71	18.72	106.46	199.72	79.89	43.70
9	16.00	17.50	1.50	Granular	7.00	0.00	27	-	13.80	15.50	1.00	-	16.75	17.50	84.00	84.00	4.71	18.72	106.46	218.44	87.38	50.60
10	17.50	19.00	1.50	Granular	9.00	0.00	20	-	0.00	5.39	1.00	-	18.25	19.00	84.00	84.00	4.71	13.87	35.69	161.53	64.61	56.13
11	19.00	20.50	1.50	Granular	9.00	0.00	20	-	0.00	5.39	1.00	-	19.75	20.50	84.00	84.00	4.71	13.87	35.69	175.40	70.16	61.66
12	20.50	22.00	1.50	Granular	9.00	0.00	29	-	17.60	20.13	1.00	-	21.25	22.00	84.00	84.00	4.71	20.11	139.51	299.33	119.73	68.94
13	22.00	23.50	1.50	Granular	9.00	0.00	29	-	17.60	20.13	1.00	-	22.75	23.50	84.00	84.00	4.71	20.11	139.51	319.44	127.78	76.22
14	23.50	25.00	1.50	Granular	9.00	0.00	29	-	17.60	20.13	1.00	-	24.25	25.00	84.00	84.00	4.71	20.11	139.51	339.55	135.82	83.50
15	25.00	26.50	1.50	Granular	9.00	0.00	29	-	17.60	20.13	1.00	-	25.75	26.50	84.00	84.00	4.71	20.11	139.51	359.65	143.86	90.78
16	26.50	28.00	1.50	Granular	9.00	0.00	29	-	17.60	20.13	1.00	-	27.25	28.00	84.00	84.00	4.71	20.11	139.51	379.76	151.90	98.06
17	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	84.00	84.00	4.71	20.80	155.49	416.54	166.62	105.53
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	84.00	84.00	1.57	6.93	155.49	423.48	169.39	108.02

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	19	2.96E+07	4.91E-02	2.70E+03	3.52	0.71	2.06	1.85	7.23	6.49	0.216	0.865	9.25	2.31	33.44	15.01	22.19	5.55	80.26	36.03
2	22.50	19	2.96E+07	4.91E-02	2.70E+03	3.52	0.71	2.06	1.85	7.23	6.49	0.216	0.865	9.25	2.31	33.44	15.01	22.19	5.55	80.26	36.03
3	24.00	19	2.96E+07	4.91E-02	2.70E+03	3.52	0.71	2.06	1.85	7.23	6.49	0.216	0.865	9.25	2.31	33.44	15.01	22.19	5.55	80.26	36.03
4	25.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
5	27.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
6	28.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
7	30.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-03	-
Chainage	0+202	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	105.00	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-03	1.20	22.00	19.50	19.50	184.97	94.12	12.11	3.03
BH-03	1.20	23.50	21.00	21.00	197.03	104.94	12.11	3.03
BH-03	1.20	25.00	22.50	22.50	209.10	115.76	12.11	3.03
BH-03	1.20	26.50	24.00	24.00	221.16	126.59	12.52	3.13
BH-03	1.20	28.00	25.50	25.50	233.23	137.41	12.52	3.13
BH-03	1.20	29.50	27.00	27.00	257.20	148.52	12.52	3.13
BH-03	1.20	30.00	27.50	27.50	261.36	152.22	12.52	3.13

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (Ki)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.00	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	5.25	10.50	5.65	1.35	21.40	22.75	9.10	6.71
2	4.00	5.50	1.50	Granular	7.00	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	15.75	21.00	5.65	4.06	37.12	42.53	17.01	10.22
3	5.50	7.00	1.50	Granular	7.00	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	26.25	31.50	5.65	6.76	52.84	65.01	26.00	14.49
4	7.00	8.50	1.50	Granular	7.00	0.00	26	-	11.90	13.19	1.00	-	7.75	8.50	36.75	42.00	5.65	9.46	68.56	90.19	36.08	19.52
5	8.50	10.00	1.50	Granular	7.00	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	47.25	52.50	5.65	12.17	84.28	118.09	47.23	25.30
6	10.00	11.50	1.50	Granular	7.00	0.00	26	-	11.90	13.19	1.00	-	10.75	11.50	57.75	63.00	5.65	14.87	100.01	148.68	59.47	31.84
7	11.50	13.00	1.50	Granular	7.00	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	68.25	73.50	5.65	18.93	156.12	223.72	89.49	39.51
7	13.00	14.50	1.50	Granular	7.00	0.00	28	-	15.70	17.82	1.00	-	13.75	14.50	78.75	84.00	5.65	21.84	177.35	266.79	106.72	48.00
8	14.50	16.00	1.50	Granular	7.00	0.00	27	-	13.80	15.50	1.00	-	15.25	16.00	89.25	94.50	5.65	23.87	172.88	286.19	114.48	57.06
9	16.00	17.50	1.50	Granular	7.00	0.00	27	-	13.80	15.50	1.00	-	16.75	17.50	99.75	105.00	5.65	26.68	191.35	331.34	132.54	66.91
10	17.50	19.00	1.50	Granular	9.00	0.00	20	-	0.00	5.39	1.00	-	18.25	19.00	105.00	105.00	5.65	20.80	64.24	225.03	90.01	75.11
11	19.00	20.50	1.50	Granular	9.00	0.00	20	-	0.00	5.39	1.00	-	19.75	20.50	105.00	105.00	5.65	20.80	64.24	245.83	98.33	83.30
12	20.50	22.00	1.50	Granular	9.00	0.00	29	-	17.60	20.13	1.00	-	21.25	22.00	105.00	105.00	5.65	30.16	250.67	462.42	184.97	94.12
13	22.00	23.50	1.50	Granular	9.00	0.00	29	-	17.60	20.13	1.00	-	22.75	23.50	105.00	105.00	5.65	30.16	250.67	492.59	197.03	104.94
14	23.50	25.00	1.50	Granular	9.00	0.00	29	-	17.60	20.13	1.00	-	24.25	25.00	105.00	105.00	5.65	30.16	250.67	522.75	209.10	115.76
15	25.00	26.50	1.50	Granular	9.00	0.00	29	-	17.60	20.13	1.00	-	25.75	26.50	105.00	105.00	5.65	30.16	250.67	552.91	221.16	126.59
16	26.50	28.00	1.50	Granular	9.00	0.00	29	-	17.60	20.13	1.00	-	27.25	28.00	105.00	105.00	5.65	30.16	250.67	583.07	233.23	137.41
17	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	105.00	105.00	5.65	31.20	279.39	642.99	257.20	148.52
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	105.00	105.00	1.88	10.40	279.39	653.39	261.36	152.22

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	19	2.96E+07	1.02E-01	2.70E+03	4.07	0.61	2.07	1.85	8.43	7.53	0.165	0.660	12.11	3.03	51.05	22.81	29.07	7.27	122.53	54.74
2	22.50	19	2.96E+07	1.02E-01	2.70E+03	4.07	0.61	2.07	1.85	8.43	7.53	0.165	0.660	12.11	3.03	51.05	22.81	29.07	7.27	122.53	54.74
3	24.00	19	2.96E+07	1.02E-01	2.70E+03	4.07	0.61	2.07	1.85	8.43	7.53	0.165	0.660	12.11	3.03	51.05	22.81	29.07	7.27	122.53	54.74
4	25.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
5	27.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
6	28.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
7	30.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-04	-
Chainage	0+291	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	78.00	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-04	1.00	22.00	19.50	19.50	105.61	66.32	8.93	2.23
BH-04	1.00	23.50	21.00	21.00	112.82	73.01	8.93	2.23
BH-04	1.00	25.00	22.50	22.50	120.03	79.71	8.93	2.23
BH-04	1.00	26.50	24.00	24.00	139.51	86.77	8.93	2.23
BH-04	1.00	28.00	25.50	25.50	148.01	93.83	8.93	2.23
BH-04	1.00	29.50	27.00	27.00	155.73	100.88	8.93	2.23
BH-04	1.00	30.00	27.50	27.50	158.31	103.24	9.25	2.31

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (Ki)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	6.50	0.00	27	-	13.80	15.50	1.00	-	3.25	4.00	4.88	9.75	4.71	1.09	15.45	16.54	6.61	4.70
2	4.00	5.50	1.50	Granular	6.50	0.00	27	-	13.80	15.50	1.00	-	4.75	5.50	14.63	19.50	4.71	3.26	27.37	31.71	12.68	7.26
3	5.50	7.00	1.50	Granular	6.50	0.00	27	-	13.80	15.50	1.00	-	6.25	7.00	24.38	29.25	4.71	5.43	39.28	49.06	19.62	10.43
4	7.00	8.50	1.50	Granular	6.50	0.00	27	-	13.80	15.50	1.00	-	7.75	8.50	34.13	39.00	4.71	7.61	51.20	68.58	27.43	14.21
5	8.50	10.00	1.50	Granular	6.50	0.00	27	-	13.80	15.50	1.00	-	9.25	10.00	43.88	48.75	4.71	9.78	63.11	90.27	36.11	18.60
6	10.00	11.50	1.50	Granular	6.50	0.00	28	-	15.70	17.82	1.00	-	10.75	11.50	53.63	58.50	4.71	12.39	86.17	125.73	50.29	23.72
7	11.50	13.00	1.50	Granular	6.50	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	63.38	68.25	4.71	14.65	99.87	154.07	61.63	29.47
7	13.00	14.50	1.50	Granular	6.50	0.00	24	-	8.00	9.78	1.00	-	13.75	14.50	73.13	78.00	4.71	14.49	62.19	130.88	52.35	35.18
8	14.50	16.00	1.50	Granular	6.50	0.00	24	-	8.00	9.78	1.00	-	15.25	16.00	78.00	78.00	4.71	15.45	62.19	146.33	58.53	41.15
9	16.00	17.50	1.50	Granular	6.50	0.00	23	-	6.00	8.68	1.00	-	16.75	17.50	78.00	78.00	4.71	14.81	54.93	153.88	61.55	46.95
10	17.50	19.00	1.50	Granular	6.50	0.00	23	-	6.00	8.68	1.00	-	18.25	19.00	78.00	78.00	4.71	14.81	54.93	168.69	67.47	52.74
11	19.00	20.50	1.50	Granular	6.50	0.00	29	-	17.60	20.13	1.00	-	19.75	20.50	78.00	78.00	4.71	18.67	128.26	260.69	104.27	59.62
12	20.50	22.00	1.50	Granular	6.50	0.00	28	-	15.70	17.82	1.00	-	21.25	22.00	78.00	78.00	4.71	18.03	113.56	264.01	105.61	66.32
13	22.00	23.50	1.50	Granular	6.50	0.00	28	-	15.70	17.82	1.00	-	22.75	23.50	78.00	78.00	4.71	18.03	113.56	282.04	112.82	73.01
14	23.50	25.00	1.50	Granular	6.50	0.00	28	-	15.70	17.82	1.00	-	24.25	25.00	78.00	78.00	4.71	18.03	113.56	300.07	120.03	79.71
15	25.00	26.50	1.50	Granular	6.50	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	78.00	78.00	4.71	19.32	142.96	348.79	139.51	86.77
16	26.50	28.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	78.00	78.00	4.71	19.32	144.88	370.02	148.01	93.83
17	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	78.00	78.00	4.71	19.32	144.88	389.34	155.73	100.88
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	78.00	78.00	1.57	6.44	144.88	395.78	158.31	103.24

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_t/T Ratio	L_t/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
2	22.50	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
3	24.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
4	25.50	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
5	27.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
6	28.50	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
7	30.00	19	2.96E+07	4.91E-02	2.70E+03	3.52	0.71	2.06	1.85	7.23	6.49	0.216	0.865	9.25	2.31	33.44	15.01	22.19	5.55	80.26	36.03

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-04	-
Chainage	0+291	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	97.50	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-04	1.20	22.00	19.50	19.50	161.84	90.97	11.70	2.93
BH-04	1.20	23.50	21.00	21.00	172.66	100.92	11.70	2.93
BH-04	1.20	25.00	22.50	22.50	183.47	110.86	11.70	2.93
BH-04	1.20	26.50	24.00	24.00	216.21	121.35	11.70	2.93
BH-04	1.20	28.00	25.50	25.50	229.12	131.84	11.70	2.93
BH-04	1.20	29.50	27.00	27.00	240.71	142.33	11.70	2.93
BH-04	1.20	30.00	27.50	27.50	244.57	145.82	12.11	3.03

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	6.50	0.00	27	-	13.80	15.50	1.00	-	3.25	4.00	4.88	9.75	5.65	1.30	23.27	24.57	9.83	6.70
2	4.00	5.50	1.50	Granular	6.50	0.00	27	-	13.80	15.50	1.00	-	4.75	5.50	14.63	19.50	5.65	3.91	40.42	45.64	18.26	10.17
3	5.50	7.00	1.50	Granular	6.50	0.00	27	-	13.80	15.50	1.00	-	6.25	7.00	24.38	29.25	5.65	6.52	57.58	69.32	27.73	14.37
4	7.00	8.50	1.50	Granular	6.50	0.00	27	-	13.80	15.50	1.00	-	7.75	8.50	34.13	39.00	5.65	9.13	74.74	95.60	38.24	19.30
5	8.50	10.00	1.50	Granular	6.50	0.00	27	-	13.80	15.50	1.00	-	9.25	10.00	43.88	48.75	5.65	11.73	91.90	124.49	49.80	24.96
6	10.00	11.50	1.50	Granular	6.50	0.00	28	-	15.70	17.82	1.00	-	10.75	11.50	53.63	58.50	5.65	14.87	125.25	172.71	69.09	31.50
7	11.50	13.00	1.50	Granular	6.50	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	63.38	68.25	5.65	17.58	144.96	210.01	84.00	38.80
7	13.00	14.50	1.50	Granular	6.50	0.00	24	-	8.00	9.78	1.00	-	13.75	14.50	73.13	78.00	5.65	17.38	90.14	172.57	69.03	46.04
8	14.50	16.00	1.50	Granular	6.50	0.00	24	-	8.00	9.78	1.00	-	15.25	16.00	82.88	87.75	5.65	19.70	100.97	203.10	81.24	53.93
9	16.00	17.50	1.50	Granular	6.50	0.00	23	-	6.00	8.68	1.00	-	16.75	17.50	92.63	97.50	5.65	21.10	98.76	221.99	88.80	62.21
10	17.50	19.00	1.50	Granular	6.50	0.00	23	-	6.00	8.68	1.00	-	18.25	19.00	97.50	97.50	5.65	22.21	98.76	244.20	97.68	70.81
11	19.00	20.50	1.50	Granular	6.50	0.00	29	-	17.60	20.13	1.00	-	19.75	20.50	97.50	97.50	5.65	28.01	230.54	403.99	161.60	81.02
12	20.50	22.00	1.50	Granular	6.50	0.00	28	-	15.70	17.82	1.00	-	21.25	22.00	97.50	97.50	5.65	27.04	204.11	404.60	161.84	90.97
13	22.00	23.50	1.50	Granular	6.50	0.00	28	-	15.70	17.82	1.00	-	22.75	23.50	97.50	97.50	5.65	27.04	204.11	431.64	172.66	100.92
14	23.50	25.00	1.50	Granular	6.50	0.00	28	-	15.70	17.82	1.00	-	24.25	25.00	97.50	97.50	5.65	27.04	204.11	458.69	183.47	110.86
15	25.00	26.50	1.50	Granular	6.50	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	97.50	97.50	5.65	28.97	256.97	540.51	216.21	121.35
16	26.50	28.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	97.50	97.50	5.65	28.97	260.29	572.81	229.12	131.84
17	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	97.50	97.50	5.65	28.97	260.29	601.78	240.71	142.33
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	97.50	97.50	1.88	9.66	260.29	611.44	244.57	145.82

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
2	22.50	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
3	24.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
4	25.50	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
5	27.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
6	28.50	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
7	30.00	19	2.96E+07	1.02E-01	2.70E+03	4.07	0.61	2.07	1.85	8.43	7.53	0.165	0.660	12.11	3.03	51.05	22.81	29.07	7.27	122.53	54.74

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-05	-
Chainage	0+410	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	84.00	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.00	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-05	1.00	22.00	19.50	18.00	116.30	62.06	9.71	2.43
BH-05	1.00	23.50	21.00	19.50	124.62	69.53	9.71	2.43
BH-05	1.00	25.00	22.50	21.00	132.32	77.01	9.71	2.43
BH-05	1.00	26.50	24.00	22.50	140.64	84.48	9.71	2.43
BH-05	1.00	28.00	25.50	24.00	149.27	91.95	9.71	2.43
BH-05	1.00	29.50	27.00	25.50	157.59	99.43	9.71	2.43
BH-05	1.00	30.00	27.50	26.00	160.67	101.92	10.06	2.51

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (Ki)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.00	0.00	27	-	13.80	15.50	1.00	-	3.25	4.00	5.25	10.50	4.71	0.00	0.00	0.00	0.00	4.40
2	4.00	5.50	1.50	Granular	7.00	0.00	27	-	13.80	15.50	1.00	-	4.75	5.50	15.75	21.00	4.71	3.51	29.47	32.98	13.19	7.03
3	5.50	7.00	1.50	Granular	7.00	0.00	27	-	13.80	15.50	1.00	-	6.25	7.00	26.25	31.50	4.71	5.85	42.30	51.66	20.67	10.32
4	7.00	8.50	1.50	Granular	7.00	0.00	27	-	13.80	15.50	1.00	-	7.75	8.50	36.75	42.00	4.71	8.19	55.13	72.68	29.07	14.26
5	8.50	10.00	1.50	Granular	7.00	0.00	29	-	17.60	20.13	1.00	-	9.25	10.00	47.25	52.50	4.71	11.31	88.15	117.01	46.80	19.08
6	10.00	11.50	1.50	Granular	7.00	0.00	29	-	17.60	20.13	1.00	-	10.75	11.50	57.75	63.00	4.71	13.82	104.81	147.49	59.00	24.60
7	11.50	13.00	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	12.25	13.00	68.25	73.50	4.71	16.90	135.38	194.97	77.99	30.98
7	13.00	14.50	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	13.75	14.50	78.75	84.00	4.71	19.50	153.96	233.04	93.22	38.09
8	14.50	16.00	1.50	Granular	7.00	0.00	21	-	2.00	6.49	1.00	-	15.25	16.00	84.00	84.00	4.71	14.56	43.51	137.16	54.86	43.81
9	16.00	17.50	1.50	Granular	7.00	0.00	21	-	2.00	6.49	1.00	-	16.75	17.50	84.00	84.00	4.71	0.00	43.51	137.16	54.86	45.46
10	17.50	19.00	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	18.25	19.00	84.00	84.00	4.71	0.00	153.96	247.60	99.04	47.11
11	19.00	20.50	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	19.75	20.50	84.00	84.00	4.71	20.80	153.96	268.40	107.36	54.59
12	20.50	22.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	21.25	22.00	84.00	84.00	4.71	20.80	155.49	290.74	116.30	62.06
13	22.00	23.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	84.00	84.00	4.71	20.80	155.49	311.54	124.62	69.53
14	23.50	25.00	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	84.00	84.00	4.71	20.80	153.96	330.81	132.32	77.01
15	25.00	26.50	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	84.00	84.00	4.71	20.80	153.96	351.61	140.64	84.48
16	26.50	28.00	1.50	Granular	8.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	84.00	84.00	4.71	20.80	154.73	373.18	149.27	91.95
17	28.00	29.50	1.50	Granular	8.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	84.00	84.00	4.71	20.80	154.73	393.98	157.59	99.43
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	84.00	84.00	1.57	6.93	155.49	401.68	160.67	101.92

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_e/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	1.12	2.00	1.83	7.12	6.50	0.206	0.824	9.71	2.43	34.55	15.79	23.30	5.83	82.92	37.90
2	22.50	18	2.96E+07	4.91E-02	2.55E+03	3.56	1.12	2.00	1.83	7.12	6.50	0.206	0.824	9.71	2.43	34.55	15.79	23.30	5.83	82.92	37.90
3	24.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	1.12	2.00	1.83	7.12	6.50	0.206	0.824	9.71	2.43	34.55	15.79	23.30	5.83	82.92	37.90
4	25.50	18	2.96E+07	4.91E-02	2.55E+03	3.56	1.12	2.00	1.83	7.12	6.50	0.206	0.824	9.71	2.43	34.55	15.79	23.30	5.83	82.92	37.90
5	27.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	1.12	2.00	1.83	7.12	6.50	0.206	0.824	9.71	2.43	34.55	15.79	23.30	5.83	82.92	37.90
6	28.50	18	2.96E+07	4.91E-02	2.55E+03	3.56	1.12	2.00	1.83	7.12	6.50	0.206	0.824	9.71	2.43	34.55	15.79	23.30	5.83	82.92	37.90
7	30.00	19	2.96E+07	4.91E-02	2.70E+03	3.52	1.14	2.00	1.83	7.03	6.43	0.199	0.795	10.06	2.51	35.37	16.17	24.14	6.03	84.88	38.81

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-05	-
Chainage	0+410	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	105.00	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.00	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-05	1.20	22.00	19.50	18.00	182.10	84.08	12.64	3.16
BH-05	1.20	23.50	21.00	19.50	194.59	95.19	12.64	3.16
BH-05	1.20	25.00	22.50	21.00	206.00	106.30	12.64	3.16
BH-05	1.20	26.50	24.00	22.50	218.48	117.41	12.64	3.16
BH-05	1.20	28.00	25.50	24.00	231.50	128.52	12.64	3.16
BH-05	1.20	29.50	27.00	25.50	243.98	139.63	12.64	3.16
BH-05	1.20	30.00	27.50	26.00	248.67	143.34	13.09	3.27

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (Ki)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.00	0.00	27	-	13.80	15.50	1.00	-	3.25	4.00	5.25	10.50	5.65	0.00	0.00	0.00	0.00	6.33
2	4.00	5.50	1.50	Granular	7.00	0.00	27	-	13.80	15.50	1.00	-	4.75	5.50	15.75	21.00	5.65	4.21	43.53	47.75	19.10	9.89
3	5.50	7.00	1.50	Granular	7.00	0.00	27	-	13.80	15.50	1.00	-	6.25	7.00	26.25	31.50	5.65	7.02	62.01	73.24	29.30	14.23
4	7.00	8.50	1.50	Granular	7.00	0.00	27	-	13.80	15.50	1.00	-	7.75	8.50	36.75	42.00	5.65	9.83	80.49	101.55	40.62	19.36
5	8.50	10.00	1.50	Granular	7.00	0.00	29	-	17.60	20.13	1.00	-	9.25	10.00	47.25	52.50	5.65	13.57	128.33	162.97	65.19	25.53
6	10.00	11.50	1.50	Granular	7.00	0.00	29	-	17.60	20.13	1.00	-	10.75	11.50	57.75	63.00	5.65	16.59	152.32	203.54	81.42	32.55
7	11.50	13.00	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	12.25	13.00	68.25	73.50	5.65	20.28	196.50	268.01	107.20	40.60
7	13.00	14.50	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	13.75	14.50	78.75	84.00	5.65	23.40	223.25	318.15	127.26	49.53
8	14.50	16.00	1.50	Granular	7.00	0.00	21	-	2.00	6.49	1.00	-	15.25	16.00	89.25	94.50	5.65	18.56	70.54	184.01	73.61	57.10
9	16.00	17.50	1.50	Granular	7.00	0.00	21	-	2.00	6.49	1.00	-	16.75	17.50	99.75	105.00	5.65	0.00	78.28	191.75	76.70	59.48
10	17.50	19.00	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	18.25	19.00	105.00	105.00	5.65	0.00	276.74	390.20	156.08	61.86
11	19.00	20.50	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	19.75	20.50	105.00	105.00	5.65	31.20	276.74	421.40	168.56	72.97
12	20.50	22.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	21.25	22.00	105.00	105.00	5.65	31.20	279.39	455.26	182.10	84.08
13	22.00	23.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	105.00	105.00	5.65	31.20	279.39	486.46	194.59	95.19
14	23.50	25.00	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	105.00	105.00	5.65	31.20	276.74	515.01	206.00	106.30
15	25.00	26.50	1.50	Granular	7.00	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	105.00	105.00	5.65	31.20	276.74	546.21	218.48	117.41
16	26.50	28.00	1.50	Granular	8.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	105.00	105.00	5.65	31.20	278.06	578.74	231.50	128.52
17	28.00	29.50	1.50	Granular	8.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	105.00	105.00	5.65	31.20	278.06	609.94	243.98	139.63
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	105.00	105.00	1.88	10.40	279.39	621.67	248.67	143.34

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.97	2.02	1.83	8.31	7.55	0.158	0.633	12.64	3.16	52.53	23.86	30.34	7.58	126.06	57.27
2	22.50	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.97	2.02	1.83	8.31	7.55	0.158	0.633	12.64	3.16	52.53	23.86	30.34	7.58	126.06	57.27
3	24.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.97	2.02	1.83	8.31	7.55	0.158	0.633	12.64	3.16	52.53	23.86	30.34	7.58	126.06	57.27
4	25.50	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.97	2.02	1.83	8.31	7.55	0.158	0.633	12.64	3.16	52.53	23.86	30.34	7.58	126.06	57.27
5	27.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.97	2.02	1.83	8.31	7.55	0.158	0.633	12.64	3.16	52.53	23.86	30.34	7.58	126.06	57.27
6	28.50	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.97	2.02	1.83	8.31	7.55	0.158	0.633	12.64	3.16	52.53	23.86	30.34	7.58	126.06	57.27
7	30.00	19	2.96E+07	1.02E-01	2.70E+03	4.07	0.98	2.02	1.83	8.21	7.47	0.153	0.611	13.09	3.27	53.77	24.44	31.42	7.85	129.04	58.65

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-06	-
Chainage	0+501	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	84.00	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.00	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-06	1.00	22.00	19.50	18.00	134.04	74.05	9.36	2.34
BH-06	1.00	23.50	21.00	19.50	115.06	80.75	9.36	2.34
BH-06	1.00	25.00	22.50	21.00	122.27	87.44	9.36	2.34
BH-06	1.00	26.50	24.00	22.50	129.67	94.14	9.36	2.34
BH-06	1.00	28.00	25.50	24.00	163.68	101.61	9.36	2.34
BH-06	1.00	29.50	27.00	25.50	171.70	109.09	9.36	2.34
BH-06	1.00	30.00	27.50	26.00	174.47	111.58	9.71	2.43

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (Ki)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.00	0.00	27	-	13.80	15.50	1.00	-	3.25	4.00	5.25	10.50	4.71	0.00	0.00	0.00	0.00	4.40
2	4.00	5.50	1.50	Granular	7.00	0.00	27	-	13.80	15.50	1.00	-	4.75	5.50	15.75	21.00	4.71	3.51	29.47	32.98	13.19	7.03
3	5.50	7.00	1.50	Granular	7.00	0.00	27	-	13.80	15.50	1.00	-	6.25	7.00	26.25	31.50	4.71	5.85	42.30	51.66	20.67	10.32
4	7.00	8.50	1.50	Granular	7.00	0.00	27	-	13.80	15.50	1.00	-	7.75	8.50	36.75	42.00	4.71	8.19	55.13	72.68	29.07	14.26
5	8.50	10.00	1.50	Granular	7.00	0.00	27	-	13.80	15.50	1.00	-	9.25	10.00	47.25	52.50	4.71	10.53	67.97	96.05	38.42	18.86
6	10.00	11.50	1.50	Granular	7.00	0.00	27	-	13.80	15.50	1.00	-	10.75	11.50	57.75	63.00	4.71	12.87	80.80	121.75	48.70	24.11
7	11.50	13.00	1.50	Granular	7.00	0.00	29	-	17.60	20.13	1.00	-	12.25	13.00	68.25	73.50	4.71	16.34	121.47	178.76	71.50	30.34
7	13.00	14.50	1.50	Granular	7.00	0.00	29	-	17.60	20.13	1.00	-	13.75	14.50	78.75	84.00	4.71	18.85	138.12	214.26	85.71	37.26
8	14.50	16.00	1.50	Granular	9.00	0.00	27	-	13.80	15.50	1.00	-	15.25	16.00	84.00	84.00	4.71	18.72	107.55	202.41	80.96	44.15
9	16.00	17.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	16.75	17.50	84.00	84.00	4.71	20.80	155.49	271.16	108.46	51.63
10	17.50	19.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	18.25	19.00	84.00	84.00	4.71	20.80	155.49	291.96	116.78	59.10
11	19.00	20.50	1.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	19.75	20.50	84.00	84.00	4.71	20.80	157.03	314.29	125.72	66.57
12	20.50	22.00	1.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	21.25	22.00	84.00	84.00	4.71	20.80	157.03	335.09	134.04	74.05
13	22.00	23.50	1.50	Granular	9.00	0.00	26	-	11.90	13.19	1.00	-	22.75	23.50	84.00	84.00	4.71	18.03	91.57	287.66	115.06	80.75
14	23.50	25.00	1.50	Granular	9.00	0.00	26	-	11.90	13.19	1.00	-	24.25	25.00	84.00	84.00	4.71	18.03	91.57	305.68	122.27	87.44
15	25.00	26.50	1.50	Granular	10.00	0.00	26	-	11.90	13.19	1.00	-	25.75	26.50	84.00	84.00	4.71	18.03	92.04	324.18	129.67	94.14
16	26.50	28.00	1.50	Granular	10.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	84.00	84.00	4.71	20.80	156.26	409.21	163.68	101.61
17	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	84.00	84.00	4.71	20.80	155.49	429.24	171.70	109.09
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	84.00	84.00	1.57	6.93	155.49	436.17	174.47	111.58

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.11	2.00	1.83	7.20	6.58	0.214	0.855	9.36	2.34	33.70	15.40	22.46	5.61	80.89	36.95
2	22.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.11	2.00	1.83	7.20	6.58	0.214	0.855	9.36	2.34	33.70	15.40	22.46	5.61	80.89	36.95
3	24.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.11	2.00	1.83	7.20	6.58	0.214	0.855	9.36	2.34	33.70	15.40	22.46	5.61	80.89	36.95
4	25.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.11	2.00	1.83	7.20	6.58	0.214	0.855	9.36	2.34	33.70	15.40	22.46	5.61	80.89	36.95
5	27.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.11	2.00	1.83	7.20	6.58	0.214	0.855	9.36	2.34	33.70	15.40	22.46	5.61	80.89	36.95
6	28.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.11	2.00	1.83	7.20	6.58	0.214	0.855	9.36	2.34	33.70	15.40	22.46	5.61	80.89	36.95
7	30.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	1.12	2.00	1.83	7.12	6.50	0.206	0.824	9.71	2.43	34.55	15.79	23.30	5.83	82.92	37.90

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-06	-
Chainage	0+501	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	111.00	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.00	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-06	1.20	22.00	19.50	18.00	217.16	103.59	12.18	3.05
BH-06	1.20	23.50	21.00	19.50	179.06	113.97	12.18	3.05
BH-06	1.20	25.00	22.50	21.00	190.50	124.35	12.18	3.05
BH-06	1.20	26.50	24.00	22.50	202.25	134.73	12.18	3.05
BH-06	1.20	28.00	25.50	24.00	264.12	146.34	12.18	3.05
BH-06	1.20	29.50	27.00	25.50	276.79	157.95	12.18	3.05
BH-06	1.20	30.00	27.50	26.00	281.19	161.82	12.64	3.16

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (Ki)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.00	0.00	27	-	13.80	15.50	1.00	-	3.25	4.00	5.25	10.50	5.65	0.00	0.00	0.00	0.00	6.33
2	4.00	5.50	1.50	Granular	7.00	0.00	27	-	13.80	15.50	1.00	-	4.75	5.50	15.75	21.00	5.65	4.21	43.53	47.75	19.10	9.89
3	5.50	7.00	1.50	Granular	7.00	0.00	27	-	13.80	15.50	1.00	-	6.25	7.00	26.25	31.50	5.65	7.02	62.01	73.24	29.30	14.23
4	7.00	8.50	1.50	Granular	7.00	0.00	27	-	13.80	15.50	1.00	-	7.75	8.50	36.75	42.00	5.65	9.83	80.49	101.55	40.62	19.36
5	8.50	10.00	1.50	Granular	7.00	0.00	27	-	13.80	15.50	1.00	-	9.25	10.00	47.25	52.50	5.65	12.64	98.97	132.66	53.07	25.27
6	10.00	11.50	1.50	Granular	7.00	0.00	27	-	13.80	15.50	1.00	-	10.75	11.50	57.75	63.00	5.65	15.44	117.44	166.59	66.63	31.97
7	11.50	13.00	1.50	Granular	7.00	0.00	29	-	17.60	20.13	1.00	-	12.25	13.00	68.25	73.50	5.65	19.60	176.31	245.06	98.02	39.83
7	13.00	14.50	1.50	Granular	7.00	0.00	29	-	17.60	20.13	1.00	-	13.75	14.50	78.75	84.00	5.65	22.62	200.30	291.67	116.67	48.54
8	14.50	16.00	1.50	Granular	9.00	0.00	27	-	13.80	15.50	1.00	-	15.25	16.00	90.75	97.50	5.65	24.27	180.04	295.67	118.27	57.71
9	16.00	17.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	16.75	17.50	104.25	111.00	5.65	30.98	294.67	441.29	176.52	68.76
10	17.50	19.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	18.25	19.00	111.00	111.00	5.65	32.98	294.67	474.27	189.71	80.37
11	19.00	20.50	1.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	19.75	20.50	111.00	111.00	5.65	32.98	297.33	509.91	203.97	91.98
12	20.50	22.00	1.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	21.25	22.00	111.00	111.00	5.65	32.98	297.33	542.90	217.16	103.59
13	22.00	23.50	1.50	Granular	9.00	0.00	26	-	11.90	13.19	1.00	-	22.75	23.50	111.00	111.00	5.65	28.59	173.50	447.65	179.06	113.97
14	23.50	25.00	1.50	Granular	9.00	0.00	26	-	11.90	13.19	1.00	-	24.25	25.00	111.00	111.00	5.65	28.59	173.50	476.24	190.50	124.35
15	25.00	26.50	1.50	Granular	10.00	0.00	26	-	11.90	13.19	1.00	-	25.75	26.50	111.00	111.00	5.65	28.59	174.31	505.64	202.25	134.73
16	26.50	28.00	1.50	Granular	10.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	111.00	111.00	5.65	32.98	296.00	660.31	264.12	146.34
17	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	111.00	111.00	5.65	32.98	294.67	691.97	276.79	157.95
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	111.00	111.00	1.88	10.99	294.67	702.96	281.19	161.82

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.96	2.02	1.84	8.41	7.64	0.164	0.657	12.18	3.05	51.25	23.27	29.24	7.31	122.99	55.85
2	22.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.96	2.02	1.84	8.41	7.64	0.164	0.657	12.18	3.05	51.25	23.27	29.24	7.31	122.99	55.85
3	24.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.96	2.02	1.84	8.41	7.64	0.164	0.657	12.18	3.05	51.25	23.27	29.24	7.31	122.99	55.85
4	25.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.96	2.02	1.84	8.41	7.64	0.164	0.657	12.18	3.05	51.25	23.27	29.24	7.31	122.99	55.85
5	27.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.96	2.02	1.84	8.41	7.64	0.164	0.657	12.18	3.05	51.25	23.27	29.24	7.31	122.99	55.85
6	28.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.96	2.02	1.84	8.41	7.64	0.164	0.657	12.18	3.05	51.25	23.27	29.24	7.31	122.99	55.85
7	30.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.97	2.02	1.83	8.31	7.55	0.158	0.633	12.64	3.16	52.53	23.86	30.34	7.58	126.06	57.27

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-07	-
Chainage	0+622	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	84.00	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.00	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-07	1.00	22.00	19.50	18.00	109.73	57.46	8.25	2.06
BH-07	1.00	23.50	21.00	19.50	118.05	64.93	8.62	2.16
BH-07	1.00	25.00	22.50	21.00	126.64	72.41	8.62	2.16
BH-07	1.00	26.50	24.00	22.50	134.97	79.88	8.62	2.16
BH-07	1.00	28.00	25.50	24.00	143.75	87.36	8.99	2.25
BH-07	1.00	29.50	27.00	25.50	152.07	94.83	8.99	2.25
BH-07	1.00	30.00	27.50	26.00	154.84	97.32	8.99	2.25

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (Ki)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	3.25	4.00	5.25	10.50	4.71	0.00	0.00	0.00	0.00	4.40
2	4.00	5.50	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	4.75	5.50	15.75	21.00	4.71	2.60	8.92	11.52	4.61	6.78
3	5.50	7.00	1.50	Granular	7.00	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	26.25	31.50	4.71	5.63	36.04	44.27	17.71	10.00
4	7.00	8.50	1.50	Granular	7.00	0.00	26	-	11.90	13.19	1.00	-	7.75	8.50	36.75	42.00	4.71	7.89	46.96	63.08	25.23	13.86
5	8.50	10.00	1.50	Granular	7.00	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	47.25	52.50	4.71	10.14	57.87	84.13	33.65	18.35
6	10.00	11.50	1.50	Granular	7.00	0.00	23	-	6.00	8.68	1.00	-	10.75	11.50	57.75	63.00	4.71	10.96	44.78	82.00	32.80	23.07
7	11.50	13.00	1.50	Granular	7.00	0.00	23	-	6.00	8.68	1.00	-	12.25	13.00	68.25	73.50	4.71	12.96	51.97	102.15	40.86	28.35
7	13.00	14.50	1.50	Granular	7.00	0.00	23	-	6.00	8.68	1.00	-	13.75	14.50	78.75	84.00	4.71	0.00	59.15	109.33	43.73	29.99
8	14.50	16.00	1.50	Granular	7.00	0.00	23	-	6.00	8.68	1.00	-	15.25	16.00	84.00	84.00	4.71	0.00	59.15	109.33	43.73	31.64
9	16.00	17.50	1.50	Granular	8.90	0.00	23	-	6.00	8.68	1.00	-	16.75	17.50	84.00	84.00	4.71	15.95	59.60	125.73	50.29	37.76
10	17.50	19.00	1.50	Granular	8.90	0.00	23	-	6.00	8.68	1.00	-	18.25	19.00	84.00	84.00	4.71	15.95	59.60	141.68	56.67	43.87
11	19.00	20.50	1.50	Granular	8.90	0.00	23	-	6.00	8.68	1.00	-	19.75	20.50	84.00	84.00	4.71	15.95	59.60	157.63	63.05	49.99
12	20.50	22.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	21.25	22.00	84.00	84.00	4.71	20.80	155.49	274.32	109.73	57.46
13	22.00	23.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	84.00	84.00	4.71	20.80	155.49	295.12	118.05	64.93
14	23.50	25.00	1.50	Granular	9.90	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	84.00	84.00	4.71	20.80	156.19	316.61	126.64	72.41
15	25.00	26.50	1.50	Granular	9.90	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	84.00	84.00	4.71	20.80	156.19	337.41	134.97	79.88
16	26.50	28.00	1.50	Granular	11.40	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	84.00	84.00	4.71	20.80	157.34	359.37	143.75	87.36
17	28.00	29.50	1.50	Granular	11.40	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	84.00	84.00	4.71	20.80	157.34	380.17	152.07	94.83
18	29.50	30.00	0.50	Granular	11.40	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	84.00	84.00	1.57	6.93	157.34	387.10	154.84	97.32

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_e/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	14	2.96E+07	4.91E-02	1.98E+03	3.74	1.07	2.01	1.83	7.51	6.85	0.243	0.970	8.25	2.06	30.98	14.13	19.79	4.95	74.36	33.91
2	22.50	15	2.96E+07	4.91E-02	2.12E+03	3.69	1.08	2.01	1.83	7.40	6.76	0.232	0.928	8.62	2.16	31.92	14.57	20.70	5.17	76.62	34.96
3	24.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	1.08	2.01	1.83	7.40	6.76	0.232	0.928	8.62	2.16	31.92	14.57	20.70	5.17	76.62	34.96
4	25.50	15	2.96E+07	4.91E-02	2.12E+03	3.69	1.08	2.01	1.83	7.40	6.76	0.232	0.928	8.62	2.16	31.92	14.57	20.70	5.17	76.62	34.96
5	27.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	1.10	2.00	1.83	7.30	6.67	0.222	0.889	8.99	2.25	32.83	14.99	21.59	5.40	78.79	35.98
6	28.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	1.10	2.00	1.83	7.30	6.67	0.222	0.889	8.99	2.25	32.83	14.99	21.59	5.40	78.79	35.98
7	30.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	1.10	2.00	1.83	7.30	6.67	0.222	0.889	8.99	2.25	32.83	14.99	21.59	5.40	78.79	35.98

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-07	-
Chainage	0+622	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	107.85	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.00	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-07	1.20	22.00	19.50	18.00	180.44	80.88	10.74	2.69
BH-07	1.20	23.50	21.00	19.50	193.26	92.23	11.23	2.81
BH-07	1.20	25.00	22.50	21.00	206.56	103.58	11.23	2.81
BH-07	1.20	26.50	24.00	22.50	219.38	114.93	11.23	2.81
BH-07	1.20	28.00	25.50	24.00	232.99	126.28	11.71	2.93
BH-07	1.20	29.50	27.00	25.50	245.81	137.62	11.71	2.93
BH-07	1.20	30.00	27.50	26.00	250.09	141.41	11.71	2.93

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (Ki)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	3.25	4.00	5.25	10.50	5.65	0.00	0.00	0.00	0.00	6.33
2	4.00	5.50	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	4.75	5.50	15.75	21.00	5.65	3.12	12.85	15.97	6.39	9.58
3	5.50	7.00	1.50	Granular	7.00	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	26.25	31.50	5.65	6.76	52.84	62.72	25.09	13.85
4	7.00	8.50	1.50	Granular	7.00	0.00	26	-	11.90	13.19	1.00	-	7.75	8.50	36.75	42.00	5.65	9.46	68.56	87.91	35.16	18.88
5	8.50	10.00	1.50	Granular	7.00	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	47.25	52.50	5.65	12.17	84.28	115.80	46.32	24.66
6	10.00	11.50	1.50	Granular	7.00	0.00	23	-	6.00	8.68	1.00	-	10.75	11.50	57.75	63.00	5.65	13.16	64.96	109.63	43.85	30.72
7	11.50	13.00	1.50	Granular	7.00	0.00	23	-	6.00	8.68	1.00	-	12.25	13.00	68.25	73.50	5.65	15.55	75.31	135.53	54.21	37.44
7	13.00	14.50	1.50	Granular	7.00	0.00	23	-	6.00	8.68	1.00	-	13.75	14.50	78.75	84.00	5.65	0.00	85.66	145.88	58.35	39.82
8	14.50	16.00	1.50	Granular	7.00	0.00	23	-	6.00	8.68	1.00	-	15.25	16.00	89.25	94.50	5.65	0.00	96.01	156.22	62.49	42.19
9	16.00	17.50	1.50	Granular	8.90	0.00	23	-	6.00	8.68	1.00	-	16.75	17.50	101.18	107.85	5.65	23.05	109.94	193.21	77.28	51.02
10	17.50	19.00	1.50	Granular	8.90	0.00	23	-	6.00	8.68	1.00	-	18.25	19.00	107.85	107.85	5.65	24.57	109.94	217.78	87.11	60.28
11	19.00	20.50	1.50	Granular	8.90	0.00	23	-	6.00	8.68	1.00	-	19.75	20.50	107.85	107.85	5.65	24.57	109.94	242.35	96.94	69.53
12	20.50	22.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	21.25	22.00	107.85	107.85	5.65	32.05	286.65	451.11	180.44	80.88
13	22.00	23.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	107.85	107.85	5.65	32.05	286.65	483.15	193.26	92.23
14	23.50	25.00	1.50	Granular	9.90	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	107.85	107.85	5.65	32.05	287.85	516.40	206.56	103.58
15	25.00	26.50	1.50	Granular	9.90	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	107.85	107.85	5.65	32.05	287.85	548.45	219.38	114.93
16	26.50	28.00	1.50	Granular	11.40	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	107.85	107.85	5.65	32.05	289.84	582.49	232.99	126.28
17	28.00	29.50	1.50	Granular	11.40	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	107.85	107.85	5.65	32.05	289.84	614.53	245.81	137.62
18	29.50	30.00	0.50	Granular	11.40	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	107.85	107.85	1.88	10.68	289.84	625.22	250.09	141.41

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_t/T Ratio	L_t/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	14	2.96E+07	1.02E-01	1.98E+03	4.33	0.92	2.03	1.84	8.77	7.96	0.186	0.745	10.74	2.69	47.12	21.36	25.78	6.44	113.09	51.27
2	22.50	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.94	2.02	1.84	8.64	7.84	0.178	0.712	11.23	2.81	48.55	22.02	26.96	6.74	116.52	52.85
3	24.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.94	2.02	1.84	8.64	7.84	0.178	0.712	11.23	2.81	48.55	22.02	26.96	6.74	116.52	52.85
4	25.50	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.94	2.02	1.84	8.64	7.84	0.178	0.712	11.23	2.81	48.55	22.02	26.96	6.74	116.52	52.85
5	27.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.95	2.02	1.84	8.52	7.74	0.171	0.683	11.71	2.93	49.92	22.66	28.11	7.03	119.81	54.38
6	28.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.95	2.02	1.84	8.52	7.74	0.171	0.683	11.71	2.93	49.92	22.66	28.11	7.03	119.81	54.38
7	30.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.95	2.02	1.84	8.52	7.74	0.171	0.683	11.71	2.93	49.92	22.66	28.11	7.03	119.81	54.38

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-08	-
Chainage	0+701	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	88.50	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.00	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-08	1.00	22.00	19.50	18.00	58.65	54.72	9.36	2.34
BH-08	1.00	23.50	21.00	19.50	64.50	60.46	9.36	2.34
BH-08	1.00	25.00	22.50	21.00	109.58	67.84	9.36	2.34
BH-08	1.00	26.50	24.00	22.50	117.76	75.21	9.36	2.34
BH-08	1.00	28.00	25.50	24.00	125.94	82.59	9.71	2.43
BH-08	1.00	29.50	27.00	25.50	148.15	90.37	9.71	2.43
BH-08	1.00	30.00	27.50	26.00	151.07	92.97	9.71	2.43

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	3.25	4.00	5.25	10.50	4.71	0.00	0.00	0.00	0.00	4.40
2	4.00	5.50	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	4.75	5.50	15.75	21.00	4.71	2.60	8.92	11.52	4.61	6.78
3	5.50	7.00	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	6.25	7.00	26.25	31.50	4.71	4.33	13.38	20.32	8.13	9.64
4	7.00	8.50	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	7.75	8.50	36.75	42.00	4.71	6.07	17.84	30.84	12.34	12.99
5	8.50	10.00	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	9.25	10.00	47.25	52.50	4.71	7.80	22.30	43.11	17.24	16.82
6	10.00	11.50	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	10.75	11.50	57.75	63.00	4.71	9.53	26.77	57.10	22.84	21.14
7	11.50	13.00	1.50	Granular	8.50	0.00	20	-	0.00	5.39	1.00	-	12.25	13.00	69.38	75.75	4.71	11.45	32.18	73.97	29.59	25.99
7	13.00	14.50	1.50	Granular	8.50	0.00	27	-	13.80	15.50	1.00	-	13.75	14.50	82.13	88.50	4.71	18.30	112.78	172.87	69.15	32.77
8	14.50	16.00	1.50	Granular	8.50	0.00	27	-	13.80	15.50	1.00	-	15.25	16.00	88.50	88.50	4.71	19.72	112.78	192.59	77.04	39.94
9	16.00	17.50	1.50	Granular	8.50	0.00	27	-	13.80	15.50	1.00	-	16.75	17.50	88.50	88.50	4.71	0.00	112.78	192.59	77.04	41.59
10	17.50	19.00	1.50	Granular	9.00	0.00	20	-	0.00	5.39	1.00	-	18.25	19.00	88.50	88.50	4.71	0.00	37.60	117.41	46.97	43.24
11	19.00	20.50	1.50	Granular	9.00	0.00	20	-	0.00	5.39	1.00	-	19.75	20.50	88.50	88.50	4.71	14.61	37.60	132.02	52.81	48.98
12	20.50	22.00	1.50	Granular	9.00	0.00	20	-	0.00	5.39	1.00	-	21.25	22.00	88.50	88.50	4.71	14.61	37.60	146.63	58.65	54.72
13	22.00	23.50	1.50	Granular	9.00	0.00	20	-	0.00	5.39	1.00	-	22.75	23.50	88.50	88.50	4.71	14.61	37.60	161.24	64.50	60.46
14	23.50	25.00	1.50	Granular	9.00	0.00	28	-	15.70	17.82	1.00	-	24.25	25.00	88.50	88.50	4.71	20.45	129.85	273.95	109.58	67.84
15	25.00	26.50	1.50	Granular	9.00	0.00	28	-	15.70	17.82	1.00	-	25.75	26.50	88.50	88.50	4.71	20.45	129.85	294.40	117.76	75.21
16	26.50	28.00	1.50	Granular	9.00	0.00	28	-	15.70	17.82	1.00	-	27.25	28.00	88.50	88.50	4.71	20.45	129.85	314.86	125.94	82.59
17	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	88.50	88.50	4.71	21.92	163.45	370.37	148.15	90.37
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	88.50	88.50	1.57	7.31	163.45	377.68	151.07	92.97

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.11	2.00	1.83	7.20	6.58	0.214	0.855	9.36	2.34	33.70	15.40	22.46	5.61	80.89	36.95
2	22.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.11	2.00	1.83	7.20	6.58	0.214	0.855	9.36	2.34	33.70	15.40	22.46	5.61	80.89	36.95
3	24.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.11	2.00	1.83	7.20	6.58	0.214	0.855	9.36	2.34	33.70	15.40	22.46	5.61	80.89	36.95
4	25.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.11	2.00	1.83	7.20	6.58	0.214	0.855	9.36	2.34	33.70	15.40	22.46	5.61	80.89	36.95
5	27.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	1.12	2.00	1.83	7.12	6.50	0.206	0.824	9.71	2.43	34.55	15.79	23.30	5.83	82.92	37.90
6	28.50	18	2.96E+07	4.91E-02	2.55E+03	3.56	1.12	2.00	1.83	7.12	6.50	0.206	0.824	9.71	2.43	34.55	15.79	23.30	5.83	82.92	37.90
7	30.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	1.12	2.00	1.83	7.12	6.50	0.206	0.824	9.71	2.43	34.55	15.79	23.30	5.83	82.92	37.90

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-08	-
Chainage	0+701	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	114.00	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.00	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-08	1.20	22.00	19.50	18.00	80.05	71.34	12.18	3.05
BH-08	1.20	23.50	21.00	19.50	89.08	80.04	12.18	3.05
BH-08	1.20	25.00	22.50	21.00	169.89	91.27	12.18	3.05
BH-08	1.20	26.50	24.00	22.50	182.54	102.49	12.18	3.05
BH-08	1.20	28.00	25.50	24.00	195.19	113.72	12.64	3.16
BH-08	1.20	29.50	27.00	25.50	233.60	125.58	12.64	3.16
BH-08	1.20	30.00	27.50	26.00	238.12	129.54	12.64	3.16

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (Ki)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	3.25	4.00	5.25	10.50	5.65	0.00	0.00	0.00	0.00	6.33
2	4.00	5.50	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	4.75	5.50	15.75	21.00	5.65	3.12	12.85	15.97	6.39	9.58
3	5.50	7.00	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	6.25	7.00	26.25	31.50	5.65	5.20	19.27	27.59	11.04	13.41
4	7.00	8.50	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	7.75	8.50	36.75	42.00	5.65	7.28	25.70	41.30	16.52	17.83
5	8.50	10.00	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	9.25	10.00	47.25	52.50	5.65	9.36	32.12	57.08	22.83	22.82
6	10.00	11.50	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	10.75	11.50	57.75	63.00	5.65	11.44	38.54	74.94	29.98	28.40
7	11.50	13.00	1.50	Granular	8.50	0.00	20	-	0.00	5.39	1.00	-	12.25	13.00	69.38	75.75	5.65	13.74	46.34	96.49	38.60	34.62
7	13.00	14.50	1.50	Granular	8.50	0.00	20	-	0.00	5.39	1.00	-	13.75	14.50	82.13	88.50	5.65	16.27	54.14	120.56	48.22	41.55
8	14.50	16.00	1.50	Granular	8.50	0.00	20	-	0.00	5.39	1.00	-	15.25	16.00	94.88	101.25	5.65	18.79	61.94	147.15	58.86	49.19
9	16.00	17.50	1.50	Granular	8.50	0.00	20	-	0.00	5.39	1.00	-	16.75	17.50	107.63	114.00	5.65	0.00	69.74	154.95	61.98	51.57
10	17.50	19.00	1.50	Granular	9.00	0.00	20	-	0.00	5.39	1.00	-	18.25	19.00	114.00	114.00	5.65	0.00	69.74	154.95	61.98	53.94
11	19.00	20.50	1.50	Granular	9.00	0.00	20	-	0.00	5.39	1.00	-	19.75	20.50	114.00	114.00	5.65	22.58	69.74	177.54	71.01	62.64
12	20.50	22.00	1.50	Granular	9.00	0.00	20	-	0.00	5.39	1.00	-	21.25	22.00	114.00	114.00	5.65	22.58	69.74	200.12	80.05	71.34
13	22.00	23.50	1.50	Granular	9.00	0.00	20	-	0.00	5.39	1.00	-	22.75	23.50	114.00	114.00	5.65	22.58	69.74	222.70	89.08	80.04
14	23.50	25.00	1.50	Granular	9.00	0.00	28	-	15.70	17.82	1.00	-	24.25	25.00	114.00	114.00	5.65	31.62	240.15	424.73	169.89	91.27
15	25.00	26.50	1.50	Granular	9.00	0.00	28	-	15.70	17.82	1.00	-	25.75	26.50	114.00	114.00	5.65	31.62	240.15	456.35	182.54	102.49
16	26.50	28.00	1.50	Granular	9.00	0.00	28	-	15.70	17.82	1.00	-	27.25	28.00	114.00	114.00	5.65	31.62	240.15	487.96	195.19	113.72
17	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	114.00	114.00	5.65	33.88	302.31	584.00	233.60	125.58
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	114.00	114.00	1.88	11.29	302.31	595.29	238.12	129.54

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.96	2.02	1.84	8.41	7.64	0.164	0.657	12.18	3.05	51.25	23.27	29.24	7.31	122.99	55.85
2	22.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.96	2.02	1.84	8.41	7.64	0.164	0.657	12.18	3.05	51.25	23.27	29.24	7.31	122.99	55.85
3	24.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.96	2.02	1.84	8.41	7.64	0.164	0.657	12.18	3.05	51.25	23.27	29.24	7.31	122.99	55.85
4	25.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.96	2.02	1.84	8.41	7.64	0.164	0.657	12.18	3.05	51.25	23.27	29.24	7.31	122.99	55.85
5	27.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.97	2.02	1.83	8.31	7.55	0.158	0.633	12.64	3.16	52.53	23.86	30.34	7.58	126.06	57.27
6	28.50	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.97	2.02	1.83	8.31	7.55	0.158	0.633	12.64	3.16	52.53	23.86	30.34	7.58	126.06	57.27
7	30.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.97	2.02	1.83	8.31	7.55	0.158	0.633	12.64	3.16	52.53	23.86	30.34	7.58	126.06	57.27

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-08A	-
Chainage	0+734	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	90.90	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.00	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-08A	1.00	22.00	19.50	18.00	79.54	64.22	10.40	2.60
BH-08A	1.00	23.50	21.00	19.50	86.14	70.49	10.40	2.60
BH-08A	1.00	25.00	22.50	21.00	140.06	78.45	10.40	2.60
BH-08A	1.00	26.50	24.00	22.50	149.06	86.40	10.73	2.68
BH-08A	1.00	28.00	25.50	24.00	158.07	94.35	11.06	2.77
BH-08A	1.00	29.50	27.00	25.50	167.07	102.30	11.06	2.77
BH-08A	1.00	30.00	27.50	26.00	170.07	104.95	11.38	2.85

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	3.25	4.00	5.25	10.50	4.71	0.00	0.00	0.00	0.00	4.40
2	4.00	5.50	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	4.75	5.50	15.75	21.00	4.71	3.12	18.40	21.52	8.61	6.92
3	5.50	7.00	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	6.25	7.00	26.25	31.50	4.71	5.20	26.49	34.82	13.93	10.03
4	7.00	8.50	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	7.75	8.50	36.75	42.00	4.71	0.00	34.59	42.91	17.16	11.68
5	8.50	10.00	1.50	Granular	7.70	0.00	24	-	8.00	9.78	1.00	-	9.25	10.00	47.78	53.55	4.71	9.46	43.72	61.50	24.60	15.98
6	10.00	11.50	1.50	Granular	7.70	0.00	24	-	8.00	9.78	1.00	-	10.75	11.50	59.33	65.10	4.71	11.75	52.62	82.16	32.86	20.92
7	11.50	13.00	1.50	Granular	8.60	0.00	24	-	8.00	9.78	1.00	-	12.25	13.00	71.55	78.00	4.71	14.17	62.85	106.56	42.63	26.53
7	13.00	14.50	1.50	Granular	8.60	0.00	24	-	8.00	9.78	1.00	-	13.75	14.50	84.45	90.90	4.71	16.73	72.80	133.24	53.30	32.87
8	14.50	16.00	1.50	Granular	8.60	0.00	22	-	4.00	7.59	1.00	-	15.25	16.00	90.90	90.90	4.71	16.51	55.71	132.66	53.06	39.14
9	16.00	17.50	1.50	Granular	8.60	0.00	22	-	4.00	7.59	1.00	-	16.75	17.50	90.90	90.90	4.71	16.51	55.71	149.16	59.67	45.41
10	17.50	19.00	1.50	Granular	8.60	0.00	22	-	4.00	7.59	1.00	-	18.25	19.00	90.90	90.90	4.71	16.51	55.71	165.67	66.27	51.68
11	19.00	20.50	1.50	Granular	8.60	0.00	22	-	4.00	7.59	1.00	-	19.75	20.50	90.90	90.90	4.71	16.51	55.71	182.18	72.87	57.95
12	20.50	22.00	1.50	Granular	9.60	0.00	22	-	4.00	7.59	1.00	-	21.25	22.00	90.90	90.90	4.71	16.51	55.87	198.84	79.54	64.22
13	22.00	23.50	1.50	Granular	9.60	0.00	22	-	4.00	7.59	1.00	-	22.75	23.50	90.90	90.90	4.71	16.51	55.87	215.35	86.14	70.49
14	23.50	25.00	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	90.90	90.90	4.71	22.51	168.16	350.15	140.06	78.45
15	25.00	26.50	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	90.90	90.90	4.71	22.51	168.16	372.66	149.06	86.40
16	26.50	28.00	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	90.90	90.90	4.71	22.51	168.16	395.17	158.07	94.35
17	28.00	29.50	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	90.90	90.90	4.71	22.51	168.16	417.68	167.07	102.30
18	29.50	30.00	0.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	90.90	90.90	1.57	7.50	168.16	425.18	170.07	104.95

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	1.15	2.00	1.83	6.96	6.36	0.192	0.769	10.40	2.60	36.16	16.54	24.95	6.24	86.78	39.70
2	22.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	1.15	2.00	1.83	6.96	6.36	0.192	0.769	10.40	2.60	36.16	16.54	24.95	6.24	86.78	39.70
3	24.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	1.15	2.00	1.83	6.96	6.36	0.192	0.769	10.40	2.60	36.16	16.54	24.95	6.24	86.78	39.70
4	25.50	21	2.96E+07	4.91E-02	2.98E+03	3.45	1.16	2.00	1.83	6.88	6.30	0.186	0.745	10.73	2.68	36.93	16.90	25.76	6.44	88.63	40.57
5	27.00	22	2.96E+07	4.91E-02	3.13E+03	3.41	1.17	2.00	1.83	6.81	6.24	0.181	0.723	11.06	2.77	37.68	17.25	26.54	6.64	90.43	41.41
6	28.50	22	2.96E+07	4.91E-02	3.13E+03	3.41	1.17	2.00	1.83	6.81	6.24	0.181	0.723	11.06	2.77	37.68	17.25	26.54	6.64	90.43	41.41
7	30.00	23	2.96E+07	4.91E-02	3.27E+03	3.38	1.18	1.99	1.83	6.75	6.18	0.176	0.703	11.38	2.85	38.41	17.59	27.32	6.83	92.19	42.23

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-08A	-
Chainage	0+734	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	116.70	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.00	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-08A	1.20	22.00	19.50	18.00	118.86	89.17	13.53	3.38
BH-08A	1.20	23.50	21.00	19.50	129.04	98.67	13.53	3.38
BH-08A	1.20	25.00	22.50	21.00	225.66	110.75	13.53	3.38
BH-08A	1.20	26.50	24.00	22.50	239.53	122.84	13.97	3.49
BH-08A	1.20	28.00	25.50	24.00	253.40	134.92	14.39	3.60
BH-08A	1.20	29.50	27.00	25.50	267.28	147.01	14.39	3.60
BH-08A	1.20	30.00	27.50	26.00	271.90	151.03	14.81	3.70

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_s)	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	3.25	4.00	5.25	10.50	5.65	0.00	0.00	0.00	0.00	6.33
2	4.00	5.50	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	4.75	5.50	15.75	21.00	5.65	3.74	27.13	30.87	12.35	9.76
3	5.50	7.00	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	6.25	7.00	26.25	31.50	5.65	6.24	38.79	48.77	19.51	13.88
4	7.00	8.50	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	7.75	8.50	36.75	42.00	5.65	0.00	50.45	60.43	24.17	16.25
5	8.50	10.00	1.50	Granular	7.70	0.00	24	-	8.00	9.78	1.00	-	9.25	10.00	47.78	53.55	5.65	11.36	63.65	84.99	34.00	21.81
6	10.00	11.50	1.50	Granular	7.70	0.00	24	-	8.00	9.78	1.00	-	10.75	11.50	59.33	65.10	5.65	14.10	76.48	111.92	44.77	28.13
7	11.50	13.00	1.50	Granular	8.60	0.00	24	-	8.00	9.78	1.00	-	12.25	13.00	71.55	78.00	5.65	17.01	91.29	143.74	57.50	35.27
7	13.00	14.50	1.50	Granular	8.60	0.00	24	-	8.00	9.78	1.00	-	13.75	14.50	84.45	90.90	5.65	20.08	105.61	178.14	71.26	43.27
8	14.50	16.00	1.50	Granular	8.60	0.00	22	-	4.00	7.59	1.00	-	15.25	16.00	97.35	103.80	5.65	21.21	91.72	185.46	74.18	51.58
9	16.00	17.50	1.50	Granular	8.60	0.00	22	-	4.00	7.59	1.00	-	16.75	17.50	110.25	116.70	5.65	24.02	102.83	220.59	88.24	60.68
10	17.50	19.00	1.50	Granular	8.60	0.00	22	-	4.00	7.59	1.00	-	18.25	19.00	116.70	116.70	5.65	25.43	102.83	246.03	98.41	70.18
11	19.00	20.50	1.50	Granular	8.60	0.00	22	-	4.00	7.59	1.00	-	19.75	20.50	116.70	116.70	5.65	25.43	102.83	271.46	108.58	79.68
12	20.50	22.00	1.50	Granular	9.60	0.00	22	-	4.00	7.59	1.00	-	21.25	22.00	116.70	116.70	5.65	25.43	103.10	297.16	118.86	89.17
13	22.00	23.50	1.50	Granular	9.60	0.00	22	-	4.00	7.59	1.00	-	22.75	23.50	116.70	116.70	5.65	25.43	103.10	322.59	129.04	98.67
14	23.50	25.00	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	116.70	116.70	5.65	34.68	309.99	564.16	225.66	110.75
15	25.00	26.50	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	116.70	116.70	5.65	34.68	309.99	598.83	239.53	122.84
16	26.50	28.00	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	116.70	116.70	5.65	34.68	309.99	633.51	253.40	134.92
17	28.00	29.50	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	116.70	116.70	5.65	34.68	309.99	668.19	267.28	147.01
18	29.50	30.00	0.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	116.70	116.70	1.88	11.56	309.99	679.75	271.90	151.03

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.99	2.02	1.83	8.12	7.39	0.148	0.591	13.53	3.38	54.97	24.99	32.48	8.12	131.92	59.98
2	22.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.99	2.02	1.83	8.12	7.39	0.148	0.591	13.53	3.38	54.97	24.99	32.48	8.12	131.92	59.98
3	24.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.99	2.02	1.83	8.12	7.39	0.148	0.591	13.53	3.38	54.97	24.99	32.48	8.12	131.92	59.98
4	25.50	21	2.96E+07	1.02E-01	2.98E+03	3.99	1.00	2.02	1.83	8.04	7.31	0.143	0.573	13.97	3.49	56.14	25.53	33.52	8.38	134.73	61.28
5	27.00	22	2.96E+07	1.02E-01	3.13E+03	3.95	1.01	2.01	1.83	7.96	7.24	0.139	0.556	14.39	3.60	57.27	26.06	34.54	8.64	137.45	62.55
6	28.50	22	2.96E+07	1.02E-01	3.13E+03	3.95	1.01	2.01	1.83	7.96	7.24	0.139	0.556	14.39	3.60	57.27	26.06	34.54	8.64	137.45	62.55
7	30.00	23	2.96E+07	1.02E-01	3.27E+03	3.92	1.02	2.01	1.83	7.88	7.18	0.135	0.540	14.81	3.70	58.38	26.57	35.55	8.89	140.11	63.78

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-08B	-
Chainage	0+847	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	101.10	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.00	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-08B	1.00	22.00	19.50	18.00	110.45	70.70	8.62	2.16
BH-08B	1.00	23.50	21.00	19.50	119.13	78.43	8.99	2.25
BH-08B	1.00	25.00	22.50	21.00	159.87	87.09	8.99	2.25
BH-08B	1.00	26.50	24.00	22.50	169.88	95.75	9.36	2.34
BH-08B	1.00	28.00	25.50	24.00	179.90	104.41	9.36	2.34
BH-08B	1.00	29.50	27.00	25.50	189.91	113.07	9.71	2.43
BH-08B	1.00	30.00	27.50	26.00	193.25	115.95	9.71	2.43

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.00	0.00	23	-	6.00	8.68	1.00	-	3.25	4.00	5.25	10.50	4.71	0.00	0.00	0.00	0.00	4.40
2	4.00	5.50	1.50	Granular	7.00	0.00	23	-	6.00	8.68	1.00	-	4.75	5.50	15.75	21.00	4.71	2.99	16.03	19.02	7.61	6.88
3	5.50	7.00	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	6.25	7.00	26.25	31.50	4.71	5.20	26.49	34.69	13.87	9.99
4	7.00	8.50	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	7.75	8.50	36.75	42.00	4.71	0.00	34.59	42.78	17.11	11.64
5	8.50	10.00	1.50	Granular	7.00	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	47.25	52.50	4.71	0.00	57.87	66.06	26.43	13.29
6	10.00	11.50	1.50	Granular	10.80	0.00	26	-	11.90	13.19	1.00	-	10.75	11.50	60.60	68.70	4.71	13.01	76.50	97.70	39.08	18.58
7	11.50	13.00	1.50	Granular	10.80	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	76.80	84.90	4.71	16.48	93.35	131.02	52.41	24.84
7	13.00	14.50	1.50	Granular	10.80	0.00	26	-	11.90	13.19	1.00	-	13.75	14.50	93.00	101.10	4.71	19.96	110.19	167.83	67.13	32.08
8	14.50	16.00	1.50	Granular	11.50	0.00	26	-	11.90	13.19	1.00	-	15.25	16.00	101.10	101.10	4.71	21.70	110.52	189.85	75.94	39.81
9	16.00	17.50	1.50	Granular	11.50	0.00	26	-	11.90	13.19	1.00	-	16.75	17.50	101.10	101.10	4.71	21.70	110.52	211.55	84.62	47.53
10	17.50	19.00	1.50	Granular	11.50	0.00	26	-	11.90	13.19	1.00	-	18.25	19.00	101.10	101.10	4.71	21.70	110.52	233.25	93.30	55.26
11	19.00	20.50	1.50	Granular	11.50	0.00	26	-	11.90	13.19	1.00	-	19.75	20.50	101.10	101.10	4.71	21.70	110.52	254.95	101.98	62.98
12	20.50	22.00	1.50	Granular	10.40	0.00	26	-	11.90	13.19	1.00	-	21.25	22.00	101.10	101.10	4.71	21.70	110.00	276.13	110.45	70.70
13	22.00	23.50	1.50	Granular	10.40	0.00	26	-	11.90	13.19	1.00	-	22.75	23.50	101.10	101.10	4.71	21.70	110.00	297.82	119.13	78.43
14	23.50	25.00	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	101.10	101.10	4.71	25.04	186.82	399.67	159.87	87.09
15	25.00	26.50	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	101.10	101.10	4.71	25.04	186.82	424.71	169.88	95.75
16	26.50	28.00	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	101.10	101.10	4.71	25.04	186.82	449.74	179.90	104.41
17	28.00	29.50	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	101.10	101.10	4.71	25.04	186.82	474.78	189.91	113.07
18	29.50	30.00	0.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	101.10	101.10	1.57	8.35	186.82	483.12	193.25	115.95

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_t/T Ratio	L_t/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	1.08	2.01	1.83	7.40	6.76	0.232	0.928	8.62	2.16	31.92	14.57	20.70	5.17	76.62	34.96
2	22.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	1.10	2.00	1.83	7.30	6.67	0.222	0.889	8.99	2.25	32.83	14.99	21.59	5.40	78.79	35.98
3	24.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	1.10	2.00	1.83	7.30	6.67	0.222	0.889	8.99	2.25	32.83	14.99	21.59	5.40	78.79	35.98
4	25.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.11	2.00	1.83	7.20	6.58	0.214	0.855	9.36	2.34	33.70	15.40	22.46	5.61	80.89	36.95
5	27.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.11	2.00	1.83	7.20	6.58	0.214	0.855	9.36	2.34	33.70	15.40	22.46	5.61	80.89	36.95
6	28.50	18	2.96E+07	4.91E-02	2.55E+03	3.56	1.12	2.00	1.83	7.12	6.50	0.206	0.824	9.71	2.43	34.55	15.79	23.30	5.83	82.92	37.90
7	30.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	1.12	2.00	1.83	7.12	6.50	0.206	0.824	9.71	2.43	34.55	15.79	23.30	5.83	82.92	37.90

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-08B	-
Chainage	0+847	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	135.60	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.00	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-08B	1.20	22.00	19.50	18.00	178.54	100.60	11.23	2.81
BH-08B	1.20	23.50	21.00	19.50	192.51	112.76	11.71	2.93
BH-08B	1.20	25.00	22.50	21.00	267.72	126.41	11.71	2.93
BH-08B	1.20	26.50	24.00	22.50	283.83	140.07	12.18	3.05
BH-08B	1.20	28.00	25.50	24.00	299.95	153.73	12.18	3.05
BH-08B	1.20	29.50	27.00	25.50	316.07	167.38	12.64	3.16
BH-08B	1.20	30.00	27.50	26.00	321.44	171.94	12.64	3.16

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.00	0.00	23	-	6.00	8.68	1.00	-	3.25	4.00	5.25	10.50	5.65	0.00	0.00	0.00	0.00	6.33
2	4.00	5.50	1.50	Granular	7.00	0.00	23	-	6.00	8.68	1.00	-	4.75	5.50	15.75	21.00	5.65	3.59	23.56	27.15	10.86	9.71
3	5.50	7.00	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	6.25	7.00	26.25	31.50	5.65	6.24	38.79	48.62	19.45	13.84
4	7.00	8.50	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	7.75	8.50	36.75	42.00	5.65	0.00	50.45	60.27	24.11	16.21
5	8.50	10.00	1.50	Granular	7.00	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	47.25	52.50	5.65	0.00	84.28	94.11	37.64	18.59
6	10.00	11.50	1.50	Granular	10.80	0.00	26	-	11.90	13.19	1.00	-	10.75	11.50	60.60	68.70	5.65	15.61	111.62	137.06	54.82	25.33
7	11.50	13.00	1.50	Granular	10.80	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	76.80	84.90	5.65	19.78	135.88	181.09	72.44	33.24
7	13.00	14.50	1.50	Granular	10.80	0.00	26	-	11.90	13.19	1.00	-	13.75	14.50	93.00	101.10	5.65	23.95	160.13	229.30	91.72	42.32
8	14.50	16.00	1.50	Granular	11.50	0.00	26	-	11.90	13.19	1.00	-	15.25	16.00	109.73	118.35	5.65	28.26	186.53	283.95	113.58	52.61
9	16.00	17.50	1.50	Granular	11.50	0.00	26	-	11.90	13.19	1.00	-	16.75	17.50	126.98	135.60	5.65	32.70	212.36	342.48	136.99	64.14
10	17.50	19.00	1.50	Granular	11.50	0.00	26	-	11.90	13.19	1.00	-	18.25	19.00	135.60	135.60	5.65	34.92	212.36	377.40	150.96	76.30
11	19.00	20.50	1.50	Granular	11.50	0.00	26	-	11.90	13.19	1.00	-	19.75	20.50	135.60	135.60	5.65	34.92	212.36	412.33	164.93	88.45
12	20.50	22.00	1.50	Granular	10.40	0.00	26	-	11.90	13.19	1.00	-	21.25	22.00	135.60	135.60	5.65	34.92	211.47	446.36	178.54	100.60
13	22.00	23.50	1.50	Granular	10.40	0.00	26	-	11.90	13.19	1.00	-	22.75	23.50	135.60	135.60	5.65	34.92	211.47	481.28	192.51	112.76
14	23.50	25.00	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	135.60	135.60	5.65	40.29	359.19	669.29	267.72	126.41
15	25.00	26.50	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	135.60	135.60	5.65	40.29	359.19	709.59	283.83	140.07
16	26.50	28.00	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	135.60	135.60	5.65	40.29	359.19	749.88	299.95	153.73
17	28.00	29.50	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	135.60	135.60	5.65	40.29	359.19	790.17	316.07	167.38
18	29.50	30.00	0.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	135.60	135.60	1.88	13.43	359.19	803.61	321.44	171.94

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.94	2.02	1.84	8.64	7.84	0.178	0.712	11.23	2.81	48.55	22.02	26.96	6.74	116.52	52.85
2	22.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.95	2.02	1.84	8.52	7.74	0.171	0.683	11.71	2.93	49.92	22.66	28.11	7.03	119.81	54.38
3	24.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.95	2.02	1.84	8.52	7.74	0.171	0.683	11.71	2.93	49.92	22.66	28.11	7.03	119.81	54.38
4	25.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.96	2.02	1.84	8.41	7.64	0.164	0.657	12.18	3.05	51.25	23.27	29.24	7.31	122.99	55.85
5	27.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.96	2.02	1.84	8.41	7.64	0.164	0.657	12.18	3.05	51.25	23.27	29.24	7.31	122.99	55.85
6	28.50	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.97	2.02	1.83	8.31	7.55	0.158	0.633	12.64	3.16	52.53	23.86	30.34	7.58	126.06	57.27
7	30.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.97	2.02	1.83	8.31	7.55	0.158	0.633	12.64	3.16	52.53	23.86	30.34	7.58	126.06	57.27

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-09	-
Chainage	0+802	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	84.00	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-09	1.00	22.00	19.50	19.50	75.70	60.59	7.60	1.90
BH-09	1.00	23.50	21.00	21.00	82.08	66.71	7.60	1.90
BH-09	1.00	25.00	22.50	22.50	88.42	72.82	7.60	1.90
BH-09	1.00	26.50	24.00	24.00	84.58	78.35	7.60	1.90
BH-09	1.00	28.00	25.50	25.50	90.13	83.89	7.60	1.90
BH-09	1.00	29.50	27.00	27.00	146.53	91.36	7.95	1.99
BH-09	1.00	30.00	27.50	27.50	149.30	93.85	7.95	1.99

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (Ki)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	3.25	4.00	5.25	10.50	4.71	0.87	4.46	5.33	2.13	4.64
2	4.00	5.50	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	4.75	5.50	15.75	21.00	4.71	2.60	8.92	12.39	4.96	7.02
3	5.50	7.00	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	6.25	7.00	26.25	31.50	4.71	0.00	26.49	29.96	11.98	8.67
4	7.00	8.50	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	7.75	8.50	36.75	42.00	4.71	7.28	34.59	45.34	18.14	12.36
5	8.50	10.00	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	9.25	10.00	47.25	52.50	4.71	7.80	22.30	40.85	16.34	16.19
6	10.00	11.50	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	10.75	11.50	57.75	63.00	4.71	9.53	26.77	54.85	21.94	20.51
7	11.50	13.00	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	12.25	13.00	68.25	73.50	4.71	11.27	31.23	70.57	28.23	25.31
7	13.00	14.50	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	13.75	14.50	78.75	84.00	4.71	13.00	35.69	88.04	35.21	30.60
8	14.50	16.00	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	15.25	16.00	84.00	84.00	4.71	13.87	35.69	101.90	40.76	36.13
9	16.00	17.50	1.50	Granular	7.00	0.00	23	-	6.00	8.68	1.00	-	16.75	17.50	84.00	84.00	4.71	15.95	59.15	141.32	56.53	42.25
10	17.50	19.00	1.50	Granular	7.00	0.00	23	-	6.00	8.68	1.00	-	18.25	19.00	84.00	84.00	4.71	15.95	59.15	157.26	62.91	48.36
11	19.00	20.50	1.50	Granular	7.00	0.00	23	-	6.00	8.68	1.00	-	19.75	20.50	84.00	84.00	4.71	15.95	59.15	173.21	69.28	54.48
12	20.50	22.00	1.50	Granular	7.35	0.00	23	-	6.00	8.68	1.00	-	21.25	22.00	84.00	84.00	4.71	15.95	59.24	189.24	75.70	60.59
13	22.00	23.50	1.50	Granular	7.35	0.00	23	-	6.00	8.68	1.00	-	22.75	23.50	84.00	84.00	4.71	15.95	59.24	205.19	82.08	66.71
14	23.50	25.00	1.50	Granular	7.00	0.00	23	-	6.00	8.68	1.00	-	24.25	25.00	84.00	84.00	4.71	15.95	59.15	221.05	88.42	72.82
15	25.00	26.50	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	25.75	26.50	84.00	84.00	4.71	13.87	35.69	211.45	84.58	78.35
16	26.50	28.00	1.50	Granular	9.50	0.00	20	-	0.00	5.39	1.00	-	27.25	28.00	84.00	84.00	4.71	13.87	35.69	225.32	90.13	83.89
17	28.00	29.50	1.50	Granular	9.50	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	84.00	84.00	4.71	20.80	155.88	366.31	146.53	91.36
18	29.50	30.00	0.50	Granular	9.50	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	84.00	84.00	1.57	6.93	155.88	373.25	149.30	93.85

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	14	2.96E+07	4.91E-02	1.98E+03	3.74	0.67	2.06	1.85	7.72	6.92	0.263	1.052	7.60	1.90	29.35	13.15	18.24	4.56	70.43	31.55
2	22.50	14	2.96E+07	4.91E-02	1.98E+03	3.74	0.67	2.06	1.85	7.72	6.92	0.263	1.052	7.60	1.90	29.35	13.15	18.24	4.56	70.43	31.55
3	24.00	14	2.96E+07	4.91E-02	1.98E+03	3.74	0.67	2.06	1.85	7.72	6.92	0.263	1.052	7.60	1.90	29.35	13.15	18.24	4.56	70.43	31.55
4	25.50	14	2.96E+07	4.91E-02	1.98E+03	3.74	0.67	2.06	1.85	7.72	6.92	0.263	1.052	7.60	1.90	29.35	13.15	18.24	4.56	70.43	31.55
5	27.00	14	2.96E+07	4.91E-02	1.98E+03	3.74	0.67	2.06	1.85	7.72	6.92	0.263	1.052	7.60	1.90	29.35	13.15	18.24	4.56	70.43	31.55
6	28.50	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.68	2.06	1.85	7.61	6.82	0.252	1.007	7.95	1.99	30.23	13.55	19.07	4.77	72.55	32.51
7	30.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.68	2.06	1.85	7.61	6.82	0.252	1.007	7.95	1.99	30.23	13.55	19.07	4.77	72.55	32.51

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-09	-
Chainage	0+802	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	105.00	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-09	1.20	22.00	19.50	19.50	112.59	83.83	9.97	2.49
BH-09	1.20	23.50	21.00	21.00	122.16	92.90	9.97	2.49
BH-09	1.20	25.00	22.50	22.50	131.67	101.98	9.97	2.49
BH-09	1.20	26.50	24.00	24.00	123.15	110.18	9.97	2.49
BH-09	1.20	28.00	25.50	25.50	131.47	118.37	9.97	2.49
BH-09	1.20	29.50	27.00	27.00	230.27	129.49	10.42	2.60
BH-09	1.20	30.00	27.50	27.50	234.43	133.19	10.42	2.60

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (Ki)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	3.25	4.00	5.25	10.50	5.65	1.04	6.42	7.46	2.99	6.62
2	4.00	5.50	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	4.75	5.50	15.75	21.00	5.65	3.12	12.85	17.01	6.80	9.87
3	5.50	7.00	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	6.25	7.00	26.25	31.50	5.65	0.00	38.79	42.95	17.18	12.25
4	7.00	8.50	1.50	Granular	7.00	0.00	24	-	8.00	9.78	1.00	-	7.75	8.50	36.75	42.00	5.65	8.74	50.45	63.34	25.34	17.07
5	8.50	10.00	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	9.25	10.00	47.25	52.50	5.65	9.36	32.12	54.38	21.75	22.07
6	10.00	11.50	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	10.75	11.50	57.75	63.00	5.65	11.44	38.54	72.24	28.90	27.64
7	11.50	13.00	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	12.25	13.00	68.25	73.50	5.65	13.52	44.97	92.18	36.87	33.80
7	13.00	14.50	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	13.75	14.50	78.75	84.00	5.65	15.60	51.39	114.21	45.68	40.55
8	14.50	16.00	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	15.25	16.00	89.25	94.50	5.65	17.68	57.81	138.31	55.33	47.87
9	16.00	17.50	1.50	Granular	7.00	0.00	23	-	6.00	8.68	1.00	-	16.75	17.50	99.75	105.00	5.65	22.72	106.36	209.58	83.83	56.61
10	17.50	19.00	1.50	Granular	7.00	0.00	23	-	6.00	8.68	1.00	-	18.25	19.00	105.00	105.00	5.65	23.92	106.36	233.50	93.40	65.68
11	19.00	20.50	1.50	Granular	7.00	0.00	23	-	6.00	8.68	1.00	-	19.75	20.50	105.00	105.00	5.65	23.92	106.36	257.42	102.97	74.76
12	20.50	22.00	1.50	Granular	7.35	0.00	23	-	6.00	8.68	1.00	-	21.25	22.00	105.00	105.00	5.65	23.92	106.50	281.49	112.59	83.83
13	22.00	23.50	1.50	Granular	7.35	0.00	23	-	6.00	8.68	1.00	-	22.75	23.50	105.00	105.00	5.65	23.92	106.50	305.41	122.16	92.90
14	23.50	25.00	1.50	Granular	7.00	0.00	23	-	6.00	8.68	1.00	-	24.25	25.00	105.00	105.00	5.65	23.92	106.36	329.18	131.67	101.98
15	25.00	26.50	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	25.75	26.50	105.00	105.00	5.65	20.80	64.24	307.87	123.15	110.18
16	26.50	28.00	1.50	Granular	9.50	0.00	20	-	0.00	5.39	1.00	-	27.25	28.00	105.00	105.00	5.65	20.80	64.24	328.67	131.47	118.37
17	28.00	29.50	1.50	Granular	9.50	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	105.00	105.00	5.65	31.20	280.06	575.69	230.27	129.49
18	29.50	30.00	0.50	Granular	9.50	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	105.00	105.00	1.88	10.40	280.06	586.09	234.43	133.19

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	14	2.96E+07	1.02E-01	1.98E+03	4.33	0.58	2.08	1.85	9.00	8.02	0.201	0.803	9.97	2.49	44.83	19.99	23.92	5.98	107.58	47.97
2	22.50	14	2.96E+07	1.02E-01	1.98E+03	4.33	0.58	2.08	1.85	9.00	8.02	0.201	0.803	9.97	2.49	44.83	19.99	23.92	5.98	107.58	47.97
3	24.00	14	2.96E+07	1.02E-01	1.98E+03	4.33	0.58	2.08	1.85	9.00	8.02	0.201	0.803	9.97	2.49	44.83	19.99	23.92	5.98	107.58	47.97
4	25.50	14	2.96E+07	1.02E-01	1.98E+03	4.33	0.58	2.08	1.85	9.00	8.02	0.201	0.803	9.97	2.49	44.83	19.99	23.92	5.98	107.58	47.97
5	27.00	14	2.96E+07	1.02E-01	1.98E+03	4.33	0.58	2.08	1.85	9.00	8.02	0.201	0.803	9.97	2.49	44.83	19.99	23.92	5.98	107.58	47.97
6	28.50	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.59	2.08	1.85	8.86	7.91	0.192	0.768	10.42	2.60	46.16	20.59	25.00	6.25	110.80	49.43
7	30.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.59	2.08	1.85	8.86	7.91	0.192	0.768	10.42	2.60	46.16	20.59	25.00	6.25	110.80	49.43

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-10	-
Chainage	0+907	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	84.15	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	5.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-10	1.00	22.00	19.50	16.50	64.80	59.54	8.38	2.09
BH-10	1.00	23.50	21.00	18.00	73.81	65.27	8.38	2.09
BH-10	1.00	25.00	22.50	19.50	79.65	71.01	8.38	2.09
BH-10	1.00	26.50	24.00	21.00	133.14	78.49	8.79	2.20
BH-10	1.00	28.00	25.50	22.50	141.48	85.97	8.79	2.20
BH-10	1.00	29.50	27.00	24.00	149.57	93.46	9.20	2.30
BH-10	1.00	30.00	27.50	24.50	152.35	95.95	9.20	2.30

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	3.25	4.00	5.25	10.50	4.71	0.00	0.00	0.00	0.00	4.40
2	4.00	5.50	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	4.75	5.50	15.75	21.00	4.71	0.00	0.00	0.00	0.00	6.05
3	5.50	7.00	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	6.25	7.00	26.25	31.50	4.71	4.33	13.38	17.72	7.09	8.91
4	7.00	8.50	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	7.75	8.50	36.75	42.00	4.71	6.07	17.84	28.24	11.30	12.26
5	8.50	10.00	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	9.25	10.00	47.25	52.50	4.71	7.80	22.30	40.51	16.20	16.09
6	10.00	11.50	1.50	Granular	7.00	0.00	22	-	4.00	7.59	1.00	-	10.75	11.50	57.75	63.00	4.71	10.49	38.77	67.46	26.98	20.68
7	11.50	13.00	1.50	Granular	7.00	0.00	22	-	4.00	7.59	1.00	-	12.25	13.00	68.25	73.50	4.71	12.39	45.05	86.13	34.45	25.80
7	13.00	14.50	1.50	Granular	7.10	0.00	22	-	4.00	7.59	1.00	-	13.75	14.50	78.83	84.15	4.71	14.31	51.44	106.83	42.73	31.45
8	14.50	16.00	1.50	Granular	7.10	0.00	22	-	4.00	7.59	1.00	-	15.25	16.00	84.15	84.15	4.71	15.28	51.44	122.11	48.85	37.38
9	16.00	17.50	1.50	Granular	7.10	0.00	20	-	0.00	5.39	1.00	-	16.75	17.50	84.15	84.15	4.71	13.89	35.75	120.32	48.13	42.92
10	17.50	19.00	1.50	Granular	7.10	0.00	20	-	0.00	5.39	1.00	-	18.25	19.00	84.15	84.15	4.71	13.89	35.75	134.21	53.68	48.46
11	19.00	20.50	1.50	Granular	7.10	0.00	20	-	0.00	5.39	1.00	-	19.75	20.50	84.15	84.15	4.71	13.89	35.75	148.10	59.24	54.00
12	20.50	22.00	1.50	Granular	7.10	0.00	20	-	0.00	5.39	1.00	-	21.25	22.00	84.15	84.15	4.71	13.89	35.75	162.00	64.80	59.54
13	22.00	23.50	1.50	Granular	8.40	0.00	21	-	2.00	6.49	1.00	-	22.75	23.50	84.15	84.15	4.71	14.59	43.70	184.53	73.81	65.27
14	23.50	25.00	1.50	Granular	8.40	0.00	21	-	2.00	6.49	1.00	-	24.25	25.00	84.15	84.15	4.71	14.59	43.70	199.11	79.65	71.01
15	25.00	26.50	1.50	Granular	10.10	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	84.15	84.15	4.71	20.84	156.60	332.86	133.14	78.49
16	26.50	28.00	1.50	Granular	10.10	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	84.15	84.15	4.71	20.84	156.60	353.70	141.48	85.97
17	28.00	29.50	1.50	Granular	9.30	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	84.15	84.15	4.71	20.84	155.99	373.92	149.57	93.46
18	29.50	30.00	0.50	Granular	9.30	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	84.15	84.15	1.57	6.95	155.99	380.87	152.35	95.95

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	13	2.96E+07	4.91E-02	1.83E+03	3.80	1.45	1.97	1.82	7.48	6.91	0.239	0.955	8.38	2.09	31.31	14.47	20.10	5.03	75.14	34.73
2	22.50	13	2.96E+07	4.91E-02	1.83E+03	3.80	1.45	1.97	1.82	7.48	6.91	0.239	0.955	8.38	2.09	31.31	14.47	20.10	5.03	75.14	34.73
3	24.00	13	2.96E+07	4.91E-02	1.83E+03	3.80	1.45	1.97	1.82	7.48	6.91	0.239	0.955	8.38	2.09	31.31	14.47	20.10	5.03	75.14	34.73
4	25.50	14	2.96E+07	4.91E-02	1.98E+03	3.74	1.47	1.96	1.82	7.36	6.80	0.227	0.910	8.79	2.20	32.34	14.96	21.10	5.28	77.61	35.89
5	27.00	14	2.96E+07	4.91E-02	1.98E+03	3.74	1.47	1.96	1.82	7.36	6.80	0.227	0.910	8.79	2.20	32.34	14.96	21.10	5.28	77.61	35.89
6	28.50	15	2.96E+07	4.91E-02	2.12E+03	3.69	1.49	1.96	1.82	7.25	6.71	0.217	0.870	9.20	2.30	33.32	15.42	22.08	5.52	79.98	37.01
7	30.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	1.49	1.96	1.82	7.25	6.71	0.217	0.870	9.20	2.30	33.32	15.42	22.08	5.52	79.98	37.01

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-10	-
Chainage	0+907	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	105.45	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	5.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-10	1.20	22.00	19.50	16.50	93.20	82.01	10.88	2.72
BH-10	1.20	23.50	21.00	18.00	107.68	90.52	10.88	2.72
BH-10	1.20	25.00	22.50	19.50	116.46	99.04	10.88	2.72
BH-10	1.20	26.50	24.00	21.00	210.27	110.19	11.42	2.86
BH-10	1.20	28.00	25.50	22.50	222.81	121.34	11.42	2.86
BH-10	1.20	29.50	27.00	24.00	234.91	132.49	11.95	2.99
BH-10	1.20	30.00	27.50	24.50	239.09	136.20	11.95	2.99

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (Ki)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	3.25	4.00	5.25	10.50	5.65	0.00	0.00	0.00	0.00	6.33
2	4.00	5.50	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	4.75	5.50	15.75	21.00	5.65	0.00	0.00	0.00	0.00	8.71
3	5.50	7.00	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	6.25	7.00	26.25	31.50	5.65	5.20	19.27	24.47	9.79	12.54
4	7.00	8.50	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	7.75	8.50	36.75	42.00	5.65	7.28	25.70	38.18	15.27	16.95
5	8.50	10.00	1.50	Granular	7.00	0.00	20	-	0.00	5.39	1.00	-	9.25	10.00	47.25	52.50	5.65	9.36	32.12	53.96	21.58	21.95
6	10.00	11.50	1.50	Granular	7.00	0.00	22	-	4.00	7.59	1.00	-	10.75	11.50	57.75	63.00	5.65	12.58	56.15	90.58	36.23	27.85
7	11.50	13.00	1.50	Granular	7.00	0.00	22	-	4.00	7.59	1.00	-	12.25	13.00	68.25	73.50	5.65	14.87	65.19	114.49	45.80	34.39
7	13.00	14.50	1.50	Granular	7.10	0.00	22	-	4.00	7.59	1.00	-	13.75	14.50	78.83	84.15	5.65	17.18	74.39	140.87	56.35	41.57
8	14.50	16.00	1.50	Granular	7.10	0.00	22	-	4.00	7.59	1.00	-	15.25	16.00	89.48	94.80	5.65	19.50	83.56	169.53	67.81	49.41
9	16.00	17.50	1.50	Granular	7.10	0.00	20	-	0.00	5.39	1.00	-	16.75	17.50	100.13	105.45	5.65	19.84	64.51	170.32	68.13	57.33
10	17.50	19.00	1.50	Granular	7.10	0.00	20	-	0.00	5.39	1.00	-	18.25	19.00	105.45	105.45	5.65	20.89	64.51	191.21	76.48	65.56
11	19.00	20.50	1.50	Granular	7.10	0.00	20	-	0.00	5.39	1.00	-	19.75	20.50	105.45	105.45	5.65	20.89	64.51	212.10	84.84	73.78
12	20.50	22.00	1.50	Granular	7.10	0.00	20	-	0.00	5.39	1.00	-	21.25	22.00	105.45	105.45	5.65	20.89	64.51	232.99	93.20	82.01
13	22.00	23.50	1.50	Granular	8.40	0.00	21	-	2.00	6.49	1.00	-	22.75	23.50	105.45	105.45	5.65	21.93	78.80	269.21	107.68	90.52
14	23.50	25.00	1.50	Granular	8.40	0.00	21	-	2.00	6.49	1.00	-	24.25	25.00	105.45	105.45	5.65	21.93	78.80	291.15	116.46	99.04
15	25.00	26.50	1.50	Granular	10.10	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	105.45	105.45	5.65	31.33	282.00	525.68	210.27	110.19
16	26.50	28.00	1.50	Granular	10.10	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	105.45	105.45	5.65	31.33	282.00	557.01	222.81	121.34
17	28.00	29.50	1.50	Granular	9.30	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	105.45	105.45	5.65	31.33	280.94	587.29	234.91	132.49
18	29.50	30.00	0.50	Granular	9.30	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	105.45	105.45	1.88	10.44	280.94	597.73	239.09	136.20

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	13	2.96E+07	1.02E-01	1.83E+03	4.40	1.25	1.99	1.82	8.74	8.02	0.184	0.735	10.88	2.72	47.54	21.83	26.12	6.53	114.09	52.39
2	22.50	13	2.96E+07	1.02E-01	1.83E+03	4.40	1.25	1.99	1.82	8.74	8.02	0.184	0.735	10.88	2.72	47.54	21.83	26.12	6.53	114.09	52.39
3	24.00	13	2.96E+07	1.02E-01	1.83E+03	4.40	1.25	1.99	1.82	8.74	8.02	0.184	0.735	10.88	2.72	47.54	21.83	26.12	6.53	114.09	52.39
4	25.50	14	2.96E+07	1.02E-01	1.98E+03	4.33	1.27	1.98	1.82	8.60	7.90	0.175	0.700	11.42	2.86	49.10	22.56	27.42	6.85	117.84	54.15
5	27.00	14	2.96E+07	1.02E-01	1.98E+03	4.33	1.27	1.98	1.82	8.60	7.90	0.175	0.700	11.42	2.86	49.10	22.56	27.42	6.85	117.84	54.15
6	28.50	15	2.96E+07	1.02E-01	2.12E+03	4.27	1.29	1.98	1.82	8.47	7.79	0.167	0.669	11.95	2.99	50.60	23.26	28.68	7.17	121.43	55.83
7	30.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	1.29	1.98	1.82	8.47	7.79	0.167	0.669	11.95	2.99	50.60	23.26	28.68	7.17	121.43	55.83

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-11	-
Chainage	1+004	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	91.20	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-11	1.00	22.00	19.50	19.50	73.74	57.78	7.95	1.99
BH-11	1.00	23.50	21.00	21.00	80.67	64.28	7.95	1.99
BH-11	1.00	25.00	22.50	22.50	87.68	70.77	8.28	2.07
BH-11	1.00	26.50	24.00	24.00	131.00	78.54	8.28	2.07
BH-11	1.00	28.00	25.50	25.50	140.23	86.30	8.28	2.07
BH-11	1.00	29.50	27.00	27.00	156.24	94.27	8.61	2.15
BH-11	1.00	30.00	27.50	27.50	159.25	96.93	8.61	2.15

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.00	0.00	22	-	4.00	7.59	1.00	-	3.25	4.00	5.25	10.50	4.71	0.95	7.38	8.34	3.33	4.67
2	4.00	5.50	1.50	Granular	7.00	0.00	22	-	4.00	7.59	1.00	-	4.75	5.50	15.75	21.00	4.71	2.86	13.66	17.47	6.99	7.12
3	5.50	7.00	1.50	Granular	7.00	0.00	22	-	4.00	7.59	1.00	-	6.25	7.00	26.25	31.50	4.71	4.77	19.94	28.52	11.41	10.10
4	7.00	8.50	1.50	Granular	7.00	0.00	22	-	4.00	7.59	1.00	-	7.75	8.50	36.75	42.00	4.71	6.67	26.22	41.47	16.59	13.62
5	8.50	10.00	1.50	Granular	7.70	0.00	22	-	4.00	7.59	1.00	-	9.25	10.00	47.78	53.55	4.71	8.68	33.23	57.16	22.87	17.70
6	10.00	11.50	1.50	Granular	7.70	0.00	22	-	4.00	7.59	1.00	-	10.75	11.50	59.33	65.10	4.71	0.00	40.14	64.07	25.63	19.35
7	11.50	13.00	1.50	Granular	8.70	0.00	20	-	0.00	5.39	1.00	-	12.25	13.00	71.63	78.15	4.71	0.00	33.20	57.13	22.85	20.99
7	13.00	14.50	1.50	Granular	8.70	0.00	20	-	0.00	5.39	1.00	-	13.75	14.50	84.68	91.20	4.71	13.98	38.75	76.65	30.66	26.56
8	14.50	16.00	1.50	Granular	8.70	0.00	20	-	0.00	5.39	1.00	-	15.25	16.00	91.20	91.20	4.71	15.06	38.75	91.71	36.68	32.42
9	16.00	17.50	1.50	Granular	8.70	0.00	20	-	0.00	5.39	1.00	-	16.75	17.50	91.20	91.20	4.71	15.06	38.75	106.77	42.71	38.29
10	17.50	19.00	1.50	Granular	8.70	0.00	23	-	6.00	8.68	1.00	-	18.25	19.00	91.20	91.20	4.71	17.31	64.48	149.82	59.93	44.79
11	19.00	20.50	1.50	Granular	8.70	0.00	23	-	6.00	8.68	1.00	-	19.75	20.50	91.20	91.20	4.71	17.31	64.48	167.13	66.85	51.28
12	20.50	22.00	1.50	Granular	8.30	0.00	23	-	6.00	8.68	1.00	-	21.25	22.00	91.20	91.20	4.71	17.31	64.39	184.35	73.74	57.78
13	22.00	23.50	1.50	Granular	8.30	0.00	23	-	6.00	8.68	1.00	-	22.75	23.50	91.20	91.20	4.71	17.31	64.39	201.67	80.67	64.28
14	23.50	25.00	1.50	Granular	9.20	0.00	23	-	6.00	8.68	1.00	-	24.25	25.00	91.20	91.20	4.71	17.31	64.60	219.19	87.68	70.77
15	25.00	26.50	1.50	Granular	9.20	0.00	29	-	17.60	20.13	1.00	-	25.75	26.50	91.20	91.20	4.71	21.83	151.07	327.50	131.00	78.54
16	26.50	28.00	1.50	Granular	11.00	0.00	29	-	17.60	20.13	1.00	-	27.25	28.00	91.20	91.20	4.71	21.83	152.32	350.58	140.23	86.30
17	28.00	29.50	1.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	91.20	91.20	4.71	22.58	169.77	390.60	156.24	94.27
18	29.50	30.00	0.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	91.20	91.20	1.57	7.53	169.77	398.13	159.25	96.93

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_t/T Ratio	L_e/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.68	2.06	1.85	7.61	6.82	0.252	1.007	7.95	1.99	30.23	13.55	19.07	4.77	72.55	32.51
2	22.50	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.68	2.06	1.85	7.61	6.82	0.252	1.007	7.95	1.99	30.23	13.55	19.07	4.77	72.55	32.51
3	24.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
4	25.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
5	27.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
6	28.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33
7	30.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-11	-
Chainage	1+004	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	117.30	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-11	1.20	22.00	19.50	19.50	114.39	81.58	10.42	2.60
BH-11	1.20	23.50	21.00	21.00	125.08	91.44	10.42	2.60
BH-11	1.20	25.00	22.50	22.50	135.92	101.30	10.85	2.71
BH-11	1.20	26.50	24.00	24.00	213.25	113.11	10.85	2.71
BH-11	1.20	28.00	25.50	25.50	227.59	124.92	10.85	2.71
BH-11	1.20	29.50	27.00	27.00	254.41	137.05	11.28	2.82
BH-11	1.20	30.00	27.50	27.50	259.06	141.10	11.28	2.82

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.00	0.00	22	-	4.00	7.59	1.00	-	3.25	4.00	5.25	10.50	5.65	1.14	10.95	12.09	4.84	6.65
2	4.00	5.50	1.50	Granular	7.00	0.00	22	-	4.00	7.59	1.00	-	4.75	5.50	15.75	21.00	5.65	3.43	19.99	24.56	9.83	9.99
3	5.50	7.00	1.50	Granular	7.00	0.00	22	-	4.00	7.59	1.00	-	6.25	7.00	26.25	31.50	5.65	5.72	29.03	39.33	15.73	13.97
4	7.00	8.50	1.50	Granular	7.00	0.00	22	-	4.00	7.59	1.00	-	7.75	8.50	36.75	42.00	5.65	8.01	38.07	56.38	22.55	18.58
5	8.50	10.00	1.50	Granular	7.70	0.00	22	-	4.00	7.59	1.00	-	9.25	10.00	47.78	53.55	5.65	10.41	48.21	76.92	30.77	23.87
6	10.00	11.50	1.50	Granular	7.70	0.00	22	-	4.00	7.59	1.00	-	10.75	11.50	59.33	65.10	5.65	0.00	58.15	86.87	34.75	26.25
7	11.50	13.00	1.50	Granular	8.70	0.00	20	-	0.00	5.39	1.00	-	12.25	13.00	71.63	78.15	5.65	0.00	47.81	76.53	30.61	28.62
7	13.00	14.50	1.50	Granular	8.70	0.00	20	-	0.00	5.39	1.00	-	13.75	14.50	84.68	91.20	5.65	16.77	55.80	101.29	40.51	35.70
8	14.50	16.00	1.50	Granular	8.70	0.00	20	-	0.00	5.39	1.00	-	15.25	16.00	97.73	104.25	5.65	19.36	63.78	128.63	51.45	43.49
9	16.00	17.50	1.50	Granular	8.70	0.00	20	-	0.00	5.39	1.00	-	16.75	17.50	110.78	117.30	5.65	21.94	71.76	158.56	63.42	52.01
10	17.50	19.00	1.50	Granular	8.70	0.00	23	-	6.00	8.68	1.00	-	18.25	19.00	117.30	117.30	5.65	26.72	119.17	232.69	93.08	61.87
11	19.00	20.50	1.50	Granular	8.70	0.00	23	-	6.00	8.68	1.00	-	19.75	20.50	117.30	117.30	5.65	26.72	119.17	259.41	103.77	71.73
12	20.50	22.00	1.50	Granular	8.30	0.00	23	-	6.00	8.68	1.00	-	21.25	22.00	117.30	117.30	5.65	26.72	119.01	285.97	114.39	81.58
13	22.00	23.50	1.50	Granular	8.30	0.00	23	-	6.00	8.68	1.00	-	22.75	23.50	117.30	117.30	5.65	26.72	119.01	312.70	125.08	91.44
14	23.50	25.00	1.50	Granular	9.20	0.00	23	-	6.00	8.68	1.00	-	24.25	25.00	117.30	117.30	5.65	26.72	119.38	339.79	135.92	101.30
15	25.00	26.50	1.50	Granular	9.20	0.00	29	-	17.60	20.13	1.00	-	25.75	26.50	117.30	117.30	5.65	33.69	279.01	533.12	213.25	113.11
16	26.50	28.00	1.50	Granular	11.00	0.00	29	-	17.60	20.13	1.00	-	27.25	28.00	117.30	117.30	5.65	33.69	281.17	568.97	227.59	124.92
17	28.00	29.50	1.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	117.30	117.30	5.65	34.86	313.38	636.03	254.41	137.05
18	29.50	30.00	0.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	117.30	117.30	1.88	11.62	313.38	647.65	259.06	141.10

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.59	2.08	1.85	8.86	7.91	0.192	0.768	10.42	2.60	46.16	20.59	25.00	6.25	110.80	49.43
2	22.50	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.59	2.08	1.85	8.86	7.91	0.192	0.768	10.42	2.60	46.16	20.59	25.00	6.25	110.80	49.43
3	24.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
4	25.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
5	27.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
6	28.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17
7	30.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17

A.2. Zone 2: CH: 1+004 km to 1+925 km (BH-12 to BH-21)

The following table presents the recommended safe capacities of bored cast-in-situ RCC piles, considering mobilization of both skin friction and end bearing, under compression, uplift, and lateral loading. The capacities are based on an assumed cut-off level at 2.5m below the existing ground level (EGL).

BH ID	Pile Dia	Total Depth of Pile	Effective Shaft Depth	Grip Length	CASE_1 GW at Encountered Level				CASE_2 GW at Ground Level			
					Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)
-	(m)	(m)	(m)	(m)	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne
BH-12	1.00	22.00	19.50	17.50	223.19	120.74	9.21	2.30	94.38	64.83	9.21	2.30
BH-12	1.00	23.50	21.00	19.00	240.52	134.52	9.21	2.30	101.61	71.54	9.21	2.30
BH-12	1.00	25.00	22.50	20.50	258.06	148.30	9.21	2.30	109.04	78.25	9.21	2.30
BH-12	1.00	26.50	24.00	22.00	306.64	163.01	9.21	2.30	129.59	85.35	9.21	2.30
BH-12	1.00	28.00	25.50	23.50	325.48	177.73	9.21	2.30	137.55	92.45	9.21	2.30
BH-12	1.00	29.50	27.00	25.00	375.44	193.38	9.58	2.39	158.69	99.93	9.58	2.39
BH-12	1.00	30.00	27.50	25.50	382.10	198.59	9.58	2.39	161.47	102.43	9.58	2.39
BH-12	1.20	22.00	19.50	17.50	309.55	156.34	11.98	2.99	143.22	89.25	11.98	2.99
BH-12	1.20	23.50	21.00	19.00	332.55	174.82	11.98	2.99	154.10	99.24	11.98	2.99
BH-12	1.20	25.00	22.50	20.50	355.90	193.29	11.98	2.99	165.33	109.23	11.98	2.99
BH-12	1.20	26.50	24.00	22.00	428.38	213.00	11.98	2.99	200.04	119.80	11.98	2.99
BH-12	1.20	28.00	25.50	23.50	453.44	232.72	11.98	2.99	212.06	130.38	11.98	2.99
BH-12	1.20	29.50	27.00	25.00	527.76	253.67	12.46	3.11	247.68	141.54	12.46	3.11
BH-12	1.20	30.00	27.50	25.50	536.60	260.66	12.46	3.11	251.86	145.26	12.46	3.11
BH-13	1.00	22.00	19.50	19.50	259.38	131.96	7.95	1.99	112.85	69.88	7.95	1.99
BH-13	1.00	23.50	21.00	21.00	276.34	145.48	8.28	2.07	120.29	76.73	8.28	2.07
BH-13	1.00	25.00	22.50	22.50	293.29	159.00	8.28	2.07	127.73	83.59	8.28	2.07
BH-13	1.00	26.50	24.00	24.00	310.70	172.52	8.28	2.07	135.62	90.45	8.28	2.07
BH-13	1.00	28.00	25.50	25.50	356.30	186.89	8.61	2.15	156.00	97.68	8.61	2.15

BH ID	Pile Dia	Total Depth of Pile	Effective Shaft Depth	Grip Length	CASE_1 GW at Encountered Level				CASE_2 GW at Ground Level			
					Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)
-	(m)	(m)	(m)	(m)	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne
BH-13	1.00	29.50	27.00	27.00	374.47	201.26	8.93	2.23	163.98	104.91	8.93	2.23
BH-13	1.00	30.00	27.50	27.50	380.53	206.05	9.25	2.31	166.63	107.32	9.25	2.31
BH-13	1.20	22.00	19.50	19.50	362.41	170.40	10.42	2.60	172.70	95.90	10.42	2.60
BH-13	1.20	23.50	21.00	21.00	385.00	188.58	10.85	2.71	183.86	106.09	10.85	2.71
BH-13	1.20	25.00	22.50	22.50	407.58	206.76	10.85	2.71	195.02	116.27	10.85	2.71
BH-13	1.20	26.50	24.00	24.00	430.93	224.94	10.85	2.71	206.95	126.46	10.85	2.71
BH-13	1.20	28.00	25.50	25.50	499.04	244.25	11.28	2.82	241.20	137.20	11.28	2.82
BH-13	1.20	29.50	27.00	27.00	523.23	263.57	11.70	2.93	253.15	147.95	11.70	2.93
BH-13	1.20	30.00	27.50	27.50	531.29	270.00	12.11	3.03	257.14	151.53	12.11	3.03
BH-14	1.00	22.00	19.50	19.50	208.59	113.86	7.95	1.99	94.44	63.94	7.95	1.99
BH-14	1.00	23.50	21.00	21.00	283.70	128.66	8.28	2.07	129.33	71.59	8.28	2.07
BH-14	1.00	25.00	22.50	22.50	302.48	143.45	8.28	2.07	137.91	79.25	8.28	2.07
BH-14	1.00	26.50	24.00	24.00	321.69	158.25	8.28	2.07	146.92	86.90	8.28	2.07
BH-14	1.00	28.00	25.50	25.50	340.47	173.04	8.61	2.15	155.50	94.56	8.61	2.15
BH-14	1.00	29.50	27.00	27.00	359.25	187.84	8.93	2.23	164.08	102.22	8.93	2.23
BH-14	1.00	30.00	27.50	27.50	365.51	192.77	9.25	2.31	166.94	104.77	9.25	2.31
BH-14	1.20	22.00	19.50	19.50	295.28	149.62	10.42	2.60	148.02	89.71	10.42	2.60
BH-14	1.20	23.50	21.00	21.00	412.64	169.84	10.85	2.71	209.90	101.37	10.85	2.71
BH-14	1.20	25.00	22.50	22.50	438.13	190.07	10.85	2.71	223.16	113.02	10.85	2.71
BH-14	1.20	26.50	24.00	24.00	464.37	210.29	10.85	2.71	237.16	124.68	10.85	2.71
BH-14	1.20	28.00	25.50	25.50	489.87	230.51	11.28	2.82	250.42	136.33	11.28	2.82
BH-14	1.20	29.50	27.00	27.00	515.36	250.73	11.70	2.93	263.67	147.98	11.70	2.93
BH-14	1.20	30.00	27.50	27.50	523.86	257.47	12.11	3.03	268.09	151.87	12.11	3.03
BH-15	1.00	22.00	19.50	19.50	185.62	109.52	8.28	2.07	78.88	59.52	8.28	2.07
BH-15	1.00	23.50	21.00	21.00	258.22	123.37	8.28	2.07	111.61	66.47	8.28	2.07

BH ID	Pile Dia	Total Depth of Pile	Effective Shaft Depth	Grip Length	CASE_1 GW at Encountered Level				CASE_2 GW at Ground Level			
					Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)
-	(m)	(m)	(m)	(m)	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne
BH-15	1.00	25.00	22.50	22.50	275.66	137.23	8.61	2.15	119.19	73.43	8.61	2.15
BH-15	1.00	26.50	24.00	24.00	292.82	151.08	8.61	2.15	126.50	80.38	8.61	2.15
BH-15	1.00	28.00	25.50	25.50	324.46	165.36	8.93	2.23	140.44	87.52	8.93	2.23
BH-15	1.00	29.50	27.00	27.00	342.50	179.63	8.93	2.23	148.28	94.66	8.93	2.23
BH-15	1.00	30.00	27.50	27.50	348.51	184.39	9.25	2.31	150.89	97.04	9.25	2.31
BH-15	1.20	22.00	19.50	19.50	259.18	143.47	10.85	2.71	122.61	83.47	10.85	2.71
BH-15	1.20	23.50	21.00	21.00	372.97	162.42	10.85	2.71	181.36	94.14	10.85	2.71
BH-15	1.20	25.00	22.50	22.50	396.65	181.37	11.28	2.82	193.21	104.81	11.28	2.82
BH-15	1.20	26.50	24.00	24.00	419.85	200.32	11.28	2.82	204.58	115.48	11.28	2.82
BH-15	1.20	28.00	25.50	25.50	466.55	219.84	11.70	2.93	228.24	126.44	11.70	2.93
BH-15	1.20	29.50	27.00	27.00	491.05	239.37	11.70	2.93	240.50	137.40	11.70	2.93
BH-15	1.20	30.00	27.50	27.50	499.21	245.88	12.11	3.03	244.59	141.05	12.11	3.03
BH-16	1.00	22.00	19.50	12.50	245.57	112.49	10.18	2.55	108.73	62.44	10.18	2.55
BH-16	1.00	23.50	21.00	14.00	248.97	126.11	10.18	2.55	110.12	69.40	10.18	2.55
BH-16	1.00	25.00	22.50	15.50	266.06	139.73	10.18	2.55	117.70	76.35	10.18	2.55
BH-16	1.00	26.50	24.00	17.00	283.95	153.35	10.18	2.55	126.07	83.31	10.18	2.55
BH-16	1.00	28.00	25.50	18.50	301.05	166.96	10.18	2.55	133.65	90.26	10.18	2.55
BH-16	1.00	29.50	27.00	20.00	346.97	181.44	10.18	2.55	154.36	97.60	10.18	2.55
BH-16	1.00	30.00	27.50	20.50	353.08	186.26	10.18	2.55	157.07	100.04	10.18	2.55
BH-16	1.20	22.00	19.50	12.50	354.17	147.75	13.32	3.33	174.28	87.69	13.32	3.33
BH-16	1.20	23.50	21.00	14.00	355.02	166.22	13.32	3.33	174.52	98.16	13.32	3.33
BH-16	1.20	25.00	22.50	15.50	378.00	184.68	13.32	3.33	186.08	108.62	13.32	3.33
BH-16	1.20	26.50	24.00	17.00	402.35	203.14	13.32	3.33	199.01	119.09	13.32	3.33
BH-16	1.20	28.00	25.50	18.50	425.33	221.60	13.32	3.33	210.57	129.56	13.32	3.33
BH-16	1.20	29.50	27.00	20.00	494.54	241.21	13.32	3.33	245.93	140.60	13.32	3.33

BH ID	Pile Dia	Total Depth of Pile	Effective Shaft Depth	Grip Length	CASE_1 GW at Encountered Level				CASE_2 GW at Ground Level			
					Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)
-	(m)	(m)	(m)	(m)	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne
BH-16	1.20	30.00	27.50	20.50	502.75	247.75	13.32	3.33	250.05	144.28	13.32	3.33
BH-17	1.00	22.00	19.50	13.00	199.39	101.26	8.75	2.19	84.18	55.84	8.75	2.19
BH-17	1.00	23.50	21.00	14.50	215.35	114.09	8.75	2.19	90.96	62.24	8.75	2.19
BH-17	1.00	25.00	22.50	16.00	231.32	126.91	9.21	2.30	97.75	68.64	9.21	2.30
BH-17	1.00	26.50	24.00	17.50	247.70	139.74	9.66	2.42	104.95	75.04	9.66	2.42
BH-17	1.00	28.00	25.50	19.00	305.50	153.80	9.66	2.42	130.04	81.97	9.66	2.42
BH-17	1.00	29.50	27.00	20.50	323.24	167.87	9.66	2.42	137.58	88.90	9.66	2.42
BH-17	1.00	30.00	27.50	21.00	329.15	172.56	9.66	2.42	140.09	91.21	9.66	2.42
BH-17	1.20	22.00	19.50	13.00	286.15	133.40	11.41	2.85	135.82	78.90	11.41	2.85
BH-17	1.20	23.50	21.00	14.50	307.78	150.92	11.41	2.85	146.44	88.71	11.41	2.85
BH-17	1.20	25.00	22.50	16.00	329.41	168.44	12.02	3.01	157.05	98.52	12.02	3.01
BH-17	1.20	26.50	24.00	17.50	351.76	185.95	12.61	3.15	168.38	108.32	12.61	3.15
BH-17	1.20	28.00	25.50	19.00	441.00	205.15	12.61	3.15	212.97	118.95	12.61	3.15
BH-17	1.20	29.50	27.00	20.50	465.04	224.35	12.61	3.15	224.76	129.59	12.61	3.15
BH-17	1.20	30.00	27.50	21.00	473.05	230.75	12.61	3.15	228.69	133.13	12.61	3.15
BH-20	1.00	22.00	19.50	19.50	311.49	142.94	9.56	2.39	147.74	79.32	9.56	2.39
BH-20	1.00	23.50	21.00	21.00	331.79	158.24	9.56	2.39	157.84	87.48	9.56	2.39
BH-20	1.00	25.00	22.50	22.50	351.29	173.54	9.56	2.39	167.14	95.64	9.56	2.39
BH-20	1.00	26.50	24.00	24.00	370.79	188.84	9.56	2.39	176.44	103.80	9.56	2.39
BH-20	1.00	28.00	25.50	25.50	390.29	204.14	9.56	2.39	185.75	111.96	9.56	2.39
BH-20	1.00	29.50	27.00	27.00	409.79	219.44	9.56	2.39	195.05	120.12	9.56	2.39
BH-20	1.00	30.00	27.50	27.50	416.29	224.54	9.56	2.39	198.15	122.84	9.56	2.39
BH-20	1.20	22.00	19.50	19.50	447.09	185.85	12.52	3.13	233.11	109.50	12.52	3.13
BH-20	1.20	23.50	21.00	21.00	474.95	206.76	12.52	3.13	248.73	121.84	12.52	3.13
BH-20	1.20	25.00	22.50	22.50	501.42	227.67	12.52	3.13	262.96	134.18	12.52	3.13

BH ID	Pile Dia	Total Depth of Pile	Effective Shaft Depth	Grip Length	CASE_1 GW at Encountered Level				CASE_2 GW at Ground Level			
					Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)
-	(m)	(m)	(m)	(m)	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne
BH-20	1.20	26.50	24.00	24.00	527.90	248.58	12.52	3.13	277.20	146.52	12.52	3.13
BH-20	1.20	28.00	25.50	25.50	554.38	269.49	12.52	3.13	291.44	158.86	12.52	3.13
BH-20	1.20	29.50	27.00	27.00	580.85	290.39	12.52	3.13	305.67	171.20	12.52	3.13
BH-20	1.20	30.00	27.50	27.50	589.68	297.36	12.52	3.13	310.42	175.32	12.52	3.13
BH-21	1.00	22.00	19.50	18.50	257.71	129.56	10.13	2.53	114.25	69.62	10.13	2.53
BH-21	1.00	23.50	21.00	20.00	274.95	143.33	10.13	2.53	121.98	76.73	10.13	2.53
BH-21	1.00	25.00	22.50	21.50	292.26	157.09	10.13	2.53	129.77	83.83	10.13	2.53
BH-21	1.00	26.50	24.00	23.00	338.90	171.72	10.13	2.53	151.21	91.32	10.13	2.53
BH-21	1.00	28.00	25.50	24.50	357.44	186.35	10.46	2.61	159.56	98.81	10.46	2.61
BH-21	1.00	29.50	27.00	26.00	375.99	200.98	10.46	2.61	167.90	106.30	10.46	2.61
BH-21	1.00	30.00	27.50	26.50	382.17	205.86	10.78	2.69	170.69	108.80	10.78	2.69
BH-21	1.20	22.00	19.50	18.50	368.42	169.22	13.21	3.30	182.40	97.29	13.21	3.30
BH-21	1.20	23.50	21.00	20.00	392.03	188.20	13.21	3.30	194.59	108.27	13.21	3.30
BH-21	1.20	25.00	22.50	21.50	415.75	207.18	13.21	3.30	206.89	119.26	13.21	3.30
BH-21	1.20	26.50	24.00	23.00	487.46	227.34	13.21	3.30	244.75	130.86	13.21	3.30
BH-21	1.20	28.00	25.50	24.50	512.88	247.51	13.63	3.41	257.93	142.46	13.63	3.41
BH-21	1.20	29.50	27.00	26.00	538.29	267.67	13.63	3.41	271.11	154.06	13.63	3.41
BH-21	1.20	30.00	27.50	26.50	546.77	274.40	14.04	3.51	275.51	157.93	14.04	3.51

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-12	-
Chainage	1+092	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	201.90	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.50	mtr
Groundwater Level from OGL	14.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-12	1.00	22.00	19.50	17.50	223.19	120.74	9.21	2.30
BH-12	1.00	23.50	21.00	19.00	240.52	134.52	9.21	2.30
BH-12	1.00	25.00	22.50	20.50	258.06	148.30	9.21	2.30
BH-12	1.00	26.50	24.00	22.00	306.64	163.01	9.21	2.30
BH-12	1.00	28.00	25.50	23.50	325.48	177.73	9.21	2.30
BH-12	1.00	29.50	27.00	25.00	375.44	193.38	9.58	2.39
BH-12	1.00	30.00	27.50	25.50	382.10	198.59	9.58	2.39

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (Ki)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	17.80	0.00	25	-	10.00	10.88	1.00	-	3.25	4.00	13.35	26.70	4.71	0.00	0.00	0.00	0.00	4.40
2	4.00	5.50	1.50	Granular	17.80	0.00	25	-	10.00	10.88	1.00	-	4.75	5.50	40.05	53.40	4.71	8.26	52.81	61.08	24.43	8.36
3	5.50	7.00	1.50	Granular	16.50	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	65.78	78.15	4.71	14.12	89.00	111.38	44.55	13.96
4	7.00	8.50	1.50	Granular	16.50	0.00	26	-	11.90	13.19	1.00	-	7.75	8.50	90.53	102.90	4.71	19.43	114.74	156.54	62.62	21.05
5	8.50	10.00	1.50	Granular	16.50	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	115.28	127.65	4.71	24.74	140.47	207.02	82.81	29.63
6	10.00	11.50	1.50	Granular	16.50	0.00	20	-	0.00	5.39	1.00	-	10.75	11.50	140.03	152.40	4.71	23.12	64.75	154.41	61.76	37.75
7	11.50	13.00	1.50	Granular	16.50	0.00	20	-	0.00	5.39	1.00	-	12.25	13.00	164.78	177.15	4.71	27.20	75.26	192.13	76.85	47.02
7	13.00	14.50	1.50	Granular	16.50	0.00	20	-	0.00	5.39	1.00	-	13.75	14.50	189.53	201.90	4.71	31.29	85.78	233.93	93.57	57.43
8	14.50	16.00	1.50	Granular	6.70	0.00	22	-	4.00	7.59	1.00	-	15.25	16.00	201.90	201.90	4.71	36.66	121.78	306.60	122.64	69.34
9	16.00	17.50	1.50	Granular	7.55	0.00	22	-	4.00	7.59	1.00	-	16.75	17.50	201.90	201.90	4.71	36.66	121.92	343.40	137.36	81.26
10	17.50	19.00	1.50	Granular	7.55	0.00	22	-	4.00	7.59	1.00	-	18.25	19.00	201.90	201.90	4.71	36.66	121.92	380.06	152.02	93.17
11	19.00	20.50	1.50	Granular	7.10	0.00	26	-	11.90	13.19	1.00	-	19.75	20.50	201.90	201.90	4.71	43.33	213.27	514.75	205.90	106.95
12	20.50	22.00	1.50	Granular	6.90	0.00	26	-	11.90	13.19	1.00	-	21.25	22.00	201.90	201.90	4.71	43.33	213.18	557.98	223.19	120.74
13	22.00	23.50	1.50	Granular	6.90	0.00	26	-	11.90	13.19	1.00	-	22.75	23.50	201.90	201.90	4.71	43.33	213.18	601.31	240.52	134.52
14	23.50	25.00	1.50	Granular	8.00	0.00	26	-	11.90	13.19	1.00	-	24.25	25.00	201.90	201.90	4.71	43.33	213.69	645.16	258.06	148.30
15	25.00	26.50	1.50	Granular	8.00	0.00	28	-	15.70	17.82	1.00	-	25.75	26.50	201.90	201.90	4.71	46.66	288.48	766.61	306.64	163.01
16	26.50	28.00	1.50	Granular	8.70	0.00	28	-	15.70	17.82	1.00	-	27.25	28.00	201.90	201.90	4.71	46.66	288.91	813.70	325.48	177.73
17	28.00	29.50	1.50	Granular	8.70	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	201.90	201.90	4.71	50.00	363.80	938.59	375.44	193.38
18	29.50	30.00	0.50	Granular	8.70	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	201.90	201.90	1.57	16.67	363.80	955.26	382.10	198.59

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	1.24	1.99	1.83	7.24	6.65	0.217	0.869	9.21	2.30	33.35	15.30	22.10	5.52	80.03	36.73
2	22.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	1.24	1.99	1.83	7.24	6.65	0.217	0.869	9.21	2.30	33.35	15.30	22.10	5.52	80.03	36.73
3	24.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	1.24	1.99	1.83	7.24	6.65	0.217	0.869	9.21	2.30	33.35	15.30	22.10	5.52	80.03	36.73
4	25.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	1.24	1.99	1.83	7.24	6.65	0.217	0.869	9.21	2.30	33.35	15.30	22.10	5.52	80.03	36.73
5	27.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	1.24	1.99	1.83	7.24	6.65	0.217	0.869	9.21	2.30	33.35	15.30	22.10	5.52	80.03	36.73
6	28.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.25	1.99	1.82	7.15	6.56	0.209	0.835	9.58	2.39	34.24	15.72	22.99	5.75	82.17	37.73
7	30.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.25	1.99	1.82	7.15	6.56	0.209	0.835	9.58	2.39	34.24	15.72	22.99	5.75	82.17	37.73

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-12	-
Chainage	1+092	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	223.28	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.50	mtr
Groundwater Level from OGL	14.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-12	1.20	22.00	19.50	17.50	309.55	156.34	11.98	2.99
BH-12	1.20	23.50	21.00	19.00	332.55	174.82	11.98	2.99
BH-12	1.20	25.00	22.50	20.50	355.90	193.29	11.98	2.99
BH-12	1.20	26.50	24.00	22.00	428.38	213.00	11.98	2.99
BH-12	1.20	28.00	25.50	23.50	453.44	232.72	11.98	2.99
BH-12	1.20	29.50	27.00	25.00	527.76	253.67	12.46	3.11
BH-12	1.20	30.00	27.50	25.50	536.60	260.66	12.46	3.11

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (Ki)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	17.80	0.00	25	-	10.00	10.88	1.00	-	3.25	4.00	13.35	26.70	5.65	0.00	0.00	0.00	0.00	6.33
2	4.00	5.50	1.50	Granular	17.80	0.00	25	-	10.00	10.88	1.00	-	4.75	5.50	40.05	53.40	5.65	9.92	78.07	87.98	35.19	11.49
3	5.50	7.00	1.50	Granular	16.50	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	65.78	78.15	5.65	16.94	130.39	157.25	62.90	18.60
4	7.00	8.50	1.50	Granular	16.50	0.00	26	-	11.90	13.19	1.00	-	7.75	8.50	90.53	102.90	5.65	23.31	167.45	217.62	87.05	27.51
5	8.50	10.00	1.50	Granular	16.50	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	115.28	127.65	5.65	29.69	204.51	284.37	113.75	38.19
6	10.00	11.50	1.50	Granular	16.50	0.00	20	-	0.00	5.39	1.00	-	10.75	11.50	140.03	152.40	5.65	27.74	93.24	200.83	80.33	48.34
7	11.50	13.00	1.50	Granular	16.50	0.00	20	-	0.00	5.39	1.00	-	12.25	13.00	164.78	177.15	5.65	32.64	108.38	248.62	99.45	59.85
7	13.00	14.50	1.50	Granular	16.50	0.00	20	-	0.00	5.39	1.00	-	13.75	14.50	189.53	201.90	5.65	37.55	123.52	301.30	120.52	72.74
8	14.50	16.00	1.50	Granular	6.70	0.00	22	-	4.00	7.59	1.00	-	15.25	16.00	206.93	211.95	5.65	45.09	184.32	407.20	162.88	87.74
9	16.00	17.50	1.50	Granular	7.55	0.00	22	-	4.00	7.59	1.00	-	16.75	17.50	217.61	223.28	5.65	47.42	194.31	464.60	185.84	103.39
10	17.50	19.00	1.50	Granular	7.55	0.00	22	-	4.00	7.59	1.00	-	18.25	19.00	223.28	223.28	5.65	48.65	194.31	513.26	205.30	119.39
11	19.00	20.50	1.50	Granular	7.10	0.00	26	-	11.90	13.19	1.00	-	19.75	20.50	223.28	223.28	5.65	57.50	340.08	716.53	286.61	137.87
12	20.50	22.00	1.50	Granular	6.90	0.00	26	-	11.90	13.19	1.00	-	21.25	22.00	223.28	223.28	5.65	57.50	339.91	773.87	309.55	156.34
13	22.00	23.50	1.50	Granular	6.90	0.00	26	-	11.90	13.19	1.00	-	22.75	23.50	223.28	223.28	5.65	57.50	339.91	831.37	332.55	174.82
14	23.50	25.00	1.50	Granular	8.00	0.00	26	-	11.90	13.19	1.00	-	24.25	25.00	223.28	223.28	5.65	57.50	340.80	889.76	355.90	193.29
15	25.00	26.50	1.50	Granular	8.00	0.00	28	-	15.70	17.82	1.00	-	25.75	26.50	223.28	223.28	5.65	61.92	460.06	1070.94	428.38	213.00
16	26.50	28.00	1.50	Granular	8.70	0.00	28	-	15.70	17.82	1.00	-	27.25	28.00	223.28	223.28	5.65	61.92	460.81	1133.61	453.44	232.72
17	28.00	29.50	1.50	Granular	8.70	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	223.28	223.28	5.65	66.35	580.24	1319.39	527.76	253.67
18	29.50	30.00	0.50	Granular	8.70	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	223.28	223.28	1.88	22.12	580.24	1341.51	536.60	260.66

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	1.07	2.01	1.83	8.46	7.72	0.167	0.668	11.98	2.99	50.67	23.11	28.74	7.19	121.60	55.46
2	22.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	1.07	2.01	1.83	8.46	7.72	0.167	0.668	11.98	2.99	50.67	23.11	28.74	7.19	121.60	55.46
3	24.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	1.07	2.01	1.83	8.46	7.72	0.167	0.668	11.98	2.99	50.67	23.11	28.74	7.19	121.60	55.46
4	25.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	1.07	2.01	1.83	8.46	7.72	0.167	0.668	11.98	2.99	50.67	23.11	28.74	7.19	121.60	55.46
5	27.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	1.07	2.01	1.83	8.46	7.72	0.167	0.668	11.98	2.99	50.67	23.11	28.74	7.19	121.60	55.46
6	28.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	1.08	2.01	1.83	8.35	7.62	0.161	0.642	12.46	3.11	52.02	23.73	29.90	7.47	124.84	56.96
7	30.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	1.08	2.01	1.83	8.35	7.62	0.161	0.642	12.46	3.11	52.02	23.73	29.90	7.47	124.84	56.96

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-13	-
Chainage	1+214	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	183.45	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	13.40	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-13	1.00	22.00	19.50	19.50	259.38	131.96	7.95	1.99
BH-13	1.00	23.50	21.00	21.00	276.34	145.48	8.28	2.07
BH-13	1.00	25.00	22.50	22.50	293.29	159.00	8.28	2.07
BH-13	1.00	26.50	24.00	24.00	310.70	172.52	8.28	2.07
BH-13	1.00	28.00	25.50	25.50	356.30	186.89	8.61	2.15
BH-13	1.00	29.50	27.00	27.00	374.47	201.26	8.93	2.23
BH-13	1.00	30.00	27.50	27.50	380.53	206.05	9.25	2.31

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	15.40	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	11.55	23.10	4.71	2.48	31.24	33.72	13.49	5.09
2	4.00	5.50	1.50	Granular	16.70	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	35.63	48.15	4.71	7.65	57.90	68.02	27.21	8.88
3	5.50	7.00	1.50	Granular	16.70	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	60.68	73.20	4.71	13.02	83.95	107.09	42.84	14.18
4	7.00	8.50	1.50	Granular	16.70	0.00	26	-	11.90	13.19	1.00	-	7.75	8.50	85.73	98.25	4.71	18.40	110.00	151.54	60.62	20.98
5	8.50	10.00	1.50	Granular	16.70	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	110.78	123.30	4.71	23.77	136.04	201.36	80.54	29.28
6	10.00	11.50	1.50	Granular	16.70	0.00	26	-	11.90	13.19	1.00	-	10.75	11.50	135.83	148.35	4.71	29.15	162.09	256.56	102.62	39.10
7	11.50	13.00	1.50	Granular	16.70	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	160.88	173.40	4.71	37.18	253.84	385.49	154.19	51.16
7	13.00	14.50	1.50	Granular	6.70	0.00	28	-	15.70	17.82	1.00	-	13.75	14.50	178.43	183.45	4.71	41.24	261.77	434.65	173.86	64.35
8	14.50	16.00	1.50	Granular	6.70	0.00	28	-	15.70	17.82	1.00	-	15.25	16.00	183.45	183.45	4.71	42.40	261.77	477.05	190.82	77.87
9	16.00	17.50	1.50	Granular	6.70	0.00	28	-	15.70	17.82	1.00	-	16.75	17.50	183.45	183.45	4.71	42.40	261.77	519.45	207.78	91.39
10	17.50	19.00	1.50	Granular	6.70	0.00	28	-	15.70	17.82	1.00	-	18.25	19.00	183.45	183.45	4.71	42.40	261.77	561.85	224.74	104.91
11	19.00	20.50	1.50	Granular	9.60	0.00	28	-	15.70	17.82	1.00	-	19.75	20.50	183.45	183.45	4.71	42.40	263.56	606.04	242.42	118.44
12	20.50	22.00	1.50	Granular	9.60	0.00	28	-	15.70	17.82	1.00	-	21.25	22.00	183.45	183.45	4.71	42.40	263.56	648.44	259.38	131.96
13	22.00	23.50	1.50	Granular	9.60	0.00	28	-	15.70	17.82	1.00	-	22.75	23.50	183.45	183.45	4.71	42.40	263.56	690.84	276.34	145.48
14	23.50	25.00	1.50	Granular	9.60	0.00	28	-	15.70	17.82	1.00	-	24.25	25.00	183.45	183.45	4.71	42.40	263.56	733.24	293.29	159.00
15	25.00	26.50	1.50	Granular	11.40	0.00	28	-	15.70	17.82	1.00	-	25.75	26.50	183.45	183.45	4.71	42.40	264.67	776.75	310.70	172.52
16	26.50	28.00	1.50	Granular	11.40	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	183.45	183.45	4.71	45.43	333.24	890.75	356.30	186.89
17	28.00	29.50	1.50	Granular	11.40	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	183.45	183.45	4.71	45.43	333.24	936.18	374.47	201.26
18	29.50	30.00	0.50	Granular	11.40	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	183.45	183.45	1.57	15.14	333.24	951.32	380.53	206.05

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.68	2.06	1.85	7.61	6.82	0.252	1.007	7.95	1.99	30.23	13.55	19.07	4.77	72.55	32.51
2	22.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
3	24.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
4	25.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
5	27.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33
6	28.50	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
7	30.00	19	2.96E+07	4.91E-02	2.70E+03	3.52	0.71	2.06	1.85	7.23	6.49	0.216	0.865	9.25	2.31	33.44	15.01	22.19	5.55	80.26	36.03

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-13	-
Chainage	1+214	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	203.55	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	13.40	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-13	1.20	22.00	19.50	19.50	362.41	170.40	10.42	2.60
BH-13	1.20	23.50	21.00	21.00	385.00	188.58	10.85	2.71
BH-13	1.20	25.00	22.50	22.50	407.58	206.76	10.85	2.71
BH-13	1.20	26.50	24.00	24.00	430.93	224.94	10.85	2.71
BH-13	1.20	28.00	25.50	25.50	499.04	244.25	11.28	2.82
BH-13	1.20	29.50	27.00	27.00	523.23	263.57	11.70	2.93
BH-13	1.20	30.00	27.50	27.50	531.29	270.00	12.11	3.03

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	15.40	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	11.55	23.10	5.65	2.97	47.07	50.04	20.02	7.17
2	4.00	5.50	1.50	Granular	16.70	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	35.63	48.15	5.65	9.17	85.63	97.78	39.11	12.11
3	5.50	7.00	1.50	Granular	16.70	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	60.68	73.20	5.65	15.63	123.14	150.92	60.37	18.86
4	7.00	8.50	1.50	Granular	16.70	0.00	26	-	11.90	13.19	1.00	-	7.75	8.50	85.73	98.25	5.65	22.08	160.65	210.50	84.20	27.42
5	8.50	10.00	1.50	Granular	16.70	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	110.78	123.30	5.65	28.53	198.16	276.54	110.62	37.78
6	10.00	11.50	1.50	Granular	16.70	0.00	26	-	11.90	13.19	1.00	-	10.75	11.50	135.83	148.35	5.65	34.98	235.67	349.03	139.61	49.95
7	11.50	13.00	1.50	Granular	16.70	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	160.88	173.40	5.65	44.62	368.50	526.48	210.59	64.82
7	13.00	14.50	1.50	Granular	6.70	0.00	28	-	15.70	17.82	1.00	-	13.75	14.50	178.43	183.45	5.65	49.49	378.14	585.60	234.24	81.05
8	14.50	16.00	1.50	Granular	6.70	0.00	28	-	15.70	17.82	1.00	-	15.25	16.00	188.48	193.50	5.65	52.27	398.46	658.19	263.28	98.06
9	16.00	17.50	1.50	Granular	6.70	0.00	28	-	15.70	17.82	1.00	-	16.75	17.50	198.53	203.55	5.65	55.06	418.78	733.58	293.43	115.85
10	17.50	19.00	1.50	Granular	6.70	0.00	28	-	15.70	17.82	1.00	-	18.25	19.00	203.55	203.55	5.65	56.45	418.78	790.03	316.01	134.03
11	19.00	20.50	1.50	Granular	9.60	0.00	28	-	15.70	17.82	1.00	-	19.75	20.50	203.55	203.55	5.65	56.45	421.88	849.58	339.83	152.22
12	20.50	22.00	1.50	Granular	9.60	0.00	28	-	15.70	17.82	1.00	-	21.25	22.00	203.55	203.55	5.65	56.45	421.88	906.04	362.41	170.40
13	22.00	23.50	1.50	Granular	9.60	0.00	28	-	15.70	17.82	1.00	-	22.75	23.50	203.55	203.55	5.65	56.45	421.88	962.49	385.00	188.58
14	23.50	25.00	1.50	Granular	9.60	0.00	28	-	15.70	17.82	1.00	-	24.25	25.00	203.55	203.55	5.65	56.45	421.88	1018.94	407.58	206.76
15	25.00	26.50	1.50	Granular	11.40	0.00	28	-	15.70	17.82	1.00	-	25.75	26.50	203.55	203.55	5.65	56.45	423.81	1077.32	430.93	224.94
16	26.50	28.00	1.50	Granular	11.40	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	203.55	203.55	5.65	60.49	533.59	1247.59	499.04	244.25
17	28.00	29.50	1.50	Granular	11.40	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	203.55	203.55	5.65	60.49	533.59	1308.08	523.23	263.57
18	29.50	30.00	0.50	Granular	11.40	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	203.55	203.55	1.88	20.16	533.59	1328.24	531.29	270.00

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_t/T Ratio	L_e/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.59	2.08	1.85	8.86	7.91	0.192	0.768	10.42	2.60	46.16	20.59	25.00	6.25	110.80	49.43
2	22.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
3	24.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
4	25.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
5	27.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17
6	28.50	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
7	30.00	19	2.96E+07	1.02E-01	2.70E+03	4.07	0.61	2.07	1.85	8.43	7.53	0.165	0.660	12.11	3.03	51.05	22.81	29.07	7.27	122.53	54.74

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-14	-
Chainage	1+293	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	189.60	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	13.40	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-14	1.00	22.00	19.50	19.50	208.59	113.86	7.95	1.99
BH-14	1.00	23.50	21.00	21.00	283.70	128.66	8.28	2.07
BH-14	1.00	25.00	22.50	22.50	302.48	143.45	8.28	2.07
BH-14	1.00	26.50	24.00	24.00	321.69	158.25	8.28	2.07
BH-14	1.00	28.00	25.50	25.50	340.47	173.04	8.61	2.15
BH-14	1.00	29.50	27.00	27.00	359.25	187.84	8.93	2.23
BH-14	1.00	30.00	27.50	27.50	365.51	192.77	9.25	2.31

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	16.20	0.00	21	-	2.00	6.49	1.00	-	3.25	4.00	12.15	24.30	4.71	2.11	13.70	15.81	6.32	4.99
2	4.00	5.50	1.50	Granular	16.20	0.00	21	-	2.00	6.49	1.00	-	4.75	5.50	36.45	48.60	4.71	6.32	26.13	34.56	13.82	8.41
3	5.50	7.00	1.50	Granular	16.90	0.00	20	-	0.00	5.39	1.00	-	6.25	7.00	61.28	73.95	4.71	10.12	31.42	49.96	19.98	12.89
4	7.00	8.50	1.50	Granular	16.90	0.00	20	-	0.00	5.39	1.00	-	7.75	8.50	86.63	99.30	4.71	0.00	42.19	60.73	24.29	14.54
5	8.50	10.00	1.50	Granular	16.90	0.00	21	-	2.00	6.49	1.00	-	9.25	10.00	111.98	124.65	4.71	0.00	65.08	83.62	33.45	16.19
6	10.00	11.50	1.50	Granular	16.90	0.00	21	-	2.00	6.49	1.00	-	10.75	11.50	137.33	150.00	4.71	23.80	78.04	120.39	48.15	24.50
7	11.50	13.00	1.50	Granular	18.10	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	163.58	177.15	4.71	35.11	192.69	270.14	108.06	35.98
7	13.00	14.50	1.50	Granular	8.30	0.00	26	-	11.90	13.19	1.00	-	13.75	14.50	183.38	189.60	4.71	39.35	201.04	317.85	127.14	48.65
8	14.50	16.00	1.50	Granular	8.30	0.00	26	-	11.90	13.19	1.00	-	15.25	16.00	189.60	189.60	4.71	40.69	201.04	358.54	143.41	61.69
9	16.00	17.50	1.50	Granular	8.30	0.00	26	-	11.90	13.19	1.00	-	16.75	17.50	189.60	189.60	4.71	40.69	201.04	399.23	159.69	74.73
10	17.50	19.00	1.50	Granular	8.30	0.00	26	-	11.90	13.19	1.00	-	18.25	19.00	189.60	189.60	4.71	40.69	201.04	439.92	175.97	87.78
11	19.00	20.50	1.50	Granular	8.70	0.00	26	-	11.90	13.19	1.00	-	19.75	20.50	189.60	189.60	4.71	40.69	201.23	480.80	192.32	100.82
12	20.50	22.00	1.50	Granular	8.70	0.00	26	-	11.90	13.19	1.00	-	21.25	22.00	189.60	189.60	4.71	40.69	201.23	521.49	208.59	113.86
13	22.00	23.50	1.50	Granular	8.70	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	189.60	189.60	4.71	46.95	342.05	709.25	283.70	128.66
14	23.50	25.00	1.50	Granular	8.70	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	189.60	189.60	4.71	46.95	342.05	756.20	302.48	143.45
15	25.00	26.50	1.50	Granular	10.10	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	189.60	189.60	4.71	46.95	343.12	804.23	321.69	158.25
16	26.50	28.00	1.50	Granular	10.10	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	189.60	189.60	4.71	46.95	343.12	851.18	340.47	173.04
17	28.00	29.50	1.50	Granular	10.10	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	189.60	189.60	4.71	46.95	343.12	898.13	359.25	187.84
18	29.50	30.00	0.50	Granular	10.10	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	189.60	189.60	1.57	15.65	343.12	913.78	365.51	192.77

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.68	2.06	1.85	7.61	6.82	0.252	1.007	7.95	1.99	30.23	13.55	19.07	4.77	72.55	32.51
2	22.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
3	24.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
4	25.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
5	27.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33
6	28.50	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
7	30.00	19	2.96E+07	4.91E-02	2.70E+03	3.52	0.71	2.06	1.85	7.23	6.49	0.216	0.865	9.25	2.31	33.44	15.01	22.19	5.55	80.26	36.03

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-14	-
Chainage	1+293	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	214.50	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	13.40	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-14	1.20	22.00	19.50	19.50	295.28	149.62	10.42	2.60
BH-14	1.20	23.50	21.00	21.00	412.64	169.84	10.85	2.71
BH-14	1.20	25.00	22.50	22.50	438.13	190.07	10.85	2.71
BH-14	1.20	26.50	24.00	24.00	464.37	210.29	10.85	2.71
BH-14	1.20	28.00	25.50	25.50	489.87	230.51	11.28	2.82
BH-14	1.20	29.50	27.00	27.00	515.36	250.73	11.70	2.93
BH-14	1.20	30.00	27.50	27.50	523.86	257.47	12.11	3.03

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (Ki)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	16.20	0.00	21	-	2.00	6.49	1.00	-	3.25	4.00	12.15	24.30	5.65	2.53	20.10	22.63	9.05	7.04
2	4.00	5.50	1.50	Granular	16.20	0.00	21	-	2.00	6.49	1.00	-	4.75	5.50	36.45	48.60	5.65	7.58	38.00	48.11	19.24	11.54
3	5.50	7.00	1.50	Granular	16.90	0.00	20	-	0.00	5.39	1.00	-	6.25	7.00	61.28	73.95	5.65	12.14	45.24	67.49	27.00	17.31
4	7.00	8.50	1.50	Granular	16.90	0.00	20	-	0.00	5.39	1.00	-	7.75	8.50	86.63	99.30	5.65	0.00	60.75	83.00	33.20	19.69
5	8.50	10.00	1.50	Granular	16.90	0.00	21	-	2.00	6.49	1.00	-	9.25	10.00	111.98	124.65	5.65	0.00	94.10	116.34	46.54	22.06
6	10.00	11.50	1.50	Granular	16.90	0.00	21	-	2.00	6.49	1.00	-	10.75	11.50	137.33	150.00	5.65	28.56	112.76	163.58	65.43	32.44
7	11.50	13.00	1.50	Granular	18.10	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	163.58	177.15	5.65	42.13	279.92	372.86	149.15	46.61
7	13.00	14.50	1.50	Granular	8.30	0.00	26	-	11.90	13.19	1.00	-	13.75	14.50	183.38	189.60	5.65	47.23	290.62	430.79	172.32	62.20
8	14.50	16.00	1.50	Granular	8.30	0.00	26	-	11.90	13.19	1.00	-	15.25	16.00	195.83	202.05	5.65	50.43	309.27	499.86	199.94	78.70
9	16.00	17.50	1.50	Granular	8.30	0.00	26	-	11.90	13.19	1.00	-	16.75	17.50	208.28	214.50	5.65	53.64	327.91	572.14	228.86	96.09
10	17.50	19.00	1.50	Granular	8.30	0.00	26	-	11.90	13.19	1.00	-	18.25	19.00	214.50	214.50	5.65	55.24	327.91	627.38	250.95	113.94
11	19.00	20.50	1.50	Granular	8.70	0.00	26	-	11.90	13.19	1.00	-	19.75	20.50	214.50	214.50	5.65	55.24	328.23	682.95	273.18	131.78
12	20.50	22.00	1.50	Granular	8.70	0.00	26	-	11.90	13.19	1.00	-	21.25	22.00	214.50	214.50	5.65	55.24	328.23	738.19	295.28	149.62
13	22.00	23.50	1.50	Granular	8.70	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	214.50	214.50	5.65	63.74	557.89	1031.59	412.64	169.84
14	23.50	25.00	1.50	Granular	8.70	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	214.50	214.50	5.65	63.74	557.89	1095.33	438.13	190.07
15	25.00	26.50	1.50	Granular	10.10	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	214.50	214.50	5.65	63.74	559.75	1160.93	464.37	210.29
16	26.50	28.00	1.50	Granular	10.10	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	214.50	214.50	5.65	63.74	559.75	1224.67	489.87	230.51
17	28.00	29.50	1.50	Granular	10.10	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	214.50	214.50	5.65	63.74	559.75	1288.41	515.36	250.73
18	29.50	30.00	0.50	Granular	10.10	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	214.50	214.50	1.88	21.25	559.75	1309.65	523.86	257.47

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_i/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.59	2.08	1.85	8.86	7.91	0.192	0.768	10.42	2.60	46.16	20.59	25.00	6.25	110.80	49.43
2	22.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
3	24.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
4	25.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
5	27.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17
6	28.50	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
7	30.00	19	2.96E+07	1.02E-01	2.70E+03	4.07	0.61	2.07	1.85	8.43	7.53	0.165	0.660	12.11	3.03	51.05	22.81	29.07	7.27	122.53	54.74

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-15	-
Chainage	1+392	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	182.10	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	13.80	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-15	1.00	22.00	19.50	19.50	185.62	109.52	8.28	2.07
BH-15	1.00	23.50	21.00	21.00	258.22	123.37	8.28	2.07
BH-15	1.00	25.00	22.50	22.50	275.66	137.23	8.61	2.15
BH-15	1.00	26.50	24.00	24.00	292.82	151.08	8.61	2.15
BH-15	1.00	28.00	25.50	25.50	324.46	165.36	8.93	2.23
BH-15	1.00	29.50	27.00	27.00	342.50	179.63	8.93	2.23
BH-15	1.00	30.00	27.50	27.50	348.51	184.39	9.25	2.31

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	15.70	0.00	20	-	0.00	5.39	1.00	-	3.25	4.00	11.78	23.55	4.71	1.94	10.01	11.95	4.78	4.94
2	4.00	5.50	1.50	Granular	15.70	0.00	20	-	0.00	5.39	1.00	-	4.75	5.50	35.33	47.10	4.71	5.83	20.01	27.79	11.11	8.22
3	5.50	7.00	1.50	Granular	15.70	0.00	20	-	0.00	5.39	1.00	-	6.25	7.00	58.88	70.65	4.71	9.72	30.02	47.51	19.00	12.60
4	7.00	8.50	1.50	Granular	15.70	0.00	20	-	0.00	5.39	1.00	-	7.75	8.50	82.43	94.20	4.71	13.61	40.02	71.12	28.45	18.05
5	8.50	10.00	1.50	Granular	17.10	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	107.03	119.85	4.71	22.97	132.64	186.71	74.69	26.14
6	10.00	11.50	1.50	Granular	17.10	0.00	26	-	11.90	13.19	1.00	-	10.75	11.50	132.68	145.50	4.71	28.47	159.31	241.86	96.74	35.76
7	11.50	13.00	1.50	Granular	17.10	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	158.33	171.15	4.71	33.98	185.99	302.51	121.00	46.92
7	13.00	14.50	1.50	Granular	7.30	0.00	26	-	11.90	13.19	1.00	-	13.75	14.50	176.63	182.10	4.71	37.91	192.78	347.20	138.88	59.18
8	14.50	16.00	1.50	Granular	8.00	0.00	25	-	10.00	10.88	1.00	-	15.25	16.00	182.10	182.10	4.71	0.00	159.32	313.75	125.50	60.83
9	16.00	17.50	1.50	Granular	8.00	0.00	25	-	10.00	10.88	1.00	-	16.75	17.50	182.10	182.10	4.71	37.58	159.32	351.33	140.53	73.00
10	17.50	19.00	1.50	Granular	8.00	0.00	25	-	10.00	10.88	1.00	-	18.25	19.00	182.10	182.10	4.71	37.58	159.32	388.90	155.56	85.18
11	19.00	20.50	1.50	Granular	8.00	0.00	25	-	10.00	10.88	1.00	-	19.75	20.50	182.10	182.10	4.71	37.58	159.32	426.48	170.59	97.35
12	20.50	22.00	1.50	Granular	8.00	0.00	25	-	10.00	10.88	1.00	-	21.25	22.00	182.10	182.10	4.71	37.58	159.32	464.06	185.62	109.52
13	22.00	23.50	1.50	Granular	12.00	0.00	29	-	17.60	20.13	1.00	-	22.75	23.50	182.10	182.10	4.71	43.59	297.23	645.56	258.22	123.37
14	23.50	25.00	1.50	Granular	12.00	0.00	29	-	17.60	20.13	1.00	-	24.25	25.00	182.10	182.10	4.71	43.59	297.23	689.15	275.66	137.23
15	25.00	26.50	1.50	Granular	11.00	0.00	29	-	17.60	20.13	1.00	-	25.75	26.50	182.10	182.10	4.71	43.59	296.54	732.05	292.82	151.08
16	26.50	28.00	1.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	182.10	182.10	4.71	45.09	330.55	811.15	324.46	165.36
17	28.00	29.50	1.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	182.10	182.10	4.71	45.09	330.55	856.24	342.50	179.63
18	29.50	30.00	0.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	182.10	182.10	1.57	15.03	330.55	871.27	348.51	184.39

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_t/T Ratio	L_t/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
2	22.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
3	24.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33
4	25.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33
5	27.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
6	28.50	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
7	30.00	19	2.96E+07	4.91E-02	2.70E+03	3.52	0.71	2.06	1.85	7.23	6.49	0.216	0.865	9.25	2.31	33.44	15.01	22.19	5.55	80.26	36.03

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-15	-
Chainage	1+392	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	206.10	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	13.80	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-15	1.20	22.00	19.50	19.50	259.18	143.47	10.85	2.71
BH-15	1.20	23.50	21.00	21.00	372.97	162.42	10.85	2.71
BH-15	1.20	25.00	22.50	22.50	396.65	181.37	11.28	2.82
BH-15	1.20	26.50	24.00	24.00	419.85	200.32	11.28	2.82
BH-15	1.20	28.00	25.50	25.50	466.55	219.84	11.70	2.93
BH-15	1.20	29.50	27.00	27.00	491.05	239.37	11.70	2.93
BH-15	1.20	30.00	27.50	27.50	499.21	245.88	12.11	3.03

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	15.70	0.00	20	-	0.00	5.39	1.00	-	3.25	4.00	11.78	23.55	5.65	2.33	14.41	16.74	6.70	6.99
2	4.00	5.50	1.50	Granular	15.70	0.00	20	-	0.00	5.39	1.00	-	4.75	5.50	35.33	47.10	5.65	7.00	28.82	38.15	15.26	11.32
3	5.50	7.00	1.50	Granular	15.70	0.00	20	-	0.00	5.39	1.00	-	6.25	7.00	58.88	70.65	5.65	11.66	43.22	64.22	25.69	16.96
4	7.00	8.50	1.50	Granular	15.70	0.00	20	-	0.00	5.39	1.00	-	7.75	8.50	82.43	94.20	5.65	16.33	57.63	94.95	37.98	23.91
5	8.50	10.00	1.50	Granular	17.10	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	107.03	119.85	5.65	27.56	193.32	258.20	103.28	34.00
6	10.00	11.50	1.50	Granular	17.10	0.00	26	-	11.90	13.19	1.00	-	10.75	11.50	132.68	145.50	5.65	34.17	231.72	330.78	132.31	45.94
7	11.50	13.00	1.50	Granular	17.10	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	158.33	171.15	5.65	40.77	270.13	409.96	163.98	59.74
7	13.00	14.50	1.50	Granular	7.30	0.00	26	-	11.90	13.19	1.00	-	13.75	14.50	176.63	182.10	5.65	45.49	278.58	463.90	185.56	74.85
8	14.50	16.00	1.50	Granular	8.00	0.00	25	-	10.00	10.88	1.00	-	15.25	16.00	188.10	194.10	5.65	0.00	245.15	430.46	172.18	77.22
9	16.00	17.50	1.50	Granular	8.00	0.00	25	-	10.00	10.88	1.00	-	16.75	17.50	200.10	206.10	5.65	49.55	259.97	494.83	197.93	93.47
10	17.50	19.00	1.50	Granular	8.00	0.00	25	-	10.00	10.88	1.00	-	18.25	19.00	206.10	206.10	5.65	51.04	259.97	545.87	218.35	110.14
11	19.00	20.50	1.50	Granular	8.00	0.00	25	-	10.00	10.88	1.00	-	19.75	20.50	206.10	206.10	5.65	51.04	259.97	596.90	238.76	126.80
12	20.50	22.00	1.50	Granular	8.00	0.00	25	-	10.00	10.88	1.00	-	21.25	22.00	206.10	206.10	5.65	51.04	259.97	647.94	259.18	143.47
13	22.00	23.50	1.50	Granular	12.00	0.00	29	-	17.60	20.13	1.00	-	22.75	23.50	206.10	206.10	5.65	59.20	485.24	932.42	372.97	162.42
14	23.50	25.00	1.50	Granular	12.00	0.00	29	-	17.60	20.13	1.00	-	24.25	25.00	206.10	206.10	5.65	59.20	485.24	991.62	396.65	181.37
15	25.00	26.50	1.50	Granular	11.00	0.00	29	-	17.60	20.13	1.00	-	25.75	26.50	206.10	206.10	5.65	59.20	484.04	1049.62	419.85	200.32
16	26.50	28.00	1.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	206.10	206.10	5.65	61.24	539.55	1166.38	466.55	219.84
17	28.00	29.50	1.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	206.10	206.10	5.65	61.24	539.55	1227.62	491.05	239.37
18	29.50	30.00	0.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	206.10	206.10	1.88	20.41	539.55	1248.03	499.21	245.88

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
2	22.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
3	24.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17
4	25.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17
5	27.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
6	28.50	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
7	30.00	19	2.96E+07	1.02E-01	2.70E+03	4.07	0.61	2.07	1.85	8.43	7.53	0.165	0.660	12.11	3.03	51.05	22.81	29.07	7.27	122.53	54.74

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-16	-
Chainage	1+487	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	184.95	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	9.50	mtr
Groundwater Level from OGL	13.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-16	1.00	22.00	19.50	12.50	245.57	112.49	10.18	2.55
BH-16	1.00	23.50	21.00	14.00	248.97	126.11	10.18	2.55
BH-16	1.00	25.00	22.50	15.50	266.06	139.73	10.18	2.55
BH-16	1.00	26.50	24.00	17.00	283.95	153.35	10.18	2.55
BH-16	1.00	28.00	25.50	18.50	301.05	166.96	10.18	2.55
BH-16	1.00	29.50	27.00	20.00	346.97	181.44	10.18	2.55
BH-16	1.00	30.00	27.50	20.50	353.08	186.26	10.18	2.55

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (Ki)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	16.30	0.00	20	-	0.00	5.39	1.00	-	3.25	4.00	12.23	24.45	4.71	0.00	0.00	0.00	0.00	4.40
2	4.00	5.50	1.50	Granular	16.30	0.00	20	-	0.00	5.39	1.00	-	4.75	5.50	36.68	48.90	4.71	0.00	0.00	0.00	0.00	6.05
3	5.50	7.00	1.50	Granular	16.30	0.00	20	-	0.00	5.39	1.00	-	6.25	7.00	61.13	73.35	4.71	0.00	0.00	0.00	0.00	7.70
4	7.00	8.50	1.50	Granular	16.30	0.00	27	-	13.80	15.50	1.00	-	7.75	8.50	85.58	97.80	4.71	0.00	0.00	0.00	0.00	9.35
5	8.50	10.00	1.50	Granular	16.30	0.00	27	-	13.80	15.50	1.00	-	9.25	10.00	110.03	122.25	4.71	0.00	158.26	158.26	63.31	11.00
6	10.00	11.50	1.50	Granular	17.20	0.00	27	-	13.80	15.50	1.00	-	10.75	11.50	135.15	148.05	4.71	30.12	190.28	220.40	88.16	21.08
7	11.50	13.00	1.50	Granular	17.20	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	160.95	173.85	4.71	34.54	188.84	253.50	101.40	32.40
7	13.00	14.50	1.50	Granular	7.40	0.00	26	-	11.90	13.19	1.00	-	13.75	14.50	179.40	184.95	4.71	38.50	195.79	298.95	119.58	44.83
8	14.50	16.00	1.50	Granular	7.40	0.00	26	-	11.90	13.19	1.00	-	15.25	16.00	184.95	184.95	4.71	39.69	195.79	338.64	135.46	57.59
9	16.00	17.50	1.50	Granular	7.40	0.00	26	-	11.90	13.19	1.00	-	16.75	17.50	184.95	184.95	4.71	39.69	195.79	378.33	151.33	70.36
10	17.50	19.00	1.50	Granular	7.40	0.00	29	-	17.60	20.13	1.00	-	18.25	19.00	184.95	184.95	4.71	44.27	298.56	525.38	210.15	84.40
11	19.00	20.50	1.50	Granular	7.40	0.00	29	-	17.60	20.13	1.00	-	19.75	20.50	184.95	184.95	4.71	44.27	298.56	569.66	227.86	98.45
12	20.50	22.00	1.50	Granular	7.40	0.00	29	-	17.60	20.13	1.00	-	21.25	22.00	184.95	184.95	4.71	44.27	298.56	613.93	245.57	112.49
13	22.00	23.50	1.50	Granular	7.40	0.00	28	-	15.70	17.82	1.00	-	22.75	23.50	184.95	184.95	4.71	42.75	264.30	622.41	248.97	126.11
14	23.50	25.00	1.50	Granular	7.40	0.00	28	-	15.70	17.82	1.00	-	24.25	25.00	184.95	184.95	4.71	42.75	264.30	665.16	266.06	139.73
15	25.00	26.50	1.50	Granular	10.60	0.00	28	-	15.70	17.82	1.00	-	25.75	26.50	184.95	184.95	4.71	42.75	266.28	709.89	283.95	153.35
16	26.50	28.00	1.50	Granular	10.60	0.00	28	-	15.70	17.82	1.00	-	27.25	28.00	184.95	184.95	4.71	42.75	266.28	752.63	301.05	166.96
17	28.00	29.50	1.50	Granular	10.60	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	184.95	184.95	4.71	45.80	335.28	867.43	346.97	181.44
18	29.50	30.00	0.50	Granular	10.60	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	184.95	184.95	1.57	15.27	335.28	882.69	353.08	186.26

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	2.57	1.90	1.79	7.00	6.62	0.196	0.786	10.18	2.55	35.66	16.85	24.44	6.11	85.58	40.45
2	22.50	15	2.96E+07	4.91E-02	2.12E+03	3.69	2.57	1.90	1.79	7.00	6.62	0.196	0.786	10.18	2.55	35.66	16.85	24.44	6.11	85.58	40.45
3	24.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	2.57	1.90	1.79	7.00	6.62	0.196	0.786	10.18	2.55	35.66	16.85	24.44	6.11	85.58	40.45
4	25.50	15	2.96E+07	4.91E-02	2.12E+03	3.69	2.57	1.90	1.79	7.00	6.62	0.196	0.786	10.18	2.55	35.66	16.85	24.44	6.11	85.58	40.45
5	27.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	2.57	1.90	1.79	7.00	6.62	0.196	0.786	10.18	2.55	35.66	16.85	24.44	6.11	85.58	40.45
6	28.50	15	2.96E+07	4.91E-02	2.12E+03	3.69	2.57	1.90	1.79	7.00	6.62	0.196	0.786	10.18	2.55	35.66	16.85	24.44	6.11	85.58	40.45
7	30.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	2.57	1.90	1.79	7.00	6.62	0.196	0.786	10.18	2.55	35.66	16.85	24.44	6.11	85.58	40.45

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-16	-
Chainage	1+487	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	207.15	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	9.50	mtr
Groundwater Level from OGL	13.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-16	1.20	22.00	19.50	12.50	354.17	147.75	13.32	3.33
BH-16	1.20	23.50	21.00	14.00	355.02	166.22	13.32	3.33
BH-16	1.20	25.00	22.50	15.50	378.00	184.68	13.32	3.33
BH-16	1.20	26.50	24.00	17.00	402.35	203.14	13.32	3.33
BH-16	1.20	28.00	25.50	18.50	425.33	221.60	13.32	3.33
BH-16	1.20	29.50	27.00	20.00	494.54	241.21	13.32	3.33
BH-16	1.20	30.00	27.50	20.50	502.75	247.75	13.32	3.33

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (Ki)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	16.30	0.00	20	-	0.00	5.39	1.00	-	3.25	4.00	12.23	24.45	5.65	0.00	0.00	0.00	0.00	6.33
2	4.00	5.50	1.50	Granular	16.30	0.00	20	-	0.00	5.39	1.00	-	4.75	5.50	36.68	48.90	5.65	0.00	0.00	0.00	0.00	8.71
3	5.50	7.00	1.50	Granular	16.30	0.00	20	-	0.00	5.39	1.00	-	6.25	7.00	61.13	73.35	5.65	0.00	0.00	0.00	0.00	11.08
4	7.00	8.50	1.50	Granular	16.30	0.00	27	-	13.80	15.50	1.00	-	7.75	8.50	85.58	97.80	5.65	0.00	0.00	0.00	0.00	13.46
5	8.50	10.00	1.50	Granular	16.30	0.00	27	-	13.80	15.50	1.00	-	9.25	10.00	110.03	122.25	5.65	0.00	230.45	230.45	92.18	15.83
6	10.00	11.50	1.50	Granular	17.20	0.00	27	-	13.80	15.50	1.00	-	10.75	11.50	135.15	148.05	5.65	36.14	276.70	312.84	125.14	28.33
7	11.50	13.00	1.50	Granular	17.20	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	160.95	173.85	5.65	41.45	274.25	351.85	140.74	42.31
7	13.00	14.50	1.50	Granular	7.40	0.00	26	-	11.90	13.19	1.00	-	13.75	14.50	179.40	184.95	5.65	46.20	282.93	406.73	162.69	57.62
8	14.50	16.00	1.50	Granular	7.40	0.00	26	-	11.90	13.19	1.00	-	15.25	16.00	190.50	196.05	5.65	49.06	299.55	472.41	188.96	73.73
9	16.00	17.50	1.50	Granular	7.40	0.00	26	-	11.90	13.19	1.00	-	16.75	17.50	201.60	207.15	5.65	51.92	316.17	540.95	216.38	90.65
10	17.50	19.00	1.50	Granular	7.40	0.00	29	-	17.60	20.13	1.00	-	18.25	19.00	207.15	207.15	5.65	59.50	482.13	766.41	306.56	109.68
11	19.00	20.50	1.50	Granular	7.40	0.00	29	-	17.60	20.13	1.00	-	19.75	20.50	207.15	207.15	5.65	59.50	482.13	825.91	330.36	128.72
12	20.50	22.00	1.50	Granular	7.40	0.00	29	-	17.60	20.13	1.00	-	21.25	22.00	207.15	207.15	5.65	59.50	482.13	885.41	354.17	147.75
13	22.00	23.50	1.50	Granular	7.40	0.00	28	-	15.70	17.82	1.00	-	22.75	23.50	207.15	207.15	5.65	57.45	426.81	887.55	355.02	166.22
14	23.50	25.00	1.50	Granular	7.40	0.00	28	-	15.70	17.82	1.00	-	24.25	25.00	207.15	207.15	5.65	57.45	426.81	945.00	378.00	184.68
15	25.00	26.50	1.50	Granular	10.60	0.00	28	-	15.70	17.82	1.00	-	25.75	26.50	207.15	207.15	5.65	57.45	430.23	1005.87	402.35	203.14
16	26.50	28.00	1.50	Granular	10.60	0.00	28	-	15.70	17.82	1.00	-	27.25	28.00	207.15	207.15	5.65	57.45	430.23	1063.32	425.33	221.60
17	28.00	29.50	1.50	Granular	10.60	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	207.15	207.15	5.65	61.56	541.70	1236.34	494.54	241.21
18	29.50	30.00	0.50	Granular	10.60	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	207.15	207.15	1.88	20.52	541.70	1256.86	502.75	247.75

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	2.22	1.91	1.80	8.17	7.69	0.150	0.601	13.32	3.33	54.39	25.59	31.97	7.99	130.53	61.42
2	22.50	15	2.96E+07	1.02E-01	2.12E+03	4.27	2.22	1.91	1.80	8.17	7.69	0.150	0.601	13.32	3.33	54.39	25.59	31.97	7.99	130.53	61.42
3	24.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	2.22	1.91	1.80	8.17	7.69	0.150	0.601	13.32	3.33	54.39	25.59	31.97	7.99	130.53	61.42
4	25.50	15	2.96E+07	1.02E-01	2.12E+03	4.27	2.22	1.91	1.80	8.17	7.69	0.150	0.601	13.32	3.33	54.39	25.59	31.97	7.99	130.53	61.42
5	27.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	2.22	1.91	1.80	8.17	7.69	0.150	0.601	13.32	3.33	54.39	25.59	31.97	7.99	130.53	61.42
6	28.50	15	2.96E+07	1.02E-01	2.12E+03	4.27	2.22	1.91	1.80	8.17	7.69	0.150	0.601	13.32	3.33	54.39	25.59	31.97	7.99	130.53	61.42
7	30.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	2.22	1.91	1.80	8.17	7.69	0.150	0.601	13.32	3.33	54.39	25.59	31.97	7.99	130.53	61.42

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-17	-
Chainage	1+587	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	179.10	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	9.00	mtr
Groundwater Level from OGL	13.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-17	1.00	22.00	19.50	13.00	199.39	101.26	8.75	2.19
BH-17	1.00	23.50	21.00	14.50	215.35	114.09	8.75	2.19
BH-17	1.00	25.00	22.50	16.00	231.32	126.91	9.21	2.30
BH-17	1.00	26.50	24.00	17.50	247.70	139.74	9.66	2.42
BH-17	1.00	28.00	25.50	19.00	305.50	153.80	9.66	2.42
BH-17	1.00	29.50	27.00	20.50	323.24	167.87	9.66	2.42
BH-17	1.00	30.00	27.50	21.00	329.15	172.56	9.66	2.42

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (Ki)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	15.70	0.00	22	-	4.00	7.59	1.00	-	3.25	4.00	11.78	23.55	4.71	0.00	0.00	0.00	0.00	4.40
2	4.00	5.50	1.50	Granular	15.70	0.00	22	-	4.00	7.59	1.00	-	4.75	5.50	35.33	47.10	4.71	0.00	0.00	0.00	0.00	6.05
3	5.50	7.00	1.50	Granular	15.70	0.00	22	-	4.00	7.59	1.00	-	6.25	7.00	58.88	70.65	4.71	0.00	0.00	0.00	0.00	7.70
4	7.00	8.50	1.50	Granular	15.70	0.00	22	-	4.00	7.59	1.00	-	7.75	8.50	82.43	94.20	4.71	0.00	0.00	0.00	0.00	9.35
5	8.50	10.00	1.50	Granular	15.70	0.00	22	-	4.00	7.59	1.00	-	9.25	10.00	105.98	117.75	4.71	19.24	72.88	92.13	36.85	16.38
6	10.00	11.50	1.50	Granular	15.70	0.00	22	-	4.00	7.59	1.00	-	10.75	11.50	129.53	141.30	4.71	23.52	86.97	129.73	51.89	24.62
7	11.50	13.00	1.50	Granular	17.50	0.00	22	-	4.00	7.59	1.00	-	12.25	13.00	154.43	167.55	4.71	28.04	102.94	173.75	69.50	34.12
7	13.00	14.50	1.50	Granular	7.70	0.00	22	-	4.00	7.59	1.00	-	13.75	14.50	173.33	179.10	4.71	31.47	108.31	210.59	84.24	44.58
8	14.50	16.00	1.50	Granular	7.70	0.00	22	-	4.00	7.59	1.00	-	15.25	16.00	179.10	179.10	4.71	32.52	108.31	243.11	97.25	55.34
9	16.00	17.50	1.50	Granular	7.70	0.00	22	-	4.00	7.59	1.00	-	16.75	17.50	179.10	179.10	4.71	32.52	108.31	275.64	110.25	66.09
10	17.50	19.00	1.50	Granular	8.00	0.00	23	-	6.00	8.68	1.00	-	18.25	19.00	179.10	179.10	4.71	34.00	124.48	325.82	130.33	77.26
11	19.00	20.50	1.50	Granular	8.00	0.00	23	-	6.00	8.68	1.00	-	19.75	20.50	179.10	179.10	4.71	34.00	124.48	359.82	143.93	88.43
12	20.50	22.00	1.50	Granular	8.00	0.00	27	-	13.80	15.50	1.00	-	21.25	22.00	179.10	179.10	4.71	39.92	223.22	498.47	199.39	101.26
13	22.00	23.50	1.50	Granular	8.00	0.00	27	-	13.80	15.50	1.00	-	22.75	23.50	179.10	179.10	4.71	39.92	223.22	538.39	215.35	114.09
14	23.50	25.00	1.50	Granular	8.00	0.00	27	-	13.80	15.50	1.00	-	24.25	25.00	179.10	179.10	4.71	39.92	223.22	578.30	231.32	126.91
15	25.00	26.50	1.50	Granular	9.90	0.00	27	-	13.80	15.50	1.00	-	25.75	26.50	179.10	179.10	4.71	39.92	224.26	619.25	247.70	139.74
16	26.50	28.00	1.50	Granular	9.90	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	179.10	179.10	4.71	44.35	324.40	763.74	305.50	153.80
17	28.00	29.50	1.50	Granular	9.90	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	179.10	179.10	4.71	44.35	324.40	808.09	323.24	167.87
18	29.50	30.00	0.50	Granular	9.90	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	179.10	179.10	1.57	14.78	324.40	822.87	329.15	172.56

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_e/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	12	2.96E+07	4.91E-02	1.69E+03	3.86	2.33	1.91	1.80	7.37	6.95	0.229	0.915	8.75	2.19	32.22	15.18	20.99	5.25	77.33	36.44
2	22.50	12	2.96E+07	4.91E-02	1.69E+03	3.86	2.33	1.91	1.80	7.37	6.95	0.229	0.915	8.75	2.19	32.22	15.18	20.99	5.25	77.33	36.44
3	24.00	13	2.96E+07	4.91E-02	1.83E+03	3.80	2.37	1.91	1.80	7.24	6.83	0.217	0.869	9.21	2.30	33.35	15.73	22.11	5.53	80.05	37.74
4	25.50	14	2.96E+07	4.91E-02	1.98E+03	3.74	2.40	1.90	1.80	7.13	6.73	0.207	0.828	9.66	2.42	34.43	16.24	23.19	5.80	82.64	38.98
5	27.00	14	2.96E+07	4.91E-02	1.98E+03	3.74	2.40	1.90	1.80	7.13	6.73	0.207	0.828	9.66	2.42	34.43	16.24	23.19	5.80	82.64	38.98
6	28.50	14	2.96E+07	4.91E-02	1.98E+03	3.74	2.40	1.90	1.80	7.13	6.73	0.207	0.828	9.66	2.42	34.43	16.24	23.19	5.80	82.64	38.98
7	30.00	14	2.96E+07	4.91E-02	1.98E+03	3.74	2.40	1.90	1.80	7.13	6.73	0.207	0.828	9.66	2.42	34.43	16.24	23.19	5.80	82.64	38.98

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-17	-
Chainage	1+587	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	202.20	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	9.00	mtr
Groundwater Level from OGL	13.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-17	1.20	22.00	19.50	13.00	286.15	133.40	11.41	2.85
BH-17	1.20	23.50	21.00	14.50	307.78	150.92	11.41	2.85
BH-17	1.20	25.00	22.50	16.00	329.41	168.44	12.02	3.01
BH-17	1.20	26.50	24.00	17.50	351.76	185.95	12.61	3.15
BH-17	1.20	28.00	25.50	19.00	441.00	205.15	12.61	3.15
BH-17	1.20	29.50	27.00	20.50	465.04	224.35	12.61	3.15
BH-17	1.20	30.00	27.50	21.00	473.05	230.75	12.61	3.15

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (Ki)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	15.70	0.00	22	-	4.00	7.59	1.00	-	3.25	4.00	11.78	23.55	5.65	0.00	0.00	0.00	0.00	6.33
2	4.00	5.50	1.50	Granular	15.70	0.00	22	-	4.00	7.59	1.00	-	4.75	5.50	35.33	47.10	5.65	0.00	0.00	0.00	0.00	8.71
3	5.50	7.00	1.50	Granular	15.70	0.00	22	-	4.00	7.59	1.00	-	6.25	7.00	58.88	70.65	5.65	0.00	0.00	0.00	0.00	11.08
4	7.00	8.50	1.50	Granular	15.70	0.00	22	-	4.00	7.59	1.00	-	7.75	8.50	82.43	94.20	5.65	0.00	0.00	0.00	0.00	13.46
5	8.50	10.00	1.50	Granular	15.70	0.00	22	-	4.00	7.59	1.00	-	9.25	10.00	105.98	117.75	5.65	23.09	105.66	128.76	51.50	22.30
6	10.00	11.50	1.50	Granular	15.70	0.00	22	-	4.00	7.59	1.00	-	10.75	11.50	129.53	141.30	5.65	28.23	125.94	177.26	70.90	32.58
7	11.50	13.00	1.50	Granular	17.50	0.00	22	-	4.00	7.59	1.00	-	12.25	13.00	154.43	167.55	5.65	33.65	149.04	234.00	93.60	44.38
7	13.00	14.50	1.50	Granular	7.70	0.00	22	-	4.00	7.59	1.00	-	13.75	14.50	173.33	179.10	5.65	37.77	156.31	279.05	111.62	57.33
8	14.50	16.00	1.50	Granular	7.70	0.00	22	-	4.00	7.59	1.00	-	15.25	16.00	184.88	190.65	5.65	40.29	166.26	329.28	131.71	70.98
9	16.00	17.50	1.50	Granular	7.70	0.00	22	-	4.00	7.59	1.00	-	16.75	17.50	196.43	202.20	5.65	42.80	176.20	382.03	152.81	85.34
10	17.50	19.00	1.50	Granular	8.00	0.00	23	-	6.00	8.68	1.00	-	18.25	19.00	202.20	202.20	5.65	46.06	202.57	454.47	181.79	100.61
11	19.00	20.50	1.50	Granular	8.00	0.00	23	-	6.00	8.68	1.00	-	19.75	20.50	202.20	202.20	5.65	46.06	202.57	500.53	200.21	115.89
12	20.50	22.00	1.50	Granular	8.00	0.00	27	-	13.80	15.50	1.00	-	21.25	22.00	202.20	202.20	5.65	54.08	363.34	715.38	286.15	133.40
13	22.00	23.50	1.50	Granular	8.00	0.00	27	-	13.80	15.50	1.00	-	22.75	23.50	202.20	202.20	5.65	54.08	363.34	769.46	307.78	150.92
14	23.50	25.00	1.50	Granular	8.00	0.00	27	-	13.80	15.50	1.00	-	24.25	25.00	202.20	202.20	5.65	54.08	363.34	823.53	329.41	168.44
15	25.00	26.50	1.50	Granular	9.90	0.00	27	-	13.80	15.50	1.00	-	25.75	26.50	202.20	202.20	5.65	54.08	365.13	879.39	351.76	185.95
16	26.50	28.00	1.50	Granular	9.90	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	202.20	202.20	5.65	60.08	528.16	1102.51	441.00	205.15
17	28.00	29.50	1.50	Granular	9.90	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	202.20	202.20	5.65	60.08	528.16	1162.59	465.04	224.35
18	29.50	30.00	0.50	Granular	9.90	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	202.20	202.20	1.88	20.03	528.16	1182.62	473.05	230.75

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	12	2.96E+07	1.02E-01	1.69E+03	4.47	2.01	1.92	1.80	8.60	8.06	0.175	0.701	11.41	2.85	49.06	23.00	27.38	6.85	117.73	55.19
2	22.50	12	2.96E+07	1.02E-01	1.69E+03	4.47	2.01	1.92	1.80	8.60	8.06	0.175	0.701	11.41	2.85	49.06	23.00	27.38	6.85	117.73	55.19
3	24.00	13	2.96E+07	1.02E-01	1.83E+03	4.40	2.05	1.92	1.80	8.45	7.93	0.166	0.666	12.02	3.01	50.79	23.83	28.85	7.21	121.90	57.18
4	25.50	14	2.96E+07	1.02E-01	1.98E+03	4.33	2.08	1.92	1.80	8.32	7.81	0.159	0.634	12.61	3.15	52.45	24.62	30.27	7.57	125.88	59.08
5	27.00	14	2.96E+07	1.02E-01	1.98E+03	4.33	2.08	1.92	1.80	8.32	7.81	0.159	0.634	12.61	3.15	52.45	24.62	30.27	7.57	125.88	59.08
6	28.50	14	2.96E+07	1.02E-01	1.98E+03	4.33	2.08	1.92	1.80	8.32	7.81	0.159	0.634	12.61	3.15	52.45	24.62	30.27	7.57	125.88	59.08
7	30.00	14	2.96E+07	1.02E-01	1.98E+03	4.33	2.08	1.92	1.80	8.32	7.81	0.159	0.634	12.61	3.15	52.45	24.62	30.27	7.57	125.88	59.08

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-20	-
Chainage	1+869	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	196.88	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	13.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-20	1.00	22.00	19.50	19.50	311.49	142.94	9.56	2.39
BH-20	1.00	23.50	21.00	21.00	331.79	158.24	9.56	2.39
BH-20	1.00	25.00	22.50	22.50	351.29	173.54	9.56	2.39
BH-20	1.00	26.50	24.00	24.00	370.79	188.84	9.56	2.39
BH-20	1.00	28.00	25.50	25.50	390.29	204.14	9.56	2.39
BH-20	1.00	29.50	27.00	27.00	409.79	219.44	9.56	2.39
BH-20	1.00	30.00	27.50	27.50	416.29	224.54	9.56	2.39

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (Ki)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	17.60	0.00	27	-	13.80	15.50	1.00	-	3.25	4.00	13.20	26.40	4.71	2.94	41.83	44.78	17.91	5.22
2	4.00	5.50	1.50	Granular	17.60	0.00	27	-	13.80	15.50	1.00	-	4.75	5.50	39.60	52.80	4.71	8.83	74.10	85.86	34.35	9.34
3	5.50	7.00	1.50	Granular	17.60	0.00	30	-	19.50	22.44	1.00	-	6.25	7.00	66.00	79.20	4.71	16.34	153.61	181.72	72.69	15.57
4	7.00	8.50	1.50	Granular	17.60	0.00	30	-	19.50	22.44	1.00	-	7.75	8.50	92.40	105.60	4.71	22.88	200.31	251.30	100.52	23.62
5	8.50	10.00	1.50	Granular	17.60	0.00	25	-	10.00	10.88	1.00	-	9.25	10.00	118.80	132.00	4.71	24.52	120.14	195.65	78.26	32.14
6	10.00	11.50	1.50	Granular	17.70	0.00	25	-	10.00	10.88	1.00	-	10.75	11.50	145.28	158.55	4.71	29.98	142.95	248.43	99.37	42.18
7	11.50	13.00	1.50	Granular	17.70	0.00	25	-	10.00	10.88	1.00	-	12.25	13.00	171.83	185.10	4.71	35.46	165.72	306.66	122.66	53.76
7	13.00	14.50	1.50	Granular	7.85	0.00	25	-	10.00	10.88	1.00	-	13.75	14.50	190.99	196.88	4.71	39.41	171.93	352.29	140.91	66.44
8	14.50	16.00	1.50	Granular	7.85	0.00	30	-	19.50	22.44	1.00	-	15.25	16.00	196.88	196.88	4.71	48.75	354.26	583.37	233.35	81.74
9	16.00	17.50	1.50	Granular	9.40	0.00	30	-	19.50	22.44	1.00	-	16.75	17.50	196.88	196.88	4.71	48.75	355.45	633.31	253.32	97.04
10	17.50	19.00	1.50	Granular	9.40	0.00	30	-	19.50	22.44	1.00	-	18.25	19.00	196.88	196.88	4.71	48.75	355.45	682.06	272.82	112.34
11	19.00	20.50	1.50	Granular	8.30	0.00	30	-	19.50	22.44	1.00	-	19.75	20.50	196.88	196.88	4.71	48.75	354.61	729.97	291.99	127.64
12	20.50	22.00	1.50	Granular	8.30	0.00	30	-	19.50	22.44	1.00	-	21.25	22.00	196.88	196.88	4.71	48.75	354.61	778.72	311.49	142.94
13	22.00	23.50	1.50	Granular	10.90	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	196.88	196.88	4.71	48.75	356.61	829.47	331.79	158.24
14	23.50	25.00	1.50	Granular	10.90	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	196.88	196.88	4.71	48.75	356.61	878.22	351.29	173.54
15	25.00	26.50	1.50	Granular	10.90	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	196.88	196.88	4.71	48.75	356.61	926.97	370.79	188.84
16	26.50	28.00	1.50	Granular	10.90	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	196.88	196.88	4.71	48.75	356.61	975.73	390.29	204.14
17	28.00	29.50	1.50	Granular	10.90	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	196.88	196.88	4.71	48.75	356.61	1024.48	409.79	219.44
18	29.50	30.00	0.50	Granular	10.90	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	196.88	196.88	1.57	16.25	356.61	1040.73	416.29	224.54

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_t/T Ratio	L_t/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
2	22.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
3	24.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
4	25.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
5	27.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
6	28.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
7	30.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-20	-
Chainage	1+869	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	222.75	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	13.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-20	1.20	22.00	19.50	19.50	447.09	185.85	12.52	3.13
BH-20	1.20	23.50	21.00	21.00	474.95	206.76	12.52	3.13
BH-20	1.20	25.00	22.50	22.50	501.42	227.67	12.52	3.13
BH-20	1.20	26.50	24.00	24.00	527.90	248.58	12.52	3.13
BH-20	1.20	28.00	25.50	25.50	554.38	269.49	12.52	3.13
BH-20	1.20	29.50	27.00	27.00	580.85	290.39	12.52	3.13
BH-20	1.20	30.00	27.50	27.50	589.68	297.36	12.52	3.13

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (Ki)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	17.60	0.00	27	-	13.80	15.50	1.00	-	3.25	4.00	13.20	26.40	5.65	3.53	63.00	66.53	26.61	7.32
2	4.00	5.50	1.50	Granular	17.60	0.00	27	-	13.80	15.50	1.00	-	4.75	5.50	39.60	52.80	5.65	10.59	109.46	123.58	49.43	12.66
3	5.50	7.00	1.50	Granular	17.60	0.00	30	-	19.50	22.44	1.00	-	6.25	7.00	66.00	79.20	5.65	19.61	225.10	258.83	103.53	20.53
4	7.00	8.50	1.50	Granular	17.60	0.00	30	-	19.50	22.44	1.00	-	7.75	8.50	92.40	105.60	5.65	27.46	292.34	353.53	141.41	30.59
5	8.50	10.00	1.50	Granular	17.60	0.00	25	-	10.00	10.88	1.00	-	9.25	10.00	118.80	132.00	5.65	29.42	175.00	265.60	106.24	41.20
6	10.00	11.50	1.50	Granular	17.70	0.00	25	-	10.00	10.88	1.00	-	10.75	11.50	145.28	158.55	5.65	35.97	207.85	334.43	133.77	53.65
7	11.50	13.00	1.50	Granular	17.70	0.00	25	-	10.00	10.88	1.00	-	12.25	13.00	171.83	185.10	5.65	42.55	240.64	409.77	163.91	67.94
7	13.00	14.50	1.50	Granular	7.85	0.00	25	-	10.00	10.88	1.00	-	13.75	14.50	190.99	196.88	5.65	47.29	248.47	464.90	185.96	83.56
8	14.50	16.00	1.50	Granular	7.85	0.00	30	-	19.50	22.44	1.00	-	15.25	16.00	202.76	208.65	5.65	60.25	541.86	818.54	327.42	102.80
9	16.00	17.50	1.50	Granular	9.40	0.00	30	-	19.50	22.44	1.00	-	16.75	17.50	215.70	222.75	5.65	64.10	579.84	920.61	368.24	123.13
10	17.50	19.00	1.50	Granular	9.40	0.00	30	-	19.50	22.44	1.00	-	18.25	19.00	222.75	222.75	5.65	66.19	579.84	986.80	394.72	144.03
11	19.00	20.50	1.50	Granular	8.30	0.00	30	-	19.50	22.44	1.00	-	19.75	20.50	222.75	222.75	5.65	66.19	578.38	1051.53	420.61	164.94
12	20.50	22.00	1.50	Granular	8.30	0.00	30	-	19.50	22.44	1.00	-	21.25	22.00	222.75	222.75	5.65	66.19	578.38	1117.72	447.09	185.85
13	22.00	23.50	1.50	Granular	10.90	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	222.75	222.75	5.65	66.19	581.83	1187.37	474.95	206.76
14	23.50	25.00	1.50	Granular	10.90	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	222.75	222.75	5.65	66.19	581.83	1253.56	501.42	227.67
15	25.00	26.50	1.50	Granular	10.90	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	222.75	222.75	5.65	66.19	581.83	1319.75	527.90	248.58
16	26.50	28.00	1.50	Granular	10.90	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	222.75	222.75	5.65	66.19	581.83	1385.94	554.38	269.49
17	28.00	29.50	1.50	Granular	10.90	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	222.75	222.75	5.65	66.19	581.83	1452.13	580.85	290.39
18	29.50	30.00	0.50	Granular	10.90	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	222.75	222.75	1.88	22.06	581.83	1474.19	589.68	297.36

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
2	22.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
3	24.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
4	25.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
5	27.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
6	28.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
7	30.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-21	-
Chainage	1+925	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	187.20	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	3.50	mtr
Groundwater Level from OGL	13.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-21	1.00	22.00	19.50	18.50	257.71	129.56	10.13	2.53
BH-21	1.00	23.50	21.00	20.00	274.95	143.33	10.13	2.53
BH-21	1.00	25.00	22.50	21.50	292.26	157.09	10.13	2.53
BH-21	1.00	26.50	24.00	23.00	338.90	171.72	10.13	2.53
BH-21	1.00	28.00	25.50	24.50	357.44	186.35	10.46	2.61
BH-21	1.00	29.50	27.00	26.00	375.99	200.98	10.46	2.61
BH-21	1.00	30.00	27.50	26.50	382.17	205.86	10.78	2.69

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (Ki)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	16.00	0.00	24	-	8.00	9.78	1.00	-	3.25	4.00	12.00	24.00	4.71	0.00	23.55	23.55	9.42	4.40
2	4.00	5.50	1.50	Granular	16.00	0.00	24	-	8.00	9.78	1.00	-	4.75	5.50	36.00	48.00	4.71	7.13	42.05	49.19	19.67	8.04
3	5.50	7.00	1.50	Granular	16.00	0.00	25	-	10.00	10.88	1.00	-	6.25	7.00	60.00	72.00	4.71	12.38	68.05	87.57	35.03	13.16
4	7.00	8.50	1.50	Granular	16.00	0.00	25	-	10.00	10.88	1.00	-	7.75	8.50	84.00	96.00	4.71	17.33	88.63	125.48	50.19	19.66
5	8.50	10.00	1.50	Granular	17.65	0.00	25	-	10.00	10.88	1.00	-	9.25	10.00	109.24	122.48	4.71	22.54	111.99	171.38	68.55	27.62
6	10.00	11.50	1.50	Granular	17.65	0.00	27	-	13.80	15.50	1.00	-	10.75	11.50	135.71	148.95	4.71	30.25	191.63	281.26	112.50	37.74
7	11.50	13.00	1.50	Granular	17.65	0.00	27	-	13.80	15.50	1.00	-	12.25	13.00	162.19	175.43	4.71	36.15	223.98	349.76	139.90	49.51
7	13.00	14.50	1.50	Granular	7.85	0.00	27	-	13.80	15.50	1.00	-	13.75	14.50	181.31	187.20	4.71	40.41	233.04	399.23	159.69	62.48
8	14.50	16.00	1.50	Granular	7.85	0.00	27	-	13.80	15.50	1.00	-	15.25	16.00	187.20	187.20	4.71	41.72	233.04	440.95	176.38	75.81
9	16.00	17.50	1.50	Granular	9.90	0.00	27	-	13.80	15.50	1.00	-	16.75	17.50	187.20	187.20	4.71	41.72	234.15	483.78	193.51	89.14
10	17.50	19.00	1.50	Granular	9.90	0.00	27	-	13.80	15.50	1.00	-	18.25	19.00	187.20	187.20	4.71	41.72	234.15	525.51	210.20	102.47
11	19.00	20.50	1.50	Granular	8.15	0.00	27	-	13.80	15.50	1.00	-	19.75	20.50	187.20	187.20	4.71	41.72	233.20	566.27	226.51	115.80
12	20.50	22.00	1.50	Granular	8.15	0.00	28	-	15.70	17.82	1.00	-	21.25	22.00	187.20	187.20	4.71	43.27	267.93	644.26	257.71	129.56
13	22.00	23.50	1.50	Granular	7.90	0.00	28	-	15.70	17.82	1.00	-	22.75	23.50	187.20	187.20	4.71	43.27	267.77	687.38	274.95	143.33
14	23.50	25.00	1.50	Granular	7.90	0.00	28	-	15.70	17.82	1.00	-	24.25	25.00	187.20	187.20	4.71	43.27	267.77	730.64	292.26	157.09
15	25.00	26.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	187.20	187.20	4.71	46.36	338.03	847.26	338.90	171.72
16	26.50	28.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	187.20	187.20	4.71	46.36	338.03	893.61	357.44	186.35
17	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	187.20	187.20	4.71	46.36	338.03	939.97	375.99	200.98
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	187.20	187.20	1.57	15.45	338.03	955.42	382.17	205.86

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_e/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	1.01	2.02	1.83	7.02	6.38	0.197	0.790	10.13	2.53	35.54	16.17	24.32	6.08	85.30	38.80
2	22.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	1.01	2.02	1.83	7.02	6.38	0.197	0.790	10.13	2.53	35.54	16.17	24.32	6.08	85.30	38.80
3	24.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	1.01	2.02	1.83	7.02	6.38	0.197	0.790	10.13	2.53	35.54	16.17	24.32	6.08	85.30	38.80
4	25.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	1.01	2.02	1.83	7.02	6.38	0.197	0.790	10.13	2.53	35.54	16.17	24.32	6.08	85.30	38.80
5	27.00	21	2.96E+07	4.91E-02	2.98E+03	3.45	1.02	2.01	1.83	6.94	6.32	0.191	0.765	10.46	2.61	36.30	16.52	25.10	6.27	87.11	39.65
6	28.50	21	2.96E+07	4.91E-02	2.98E+03	3.45	1.02	2.01	1.83	6.94	6.32	0.191	0.765	10.46	2.61	36.30	16.52	25.10	6.27	87.11	39.65
7	30.00	22	2.96E+07	4.91E-02	3.13E+03	3.41	1.03	2.01	1.83	6.87	6.26	0.186	0.742	10.78	2.69	37.03	16.86	25.86	6.47	88.88	40.46

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-21	-
Chainage	1+925	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	213.83	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	3.50	mtr
Groundwater Level from OGL	13.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-21	1.20	22.00	19.50	18.50	368.42	169.22	13.21	3.30
BH-21	1.20	23.50	21.00	20.00	392.03	188.20	13.21	3.30
BH-21	1.20	25.00	22.50	21.50	415.75	207.18	13.21	3.30
BH-21	1.20	26.50	24.00	23.00	487.46	227.34	13.21	3.30
BH-21	1.20	28.00	25.50	24.50	512.88	247.51	13.63	3.41
BH-21	1.20	29.50	27.00	26.00	538.29	267.67	13.63	3.41
BH-21	1.20	30.00	27.50	26.50	546.77	274.40	14.04	3.51

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	16.00	0.00	24	-	8.00	9.78	1.00	-	3.25	4.00	12.00	24.00	5.65	0.00	35.36	35.36	14.15	6.33
2	4.00	5.50	1.50	Granular	16.00	0.00	24	-	8.00	9.78	1.00	-	4.75	5.50	36.00	48.00	5.65	8.56	62.01	70.57	28.23	11.10
3	5.50	7.00	1.50	Granular	16.00	0.00	25	-	10.00	10.88	1.00	-	6.25	7.00	60.00	72.00	5.65	14.86	99.81	123.23	49.29	17.64
4	7.00	8.50	1.50	Granular	16.00	0.00	25	-	10.00	10.88	1.00	-	7.75	8.50	84.00	96.00	5.65	20.80	129.45	173.67	69.47	25.84
5	8.50	10.00	1.50	Granular	17.65	0.00	25	-	10.00	10.88	1.00	-	9.25	10.00	109.24	122.48	5.65	27.05	163.27	234.53	93.81	35.79
6	10.00	11.50	1.50	Granular	17.65	0.00	27	-	13.80	15.50	1.00	-	10.75	11.50	135.71	148.95	5.65	36.29	278.71	386.27	154.51	48.33
7	11.50	13.00	1.50	Granular	17.65	0.00	27	-	13.80	15.50	1.00	-	12.25	13.00	162.19	175.43	5.65	43.38	325.30	476.23	190.49	62.85
7	13.00	14.50	1.50	Granular	7.85	0.00	27	-	13.80	15.50	1.00	-	13.75	14.50	181.31	187.20	5.65	48.49	336.81	536.23	214.49	78.80
8	14.50	16.00	1.50	Granular	7.85	0.00	27	-	13.80	15.50	1.00	-	15.25	16.00	193.09	198.98	5.65	51.64	357.53	608.59	243.44	95.63
9	16.00	17.50	1.50	Granular	9.90	0.00	27	-	13.80	15.50	1.00	-	16.75	17.50	206.40	213.83	5.65	55.20	385.59	691.85	276.74	113.46
10	17.50	19.00	1.50	Granular	9.90	0.00	27	-	13.80	15.50	1.00	-	18.25	19.00	213.83	213.83	5.65	57.19	385.59	749.04	299.62	131.85
11	19.00	20.50	1.50	Granular	8.15	0.00	27	-	13.80	15.50	1.00	-	19.75	20.50	213.83	213.83	5.65	57.19	383.94	804.58	321.83	150.24
12	20.50	22.00	1.50	Granular	8.15	0.00	28	-	15.70	17.82	1.00	-	21.25	22.00	213.83	213.83	5.65	59.30	441.11	921.05	368.42	169.22
13	22.00	23.50	1.50	Granular	7.90	0.00	28	-	15.70	17.82	1.00	-	22.75	23.50	213.83	213.83	5.65	59.30	440.84	980.08	392.03	188.20
14	23.50	25.00	1.50	Granular	7.90	0.00	28	-	15.70	17.82	1.00	-	24.25	25.00	213.83	213.83	5.65	59.30	440.84	1039.39	415.75	207.18
15	25.00	26.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	213.83	213.83	5.65	63.54	556.57	1218.66	487.46	227.34
16	26.50	28.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	213.83	213.83	5.65	63.54	556.57	1282.20	512.88	247.51
17	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	213.83	213.83	5.65	63.54	556.57	1345.73	538.29	267.67
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	213.83	213.83	1.88	21.18	556.57	1366.91	546.77	274.40

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_1/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.87	2.03	1.84	8.19	7.41	0.151	0.606	13.21	3.30	54.08	24.46	31.70	7.92	129.80	58.70
2	22.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.87	2.03	1.84	8.19	7.41	0.151	0.606	13.21	3.30	54.08	24.46	31.70	7.92	129.80	58.70
3	24.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.87	2.03	1.84	8.19	7.41	0.151	0.606	13.21	3.30	54.08	24.46	31.70	7.92	129.80	58.70
4	25.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.87	2.03	1.84	8.19	7.41	0.151	0.606	13.21	3.30	54.08	24.46	31.70	7.92	129.80	58.70
5	27.00	21	2.96E+07	1.02E-01	2.98E+03	3.99	0.88	2.03	1.84	8.10	7.33	0.147	0.587	13.63	3.41	55.23	24.99	32.71	8.18	132.55	59.97
6	28.50	21	2.96E+07	1.02E-01	2.98E+03	3.99	0.88	2.03	1.84	8.10	7.33	0.147	0.587	13.63	3.41	55.23	24.99	32.71	8.18	132.55	59.97
7	30.00	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.89	2.03	1.84	8.02	7.26	0.142	0.570	14.04	3.51	56.34	25.50	33.70	8.43	135.22	61.20



CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-12	-
Chainage	1+092	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	84.22	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-12	1.00	22.00	19.50	17.50	94.38	64.83	9.21	2.30
BH-12	1.00	23.50	21.00	19.00	101.61	71.54	9.21	2.30
BH-12	1.00	25.00	22.50	20.50	109.04	78.25	9.21	2.30
BH-12	1.00	26.50	24.00	22.00	129.59	85.35	9.21	2.30
BH-12	1.00	28.00	25.50	23.50	137.55	92.45	9.21	2.30
BH-12	1.00	29.50	27.00	25.00	158.69	99.93	9.58	2.39
BH-12	1.00	30.00	27.50	25.50	161.47	102.43	9.58	2.39

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.99	0.00	25	-	10.00	10.88	1.00	-	3.25	4.00	6.00	11.99	4.71	0.00	0.00	0.00	0.00	4.40
2	4.00	5.50	1.50	Granular	7.99	0.00	25	-	10.00	10.88	1.00	-	4.75	5.50	17.99	23.98	4.71	3.71	23.72	27.43	10.97	7.09
3	5.50	7.00	1.50	Granular	6.69	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	29.00	34.02	4.71	6.22	38.51	48.45	19.38	10.48
4	7.00	8.50	1.50	Granular	6.69	0.00	26	-	11.90	13.19	1.00	-	7.75	8.50	39.04	44.06	4.71	8.38	48.95	67.27	26.91	14.47
5	8.50	10.00	1.50	Granular	6.69	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	49.08	54.10	4.71	10.53	59.39	88.24	35.30	19.07
6	10.00	11.50	1.50	Granular	6.69	0.00	20	-	0.00	5.39	1.00	-	10.75	11.50	59.12	64.14	4.71	9.76	27.25	65.86	26.34	23.45
7	11.50	13.00	1.50	Granular	6.69	0.00	20	-	0.00	5.39	1.00	-	12.25	13.00	69.16	74.18	4.71	11.42	31.52	81.54	32.62	28.30
7	13.00	14.50	1.50	Granular	6.69	0.00	20	-	0.00	5.39	1.00	-	13.75	14.50	79.20	84.22	4.71	13.07	35.78	98.88	39.55	33.61
8	14.50	16.00	1.50	Granular	6.70	0.00	22	-	4.00	7.59	1.00	-	15.25	16.00	84.22	84.22	4.71	15.29	51.42	129.81	51.92	39.54
9	16.00	17.50	1.50	Granular	7.55	0.00	22	-	4.00	7.59	1.00	-	16.75	17.50	84.22	84.22	4.71	15.29	51.55	145.24	58.09	45.47
10	17.50	19.00	1.50	Granular	7.55	0.00	22	-	4.00	7.59	1.00	-	18.25	19.00	84.22	84.22	4.71	15.29	51.55	160.53	64.21	51.41
11	19.00	20.50	1.50	Granular	7.10	0.00	26	-	11.90	13.19	1.00	-	19.75	20.50	84.22	84.22	4.71	18.07	90.90	217.96	87.18	58.12
12	20.50	22.00	1.50	Granular	6.90	0.00	26	-	11.90	13.19	1.00	-	21.25	22.00	84.22	84.22	4.71	18.07	90.81	235.94	94.38	64.83
13	22.00	23.50	1.50	Granular	6.90	0.00	26	-	11.90	13.19	1.00	-	22.75	23.50	84.22	84.22	4.71	18.07	90.81	254.01	101.61	71.54
14	23.50	25.00	1.50	Granular	8.00	0.00	26	-	11.90	13.19	1.00	-	24.25	25.00	84.22	84.22	4.71	18.07	91.33	272.61	109.04	78.25
15	25.00	26.50	1.50	Granular	8.00	0.00	28	-	15.70	17.82	1.00	-	25.75	26.50	84.22	84.22	4.71	19.46	123.22	323.96	129.59	85.35
16	26.50	28.00	1.50	Granular	8.70	0.00	28	-	15.70	17.82	1.00	-	27.25	28.00	84.22	84.22	4.71	19.46	123.65	343.86	137.55	92.45
17	28.00	29.50	1.50	Granular	8.70	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	84.22	84.22	4.71	20.86	155.65	396.72	158.69	99.93
18	29.50	30.00	0.50	Granular	8.70	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	84.22	84.22	1.57	6.95	155.65	403.67	161.47	102.43

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	1.24	1.99	1.83	7.24	6.65	0.217	0.869	9.21	2.30	33.35	15.30	22.10	5.52	80.03	36.73
2	22.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	1.24	1.99	1.83	7.24	6.65	0.217	0.869	9.21	2.30	33.35	15.30	22.10	5.52	80.03	36.73
3	24.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	1.24	1.99	1.83	7.24	6.65	0.217	0.869	9.21	2.30	33.35	15.30	22.10	5.52	80.03	36.73
4	25.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	1.24	1.99	1.83	7.24	6.65	0.217	0.869	9.21	2.30	33.35	15.30	22.10	5.52	80.03	36.73
5	27.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	1.24	1.99	1.83	7.24	6.65	0.217	0.869	9.21	2.30	33.35	15.30	22.10	5.52	80.03	36.73
6	28.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.25	1.99	1.82	7.15	6.56	0.209	0.835	9.58	2.39	34.24	15.72	22.99	5.75	82.17	37.73
7	30.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	1.25	1.99	1.82	7.15	6.56	0.209	0.835	9.58	2.39	34.24	15.72	22.99	5.75	82.17	37.73

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-12	-
Chainage	1+092	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	105.60	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	4.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-12	1.20	22.00	19.50	17.50	143.22	89.25	11.98	2.99
BH-12	1.20	23.50	21.00	19.00	154.10	99.24	11.98	2.99
BH-12	1.20	25.00	22.50	20.50	165.33	109.23	11.98	2.99
BH-12	1.20	26.50	24.00	22.00	200.04	119.80	11.98	2.99
BH-12	1.20	28.00	25.50	23.50	212.06	130.38	11.98	2.99
BH-12	1.20	29.50	27.00	25.00	247.68	141.54	12.46	3.11
BH-12	1.20	30.00	27.50	25.50	251.86	145.26	12.46	3.11

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.99	0.00	25	-	10.00	10.88	1.00	-	3.25	4.00	6.00	11.99	5.65	0.00	0.00	0.00	0.00	6.33
2	4.00	5.50	1.50	Granular	7.99	0.00	25	-	10.00	10.88	1.00	-	4.75	5.50	17.99	23.98	5.65	4.45	35.06	39.51	15.80	9.96
3	5.50	7.00	1.50	Granular	6.69	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	29.00	34.02	5.65	7.47	56.36	68.29	27.31	14.42
4	7.00	8.50	1.50	Granular	6.69	0.00	26	-	11.90	13.19	1.00	-	7.75	8.50	39.04	44.06	5.65	10.05	71.40	93.37	37.35	19.61
5	8.50	10.00	1.50	Granular	6.69	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	49.08	54.10	5.65	12.64	86.43	121.05	48.42	25.53
6	10.00	11.50	1.50	Granular	6.69	0.00	20	-	0.00	5.39	1.00	-	10.75	11.50	59.12	64.14	5.65	11.71	39.24	85.57	34.23	31.18
7	11.50	13.00	1.50	Granular	6.69	0.00	20	-	0.00	5.39	1.00	-	12.25	13.00	69.16	74.18	5.65	13.70	45.38	105.41	42.16	37.39
7	13.00	14.50	1.50	Granular	6.69	0.00	20	-	0.00	5.39	1.00	-	13.75	14.50	79.20	84.22	5.65	15.69	51.53	127.24	50.90	44.16
8	14.50	16.00	1.50	Granular	6.70	0.00	22	-	4.00	7.59	1.00	-	15.25	16.00	89.25	94.27	5.65	19.45	83.00	178.16	71.26	51.98
9	16.00	17.50	1.50	Granular	7.55	0.00	22	-	4.00	7.59	1.00	-	16.75	17.50	99.93	105.60	5.65	21.78	92.98	209.92	83.97	60.45
10	17.50	19.00	1.50	Granular	7.55	0.00	22	-	4.00	7.59	1.00	-	18.25	19.00	105.60	105.60	5.65	23.01	92.98	232.93	93.17	69.27
11	19.00	20.50	1.50	Granular	7.10	0.00	26	-	11.90	13.19	1.00	-	19.75	20.50	105.60	105.60	5.65	27.19	163.87	331.01	132.41	79.26
12	20.50	22.00	1.50	Granular	6.90	0.00	26	-	11.90	13.19	1.00	-	21.25	22.00	105.60	105.60	5.65	27.19	163.71	358.05	143.22	89.25
13	22.00	23.50	1.50	Granular	6.90	0.00	26	-	11.90	13.19	1.00	-	22.75	23.50	105.60	105.60	5.65	27.19	163.71	385.24	154.10	99.24
14	23.50	25.00	1.50	Granular	8.00	0.00	26	-	11.90	13.19	1.00	-	24.25	25.00	105.60	105.60	5.65	27.19	164.60	413.33	165.33	109.23
15	25.00	26.50	1.50	Granular	8.00	0.00	28	-	15.70	17.82	1.00	-	25.75	26.50	105.60	105.60	5.65	29.29	222.09	500.10	200.04	119.80
16	26.50	28.00	1.50	Granular	8.70	0.00	28	-	15.70	17.82	1.00	-	27.25	28.00	105.60	105.60	5.65	29.29	222.84	530.14	212.06	130.38
17	28.00	29.50	1.50	Granular	8.70	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	105.60	105.60	5.65	31.38	280.51	619.19	247.68	141.54
18	29.50	30.00	0.50	Granular	8.70	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	105.60	105.60	1.88	10.46	280.51	629.65	251.86	145.26

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	1.07	2.01	1.83	8.46	7.72	0.167	0.668	11.98	2.99	50.67	23.11	28.74	7.19	121.60	55.46
2	22.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	1.07	2.01	1.83	8.46	7.72	0.167	0.668	11.98	2.99	50.67	23.11	28.74	7.19	121.60	55.46
3	24.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	1.07	2.01	1.83	8.46	7.72	0.167	0.668	11.98	2.99	50.67	23.11	28.74	7.19	121.60	55.46
4	25.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	1.07	2.01	1.83	8.46	7.72	0.167	0.668	11.98	2.99	50.67	23.11	28.74	7.19	121.60	55.46
5	27.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	1.07	2.01	1.83	8.46	7.72	0.167	0.668	11.98	2.99	50.67	23.11	28.74	7.19	121.60	55.46
6	28.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	1.08	2.01	1.83	8.35	7.62	0.161	0.642	12.46	3.11	52.02	23.73	29.90	7.47	124.84	56.96
7	30.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	1.08	2.01	1.83	8.35	7.62	0.161	0.642	12.46	3.11	52.02	23.73	29.90	7.47	124.84	56.96

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-13	-
Chainage	1+214	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	80.48	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-13	1.00	22.00	19.50	19.50	112.85	69.88	7.95	1.99
BH-13	1.00	23.50	21.00	21.00	120.29	76.73	8.28	2.07
BH-13	1.00	25.00	22.50	22.50	127.73	83.59	8.28	2.07
BH-13	1.00	26.50	24.00	24.00	135.62	90.45	8.28	2.07
BH-13	1.00	28.00	25.50	25.50	156.00	97.68	8.61	2.15
BH-13	1.00	29.50	27.00	27.00	163.98	104.91	8.93	2.23
BH-13	1.00	30.00	27.50	27.50	166.63	107.32	9.25	2.31

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	5.59	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	4.20	8.39	4.71	0.90	11.35	12.25	4.90	4.65
2	4.00	5.50	1.50	Granular	6.89	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	13.56	18.73	4.71	2.91	22.71	26.52	10.61	7.11
3	5.50	7.00	1.50	Granular	6.89	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	23.90	29.07	4.71	5.13	33.46	42.40	16.96	10.20
4	7.00	8.50	1.50	Granular	6.89	0.00	26	-	11.90	13.19	1.00	-	7.75	8.50	34.24	39.41	4.71	7.35	44.21	60.50	24.20	13.91
5	8.50	10.00	1.50	Granular	6.89	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	44.58	49.75	4.71	9.57	54.96	80.82	32.33	18.24
6	10.00	11.50	1.50	Granular	6.89	0.00	26	-	11.90	13.19	1.00	-	10.75	11.50	54.92	60.09	4.71	11.79	65.72	103.36	41.34	23.18
7	11.50	13.00	1.50	Granular	6.89	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	65.26	70.43	4.71	15.08	103.17	155.90	62.36	29.06
7	13.00	14.50	1.50	Granular	6.70	0.00	28	-	15.70	17.82	1.00	-	13.75	14.50	75.46	80.48	4.71	17.44	117.16	187.33	74.93	35.59
8	14.50	16.00	1.50	Granular	6.70	0.00	28	-	15.70	17.82	1.00	-	15.25	16.00	80.48	80.48	4.71	18.60	117.16	205.93	82.37	42.45
9	16.00	17.50	1.50	Granular	6.70	0.00	28	-	15.70	17.82	1.00	-	16.75	17.50	80.48	80.48	4.71	18.60	117.16	224.53	89.81	49.30
10	17.50	19.00	1.50	Granular	6.70	0.00	28	-	15.70	17.82	1.00	-	18.25	19.00	80.48	80.48	4.71	18.60	117.16	243.13	97.25	56.16
11	19.00	20.50	1.50	Granular	9.60	0.00	28	-	15.70	17.82	1.00	-	19.75	20.50	80.48	80.48	4.71	18.60	118.96	263.52	105.41	63.02
12	20.50	22.00	1.50	Granular	9.60	0.00	28	-	15.70	17.82	1.00	-	21.25	22.00	80.48	80.48	4.71	18.60	118.96	282.13	112.85	69.88
13	22.00	23.50	1.50	Granular	9.60	0.00	28	-	15.70	17.82	1.00	-	22.75	23.50	80.48	80.48	4.71	18.60	118.96	300.73	120.29	76.73
14	23.50	25.00	1.50	Granular	9.60	0.00	28	-	15.70	17.82	1.00	-	24.25	25.00	80.48	80.48	4.71	18.60	118.96	319.33	127.73	83.59
15	25.00	26.50	1.50	Granular	11.40	0.00	28	-	15.70	17.82	1.00	-	25.75	26.50	80.48	80.48	4.71	18.60	120.07	339.04	135.62	90.45
16	26.50	28.00	1.50	Granular	11.40	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	80.48	80.48	4.71	19.93	151.11	390.01	156.00	97.68
17	28.00	29.50	1.50	Granular	11.40	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	80.48	80.48	4.71	19.93	151.11	409.94	163.98	104.91
18	29.50	30.00	0.50	Granular	11.40	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	80.48	80.48	1.57	6.64	151.11	416.58	166.63	107.32

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.68	2.06	1.85	7.61	6.82	0.252	1.007	7.95	1.99	30.23	13.55	19.07	4.77	72.55	32.51
2	22.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
3	24.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
4	25.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
5	27.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33
6	28.50	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
7	30.00	19	2.96E+07	4.91E-02	2.70E+03	3.52	0.71	2.06	1.85	7.23	6.49	0.216	0.865	9.25	2.31	33.44	15.01	22.19	5.55	80.26	36.03

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-13	-
Chainage	1+214	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	100.58	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-13	1.20	22.00	19.50	19.50	172.70	95.90	10.42	2.60
BH-13	1.20	23.50	21.00	21.00	183.86	106.09	10.85	2.71
BH-13	1.20	25.00	22.50	22.50	195.02	116.27	10.85	2.71
BH-13	1.20	26.50	24.00	24.00	206.95	126.46	10.85	2.71
BH-13	1.20	28.00	25.50	25.50	241.20	137.20	11.28	2.82
BH-13	1.20	29.50	27.00	27.00	253.15	147.95	11.70	2.93
BH-13	1.20	30.00	27.50	27.50	257.14	151.53	12.11	3.03

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	5.59	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	4.20	8.39	5.65	1.08	17.10	18.18	7.27	6.64
2	4.00	5.50	1.50	Granular	6.89	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	13.56	18.73	5.65	3.49	33.63	38.20	15.28	9.99
3	5.50	7.00	1.50	Granular	6.89	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	23.90	29.07	5.65	6.16	49.11	59.84	23.94	14.09
4	7.00	8.50	1.50	Granular	6.89	0.00	26	-	11.90	13.19	1.00	-	7.75	8.50	34.24	39.41	5.65	8.82	64.60	84.14	33.66	18.93
5	8.50	10.00	1.50	Granular	6.89	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	44.58	49.75	5.65	11.48	80.08	111.11	44.44	24.52
6	10.00	11.50	1.50	Granular	6.89	0.00	26	-	11.90	13.19	1.00	-	10.75	11.50	54.92	60.09	5.65	14.14	95.56	140.73	56.29	30.86
7	11.50	13.00	1.50	Granular	6.89	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	65.26	70.43	5.65	18.10	149.79	213.06	85.23	38.30
7	13.00	14.50	1.50	Granular	6.70	0.00	28	-	15.70	17.82	1.00	-	13.75	14.50	75.46	80.48	5.65	20.93	169.91	254.11	101.64	46.53
8	14.50	16.00	1.50	Granular	6.70	0.00	28	-	15.70	17.82	1.00	-	15.25	16.00	85.51	90.53	5.65	23.71	190.23	298.14	119.26	55.55
9	16.00	17.50	1.50	Granular	6.70	0.00	28	-	15.70	17.82	1.00	-	16.75	17.50	95.56	100.58	5.65	26.50	210.56	344.97	137.99	65.34
10	17.50	19.00	1.50	Granular	6.70	0.00	28	-	15.70	17.82	1.00	-	18.25	19.00	100.58	100.58	5.65	27.90	210.56	372.86	149.15	75.53
11	19.00	20.50	1.50	Granular	9.60	0.00	28	-	15.70	17.82	1.00	-	19.75	20.50	100.58	100.58	5.65	27.90	213.66	403.86	161.54	85.72
12	20.50	22.00	1.50	Granular	9.60	0.00	28	-	15.70	17.82	1.00	-	21.25	22.00	100.58	100.58	5.65	27.90	213.66	431.76	172.70	95.90
13	22.00	23.50	1.50	Granular	9.60	0.00	28	-	15.70	17.82	1.00	-	22.75	23.50	100.58	100.58	5.65	27.90	213.66	459.65	183.86	106.09
14	23.50	25.00	1.50	Granular	9.60	0.00	28	-	15.70	17.82	1.00	-	24.25	25.00	100.58	100.58	5.65	27.90	213.66	487.55	195.02	116.27
15	25.00	26.50	1.50	Granular	11.40	0.00	28	-	15.70	17.82	1.00	-	25.75	26.50	100.58	100.58	5.65	27.90	215.58	517.37	206.95	126.46
16	26.50	28.00	1.50	Granular	11.40	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	100.58	100.58	5.65	29.89	271.32	602.99	241.20	137.20
17	28.00	29.50	1.50	Granular	11.40	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	100.58	100.58	5.65	29.89	271.32	632.88	253.15	147.95
18	29.50	30.00	0.50	Granular	11.40	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	100.58	100.58	1.88	9.96	271.32	642.84	257.14	151.53

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.59	2.08	1.85	8.86	7.91	0.192	0.768	10.42	2.60	46.16	20.59	25.00	6.25	110.80	49.43
2	22.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
3	24.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
4	25.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
5	27.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17
6	28.50	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
7	30.00	19	2.96E+07	1.02E-01	2.70E+03	4.07	0.61	2.07	1.85	8.43	7.53	0.165	0.660	12.11	3.03	51.05	22.81	29.07	7.27	122.53	54.74

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-14	-
Chainage	1+293	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	86.63	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-14	1.00	22.00	19.50	19.50	94.44	63.94	7.95	1.99
BH-14	1.00	23.50	21.00	21.00	129.33	71.59	8.28	2.07
BH-14	1.00	25.00	22.50	22.50	137.91	79.25	8.28	2.07
BH-14	1.00	26.50	24.00	24.00	146.92	86.90	8.28	2.07
BH-14	1.00	28.00	25.50	25.50	155.50	94.56	8.61	2.15
BH-14	1.00	29.50	27.00	27.00	164.08	102.22	8.93	2.23
BH-14	1.00	30.00	27.50	27.50	166.94	104.77	9.25	2.31

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	6.39	0.00	21	-	2.00	6.49	1.00	-	3.25	4.00	4.80	9.59	4.71	0.83	5.41	6.24	2.50	4.63
2	4.00	5.50	1.50	Granular	6.39	0.00	21	-	2.00	6.49	1.00	-	4.75	5.50	14.39	19.18	4.71	2.49	10.31	13.64	5.45	6.98
3	5.50	7.00	1.50	Granular	7.09	0.00	20	-	0.00	5.39	1.00	-	6.25	7.00	24.50	29.82	4.71	4.04	12.67	20.04	8.02	9.76
4	7.00	8.50	1.50	Granular	7.09	0.00	20	-	0.00	5.39	1.00	-	7.75	8.50	35.14	40.46	4.71	0.00	17.19	24.56	9.82	11.41
5	8.50	10.00	1.50	Granular	7.09	0.00	21	-	2.00	6.49	1.00	-	9.25	10.00	45.78	51.10	4.71	0.00	26.69	34.06	13.62	13.06
6	10.00	11.50	1.50	Granular	7.09	0.00	21	-	2.00	6.49	1.00	-	10.75	11.50	56.42	61.74	4.71	9.78	32.13	49.28	19.71	17.45
7	11.50	13.00	1.50	Granular	8.29	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	67.96	74.18	4.71	14.59	81.02	112.76	45.10	23.18
7	13.00	14.50	1.50	Granular	8.30	0.00	26	-	11.90	13.19	1.00	-	13.75	14.50	80.41	86.63	4.71	17.26	93.97	142.96	57.19	29.66
8	14.50	16.00	1.50	Granular	8.30	0.00	26	-	11.90	13.19	1.00	-	15.25	16.00	86.63	86.63	4.71	18.59	93.97	161.55	64.62	36.52
9	16.00	17.50	1.50	Granular	8.30	0.00	26	-	11.90	13.19	1.00	-	16.75	17.50	86.63	86.63	4.71	18.59	93.97	180.15	72.06	43.37
10	17.50	19.00	1.50	Granular	8.30	0.00	26	-	11.90	13.19	1.00	-	18.25	19.00	86.63	86.63	4.71	18.59	93.97	198.74	79.50	50.23
11	19.00	20.50	1.50	Granular	8.70	0.00	26	-	11.90	13.19	1.00	-	19.75	20.50	86.63	86.63	4.71	18.59	94.16	217.52	87.01	57.08
12	20.50	22.00	1.50	Granular	8.70	0.00	26	-	11.90	13.19	1.00	-	21.25	22.00	86.63	86.63	4.71	18.59	94.16	236.11	94.44	63.94
13	22.00	23.50	1.50	Granular	8.70	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	86.63	86.63	4.71	21.45	159.92	323.32	129.33	71.59
14	23.50	25.00	1.50	Granular	8.70	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	86.63	86.63	4.71	21.45	159.92	344.77	137.91	79.25
15	25.00	26.50	1.50	Granular	10.10	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	86.63	86.63	4.71	21.45	160.99	367.30	146.92	86.90
16	26.50	28.00	1.50	Granular	10.10	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	86.63	86.63	4.71	21.45	160.99	388.75	155.50	94.56
17	28.00	29.50	1.50	Granular	10.10	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	86.63	86.63	4.71	21.45	160.99	410.20	164.08	102.22
18	29.50	30.00	0.50	Granular	10.10	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	86.63	86.63	1.57	7.15	160.99	417.35	166.94	104.77

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.68	2.06	1.85	7.61	6.82	0.252	1.007	7.95	1.99	30.23	13.55	19.07	4.77	72.55	32.51
2	22.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
3	24.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
4	25.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
5	27.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33
6	28.50	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
7	30.00	19	2.96E+07	4.91E-02	2.70E+03	3.52	0.71	2.06	1.85	7.23	6.49	0.216	0.865	9.25	2.31	33.44	15.01	22.19	5.55	80.26	36.03

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-14	-
Chainage	1+293	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	111.53	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-14	1.20	22.00	19.50	19.50	148.02	89.71	10.42	2.60
BH-14	1.20	23.50	21.00	21.00	209.90	101.37	10.85	2.71
BH-14	1.20	25.00	22.50	22.50	223.16	113.02	10.85	2.71
BH-14	1.20	26.50	24.00	24.00	237.16	124.68	10.85	2.71
BH-14	1.20	28.00	25.50	25.50	250.42	136.33	11.28	2.82
BH-14	1.20	29.50	27.00	27.00	263.67	147.98	11.70	2.93
BH-14	1.20	30.00	27.50	27.50	268.09	151.87	12.11	3.03

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	6.39	0.00	21	-	2.00	6.49	1.00	-	3.25	4.00	4.80	9.59	5.65	1.00	7.93	8.93	3.57	6.61
2	4.00	5.50	1.50	Granular	6.39	0.00	21	-	2.00	6.49	1.00	-	4.75	5.50	14.39	19.18	5.65	2.99	15.00	18.98	7.59	9.83
3	5.50	7.00	1.50	Granular	7.09	0.00	20	-	0.00	5.39	1.00	-	6.25	7.00	24.50	29.82	5.65	4.85	18.24	27.09	10.83	13.56
4	7.00	8.50	1.50	Granular	7.09	0.00	20	-	0.00	5.39	1.00	-	7.75	8.50	35.14	40.46	5.65	0.00	24.75	33.60	13.44	15.93
5	8.50	10.00	1.50	Granular	7.09	0.00	21	-	2.00	6.49	1.00	-	9.25	10.00	45.78	51.10	5.65	0.00	38.60	47.44	18.98	18.31
6	10.00	11.50	1.50	Granular	7.09	0.00	21	-	2.00	6.49	1.00	-	10.75	11.50	56.42	61.74	5.65	11.74	46.43	67.01	26.80	23.97
7	11.50	13.00	1.50	Granular	8.29	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	67.96	74.18	5.65	17.50	117.79	155.88	62.35	31.25
7	13.00	14.50	1.50	Granular	8.30	0.00	26	-	11.90	13.19	1.00	-	13.75	14.50	80.41	86.63	5.65	20.71	136.44	195.23	78.09	39.42
8	14.50	16.00	1.50	Granular	8.30	0.00	26	-	11.90	13.19	1.00	-	15.25	16.00	92.86	99.08	5.65	23.91	155.08	237.79	95.11	48.49
9	16.00	17.50	1.50	Granular	8.30	0.00	26	-	11.90	13.19	1.00	-	16.75	17.50	105.31	111.53	5.65	27.12	173.73	283.55	113.42	58.46
10	17.50	19.00	1.50	Granular	8.30	0.00	26	-	11.90	13.19	1.00	-	18.25	19.00	111.53	111.53	5.65	28.72	173.73	312.27	124.91	68.88
11	19.00	20.50	1.50	Granular	8.70	0.00	26	-	11.90	13.19	1.00	-	19.75	20.50	111.53	111.53	5.65	28.72	174.05	341.32	136.53	79.29
12	20.50	22.00	1.50	Granular	8.70	0.00	26	-	11.90	13.19	1.00	-	21.25	22.00	111.53	111.53	5.65	28.72	174.05	370.04	148.02	89.71
13	22.00	23.50	1.50	Granular	8.70	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	111.53	111.53	5.65	33.14	295.63	524.76	209.90	101.37
14	23.50	25.00	1.50	Granular	8.70	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	111.53	111.53	5.65	33.14	295.63	557.90	223.16	113.02
15	25.00	26.50	1.50	Granular	10.10	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	111.53	111.53	5.65	33.14	297.48	592.90	237.16	124.68
16	26.50	28.00	1.50	Granular	10.10	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	111.53	111.53	5.65	33.14	297.48	626.04	250.42	136.33
17	28.00	29.50	1.50	Granular	10.10	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	111.53	111.53	5.65	33.14	297.48	659.18	263.67	147.98
18	29.50	30.00	0.50	Granular	10.10	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	111.53	111.53	1.88	11.05	297.48	670.23	268.09	151.87

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.59	2.08	1.85	8.86	7.91	0.192	0.768	10.42	2.60	46.16	20.59	25.00	6.25	110.80	49.43
2	22.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
3	24.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
4	25.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
5	27.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17
6	28.50	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
7	30.00	19	2.96E+07	1.02E-01	2.70E+03	4.07	0.61	2.07	1.85	8.43	7.53	0.165	0.660	12.11	3.03	51.05	22.81	29.07	7.27	122.53	54.74

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-15	-
Chainage	1+392	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	79.16	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-15	1.00	22.00	19.50	19.50	78.88	59.52	8.28	2.07
BH-15	1.00	23.50	21.00	21.00	111.61	66.47	8.28	2.07
BH-15	1.00	25.00	22.50	22.50	119.19	73.43	8.61	2.15
BH-15	1.00	26.50	24.00	24.00	126.50	80.38	8.61	2.15
BH-15	1.00	28.00	25.50	25.50	140.44	87.52	8.93	2.23
BH-15	1.00	29.50	27.00	27.00	148.28	94.66	8.93	2.23
BH-15	1.00	30.00	27.50	27.50	150.89	97.04	9.25	2.31

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	5.89	0.00	20	-	0.00	5.39	1.00	-	3.25	4.00	4.42	8.84	4.71	0.73	3.76	4.49	1.79	4.60
2	4.00	5.50	1.50	Granular	5.89	0.00	20	-	0.00	5.39	1.00	-	4.75	5.50	13.26	17.68	4.71	2.19	7.51	10.43	4.17	6.86
3	5.50	7.00	1.50	Granular	5.89	0.00	20	-	0.00	5.39	1.00	-	6.25	7.00	22.10	26.52	4.71	3.65	11.27	17.83	7.13	9.54
4	7.00	8.50	1.50	Granular	5.89	0.00	20	-	0.00	5.39	1.00	-	7.75	8.50	30.94	35.36	4.71	5.11	15.02	26.70	10.68	12.62
5	8.50	10.00	1.50	Granular	7.30	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	40.84	46.31	4.71	8.76	51.58	72.02	28.81	16.72
6	10.00	11.50	1.50	Granular	7.30	0.00	26	-	11.90	13.19	1.00	-	10.75	11.50	51.79	57.26	4.71	11.11	62.96	94.52	37.81	21.48
7	11.50	13.00	1.50	Granular	7.30	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	62.74	68.21	4.71	13.46	74.35	119.37	47.75	26.90
7	13.00	14.50	1.50	Granular	7.30	0.00	26	-	11.90	13.19	1.00	-	13.75	14.50	73.69	79.16	4.71	15.81	85.74	146.57	58.63	32.98
8	14.50	16.00	1.50	Granular	8.00	0.00	25	-	10.00	10.88	1.00	-	15.25	16.00	79.16	79.16	4.71	0.00	71.04	131.87	52.75	34.63
9	16.00	17.50	1.50	Granular	8.00	0.00	25	-	10.00	10.88	1.00	-	16.75	17.50	79.16	79.16	4.71	16.34	71.04	148.20	59.28	40.85
10	17.50	19.00	1.50	Granular	8.00	0.00	25	-	10.00	10.88	1.00	-	18.25	19.00	79.16	79.16	4.71	16.34	71.04	164.54	65.82	47.07
11	19.00	20.50	1.50	Granular	8.00	0.00	25	-	10.00	10.88	1.00	-	19.75	20.50	79.16	79.16	4.71	16.34	71.04	180.88	72.35	53.29
12	20.50	22.00	1.50	Granular	8.00	0.00	25	-	10.00	10.88	1.00	-	21.25	22.00	79.16	79.16	4.71	16.34	71.04	197.21	78.88	59.52
13	22.00	23.50	1.50	Granular	12.00	0.00	29	-	17.60	20.13	1.00	-	22.75	23.50	79.16	79.16	4.71	18.95	133.91	279.03	111.61	66.47
14	23.50	25.00	1.50	Granular	12.00	0.00	29	-	17.60	20.13	1.00	-	24.25	25.00	79.16	79.16	4.71	18.95	133.91	297.98	119.19	73.43
15	25.00	26.50	1.50	Granular	11.00	0.00	29	-	17.60	20.13	1.00	-	25.75	26.50	79.16	79.16	4.71	18.95	133.22	316.24	126.50	80.38
16	26.50	28.00	1.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	79.16	79.16	4.71	19.60	148.47	351.09	140.44	87.52
17	28.00	29.50	1.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	79.16	79.16	4.71	19.60	148.47	370.69	148.28	94.66
18	29.50	30.00	0.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	79.16	79.16	1.57	6.53	148.47	377.23	150.89	97.04

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
2	22.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
3	24.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33
4	25.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33
5	27.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
6	28.50	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
7	30.00	19	2.96E+07	4.91E-02	2.70E+03	3.52	0.71	2.06	1.85	7.23	6.49	0.216	0.865	9.25	2.31	33.44	15.01	22.19	5.55	80.26	36.03

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-15	-
Chainage	1+392	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	103.16	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-15	1.20	22.00	19.50	19.50	122.61	83.47	10.85	2.71
BH-15	1.20	23.50	21.00	21.00	181.36	94.14	10.85	2.71
BH-15	1.20	25.00	22.50	22.50	193.21	104.81	11.28	2.82
BH-15	1.20	26.50	24.00	24.00	204.58	115.48	11.28	2.82
BH-15	1.20	28.00	25.50	25.50	228.24	126.44	11.70	2.93
BH-15	1.20	29.50	27.00	27.00	240.50	137.40	11.70	2.93
BH-15	1.20	30.00	27.50	27.50	244.59	141.05	12.11	3.03

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	5.89	0.00	20	-	0.00	5.39	1.00	-	3.25	4.00	4.42	8.84	5.65	0.88	5.41	6.28	2.51	6.58
2	4.00	5.50	1.50	Granular	5.89	0.00	20	-	0.00	5.39	1.00	-	4.75	5.50	13.26	17.68	5.65	2.63	10.82	14.32	5.73	9.69
3	5.50	7.00	1.50	Granular	5.89	0.00	20	-	0.00	5.39	1.00	-	6.25	7.00	22.10	26.52	5.65	4.38	16.22	24.11	9.64	13.29
4	7.00	8.50	1.50	Granular	5.89	0.00	20	-	0.00	5.39	1.00	-	7.75	8.50	30.94	35.36	5.65	6.13	21.63	35.64	14.26	17.38
5	8.50	10.00	1.50	Granular	7.30	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	40.84	46.31	5.65	10.52	75.26	99.78	39.91	22.70
6	10.00	11.50	1.50	Granular	7.30	0.00	26	-	11.90	13.19	1.00	-	10.75	11.50	51.79	57.26	5.65	13.34	91.65	129.52	51.81	28.81
7	11.50	13.00	1.50	Granular	7.30	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	62.74	68.21	5.65	16.16	108.05	162.07	64.83	35.71
7	13.00	14.50	1.50	Granular	7.30	0.00	26	-	11.90	13.19	1.00	-	13.75	14.50	73.69	79.16	5.65	18.98	124.45	197.44	78.98	43.40
8	14.50	16.00	1.50	Granular	8.00	0.00	25	-	10.00	10.88	1.00	-	15.25	16.00	85.16	91.16	5.65	0.00	118.02	191.02	76.41	45.77
9	16.00	17.50	1.50	Granular	8.00	0.00	25	-	10.00	10.88	1.00	-	16.75	17.50	97.16	103.16	5.65	24.06	132.84	229.90	91.96	54.88
10	17.50	19.00	1.50	Granular	8.00	0.00	25	-	10.00	10.88	1.00	-	18.25	19.00	103.16	103.16	5.65	25.55	132.84	255.44	102.18	64.41
11	19.00	20.50	1.50	Granular	8.00	0.00	25	-	10.00	10.88	1.00	-	19.75	20.50	103.16	103.16	5.65	25.55	132.84	280.99	112.40	73.94
12	20.50	22.00	1.50	Granular	8.00	0.00	25	-	10.00	10.88	1.00	-	21.25	22.00	103.16	103.16	5.65	25.55	132.84	306.53	122.61	83.47
13	22.00	23.50	1.50	Granular	12.00	0.00	29	-	17.60	20.13	1.00	-	22.75	23.50	103.16	103.16	5.65	29.63	250.06	453.39	181.36	94.14
14	23.50	25.00	1.50	Granular	12.00	0.00	29	-	17.60	20.13	1.00	-	24.25	25.00	103.16	103.16	5.65	29.63	250.06	483.02	193.21	104.81
15	25.00	26.50	1.50	Granular	11.00	0.00	29	-	17.60	20.13	1.00	-	25.75	26.50	103.16	103.16	5.65	29.63	248.87	511.46	204.58	115.48
16	26.50	28.00	1.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	103.16	103.16	5.65	30.65	277.36	570.60	228.24	126.44
17	28.00	29.50	1.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	103.16	103.16	5.65	30.65	277.36	601.26	240.50	137.40
18	29.50	30.00	0.50	Granular	11.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	103.16	103.16	1.88	10.22	277.36	611.48	244.59	141.05

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
2	22.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
3	24.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17
4	25.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17
5	27.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
6	28.50	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
7	30.00	19	2.96E+07	1.02E-01	2.70E+03	4.07	0.61	2.07	1.85	8.43	7.53	0.165	0.660	12.11	3.03	51.05	22.81	29.07	7.27	122.53	54.74

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-16	-
Chainage	1+487	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	82.00	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	9.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-16	1.00	22.00	19.50	12.50	108.73	62.44	10.18	2.55
BH-16	1.00	23.50	21.00	14.00	110.12	69.40	10.18	2.55
BH-16	1.00	25.00	22.50	15.50	117.70	76.35	10.18	2.55
BH-16	1.00	26.50	24.00	17.00	126.07	83.31	10.18	2.55
BH-16	1.00	28.00	25.50	18.50	133.65	90.26	10.18	2.55
BH-16	1.00	29.50	27.00	20.00	154.36	97.60	10.18	2.55
BH-16	1.00	30.00	27.50	20.50	157.07	100.04	10.18	2.55

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	6.49	0.00	20	-	0.00	5.39	1.00	-	3.25	4.00	4.87	9.74	4.71	0.00	0.00	0.00	0.00	4.40
2	4.00	5.50	1.50	Granular	6.49	0.00	20	-	0.00	5.39	1.00	-	4.75	5.50	14.61	19.48	4.71	0.00	0.00	0.00	0.00	6.05
3	5.50	7.00	1.50	Granular	6.49	0.00	20	-	0.00	5.39	1.00	-	6.25	7.00	24.35	29.22	4.71	0.00	0.00	0.00	0.00	7.70
4	7.00	8.50	1.50	Granular	6.49	0.00	27	-	13.80	15.50	1.00	-	7.75	8.50	34.09	38.96	4.71	0.00	0.00	0.00	0.00	9.35
5	8.50	10.00	1.50	Granular	6.49	0.00	27	-	13.80	15.50	1.00	-	9.25	10.00	43.83	48.70	4.71	0.00	63.05	63.05	25.22	11.00
6	10.00	11.50	1.50	Granular	7.40	0.00	27	-	13.80	15.50	1.00	-	10.75	11.50	54.25	59.80	4.71	12.09	77.10	89.19	35.68	16.03
7	11.50	13.00	1.50	Granular	7.40	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	65.35	70.90	4.71	14.02	77.19	103.31	41.32	21.61
7	13.00	14.50	1.50	Granular	7.40	0.00	26	-	11.90	13.19	1.00	-	13.75	14.50	76.45	82.00	4.71	16.41	88.74	131.26	52.50	27.85
8	14.50	16.00	1.50	Granular	7.40	0.00	26	-	11.90	13.19	1.00	-	15.25	16.00	82.00	82.00	4.71	17.60	88.74	148.86	59.54	34.43
9	16.00	17.50	1.50	Granular	7.40	0.00	26	-	11.90	13.19	1.00	-	16.75	17.50	82.00	82.00	4.71	17.60	88.74	166.46	66.58	41.00
10	17.50	19.00	1.50	Granular	7.40	0.00	29	-	17.60	20.13	1.00	-	18.25	19.00	82.00	82.00	4.71	19.63	135.23	232.58	93.03	48.15
11	19.00	20.50	1.50	Granular	7.40	0.00	29	-	17.60	20.13	1.00	-	19.75	20.50	82.00	82.00	4.71	19.63	135.23	252.21	100.88	55.29
12	20.50	22.00	1.50	Granular	7.40	0.00	29	-	17.60	20.13	1.00	-	21.25	22.00	82.00	82.00	4.71	19.63	135.23	271.83	108.73	62.44
13	22.00	23.50	1.50	Granular	7.40	0.00	28	-	15.70	17.82	1.00	-	22.75	23.50	82.00	82.00	4.71	18.95	119.73	275.29	110.12	69.40
14	23.50	25.00	1.50	Granular	7.40	0.00	28	-	15.70	17.82	1.00	-	24.25	25.00	82.00	82.00	4.71	18.95	119.73	294.24	117.70	76.35
15	25.00	26.50	1.50	Granular	10.60	0.00	28	-	15.70	17.82	1.00	-	25.75	26.50	82.00	82.00	4.71	18.95	121.71	315.17	126.07	83.31
16	26.50	28.00	1.50	Granular	10.60	0.00	28	-	15.70	17.82	1.00	-	27.25	28.00	82.00	82.00	4.71	18.95	121.71	334.12	133.65	90.26
17	28.00	29.50	1.50	Granular	10.60	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	82.00	82.00	4.71	20.31	153.19	385.90	154.36	97.60
18	29.50	30.00	0.50	Granular	10.60	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	82.00	82.00	1.57	6.77	153.19	392.67	157.07	100.04

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_i/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	2.57	1.90	1.79	7.00	6.62	0.196	0.786	10.18	2.55	35.66	16.85	24.44	6.11	85.58	40.45
2	22.50	15	2.96E+07	4.91E-02	2.12E+03	3.69	2.57	1.90	1.79	7.00	6.62	0.196	0.786	10.18	2.55	35.66	16.85	24.44	6.11	85.58	40.45
3	24.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	2.57	1.90	1.79	7.00	6.62	0.196	0.786	10.18	2.55	35.66	16.85	24.44	6.11	85.58	40.45
4	25.50	15	2.96E+07	4.91E-02	2.12E+03	3.69	2.57	1.90	1.79	7.00	6.62	0.196	0.786	10.18	2.55	35.66	16.85	24.44	6.11	85.58	40.45
5	27.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	2.57	1.90	1.79	7.00	6.62	0.196	0.786	10.18	2.55	35.66	16.85	24.44	6.11	85.58	40.45
6	28.50	15	2.96E+07	4.91E-02	2.12E+03	3.69	2.57	1.90	1.79	7.00	6.62	0.196	0.786	10.18	2.55	35.66	16.85	24.44	6.11	85.58	40.45
7	30.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	2.57	1.90	1.79	7.00	6.62	0.196	0.786	10.18	2.55	35.66	16.85	24.44	6.11	85.58	40.45

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-16	-
Chainage	1+487	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	104.20	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	9.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-16	1.20	22.00	19.50	12.50	174.28	87.69	13.32	3.33
BH-16	1.20	23.50	21.00	14.00	174.52	98.16	13.32	3.33
BH-16	1.20	25.00	22.50	15.50	186.08	108.62	13.32	3.33
BH-16	1.20	26.50	24.00	17.00	199.01	119.09	13.32	3.33
BH-16	1.20	28.00	25.50	18.50	210.57	129.56	13.32	3.33
BH-16	1.20	29.50	27.00	20.00	245.93	140.60	13.32	3.33
BH-16	1.20	30.00	27.50	20.50	250.05	144.28	13.32	3.33

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	6.49	0.00	20	-	0.00	5.39	1.00	-	3.25	4.00	4.87	9.74	5.65	0.00	0.00	0.00	0.00	6.33
2	4.00	5.50	1.50	Granular	6.49	0.00	20	-	0.00	5.39	1.00	-	4.75	5.50	14.61	19.48	5.65	0.00	0.00	0.00	0.00	8.71
3	5.50	7.00	1.50	Granular	6.49	0.00	20	-	0.00	5.39	1.00	-	6.25	7.00	24.35	29.22	5.65	0.00	0.00	0.00	0.00	11.08
4	7.00	8.50	1.50	Granular	6.49	0.00	27	-	13.80	15.50	1.00	-	7.75	8.50	34.09	38.96	5.65	0.00	0.00	0.00	0.00	13.46
5	8.50	10.00	1.50	Granular	6.49	0.00	27	-	13.80	15.50	1.00	-	9.25	10.00	43.83	48.70	5.65	0.00	91.80	91.80	36.72	15.83
6	10.00	11.50	1.50	Granular	7.40	0.00	27	-	13.80	15.50	1.00	-	10.75	11.50	54.25	59.80	5.65	14.51	112.19	126.70	50.68	22.27
7	11.50	13.00	1.50	Granular	7.40	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	65.35	70.90	5.65	16.83	112.16	143.50	57.40	29.36
7	13.00	14.50	1.50	Granular	7.40	0.00	26	-	11.90	13.19	1.00	-	13.75	14.50	76.45	82.00	5.65	19.69	128.78	179.81	71.92	37.25
8	14.50	16.00	1.50	Granular	7.40	0.00	26	-	11.90	13.19	1.00	-	15.25	16.00	87.55	93.10	5.65	22.55	145.40	218.97	87.59	45.93
9	16.00	17.50	1.50	Granular	7.40	0.00	26	-	11.90	13.19	1.00	-	16.75	17.50	98.65	104.20	5.65	25.41	162.02	261.00	104.40	55.42
10	17.50	19.00	1.50	Granular	7.40	0.00	29	-	17.60	20.13	1.00	-	18.25	19.00	104.20	104.20	5.65	29.93	246.93	375.84	150.34	66.18
11	19.00	20.50	1.50	Granular	7.40	0.00	29	-	17.60	20.13	1.00	-	19.75	20.50	104.20	104.20	5.65	29.93	246.93	405.77	162.31	76.93
12	20.50	22.00	1.50	Granular	7.40	0.00	29	-	17.60	20.13	1.00	-	21.25	22.00	104.20	104.20	5.65	29.93	246.93	435.70	174.28	87.69
13	22.00	23.50	1.50	Granular	7.40	0.00	28	-	15.70	17.82	1.00	-	22.75	23.50	104.20	104.20	5.65	28.90	218.63	436.30	174.52	98.16
14	23.50	25.00	1.50	Granular	7.40	0.00	28	-	15.70	17.82	1.00	-	24.25	25.00	104.20	104.20	5.65	28.90	218.63	465.20	186.08	108.62
15	25.00	26.50	1.50	Granular	10.60	0.00	28	-	15.70	17.82	1.00	-	25.75	26.50	104.20	104.20	5.65	28.90	222.05	497.52	199.01	119.09
16	26.50	28.00	1.50	Granular	10.60	0.00	28	-	15.70	17.82	1.00	-	27.25	28.00	104.20	104.20	5.65	28.90	222.05	526.42	210.57	129.56
17	28.00	29.50	1.50	Granular	10.60	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	104.20	104.20	5.65	30.96	279.48	614.81	245.93	140.60
18	29.50	30.00	0.50	Granular	10.60	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	104.20	104.20	1.88	10.32	279.48	625.13	250.05	144.28

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_i/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	2.22	1.91	1.80	8.17	7.69	0.150	0.601	13.32	3.33	54.39	25.59	31.97	7.99	130.53	61.42
2	22.50	15	2.96E+07	1.02E-01	2.12E+03	4.27	2.22	1.91	1.80	8.17	7.69	0.150	0.601	13.32	3.33	54.39	25.59	31.97	7.99	130.53	61.42
3	24.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	2.22	1.91	1.80	8.17	7.69	0.150	0.601	13.32	3.33	54.39	25.59	31.97	7.99	130.53	61.42
4	25.50	15	2.96E+07	1.02E-01	2.12E+03	4.27	2.22	1.91	1.80	8.17	7.69	0.150	0.601	13.32	3.33	54.39	25.59	31.97	7.99	130.53	61.42
5	27.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	2.22	1.91	1.80	8.17	7.69	0.150	0.601	13.32	3.33	54.39	25.59	31.97	7.99	130.53	61.42
6	28.50	15	2.96E+07	1.02E-01	2.12E+03	4.27	2.22	1.91	1.80	8.17	7.69	0.150	0.601	13.32	3.33	54.39	25.59	31.97	7.99	130.53	61.42
7	30.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	2.22	1.91	1.80	8.17	7.69	0.150	0.601	13.32	3.33	54.39	25.59	31.97	7.99	130.53	61.42

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-17	-
Chainage	1+587	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	76.14	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	9.00	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-17	1.00	22.00	19.50	13.00	84.18	55.84	8.75	2.19
BH-17	1.00	23.50	21.00	14.50	90.96	62.24	8.75	2.19
BH-17	1.00	25.00	22.50	16.00	97.75	68.64	9.21	2.30
BH-17	1.00	26.50	24.00	17.50	104.95	75.04	9.66	2.42
BH-17	1.00	28.00	25.50	19.00	130.04	81.97	9.66	2.42
BH-17	1.00	29.50	27.00	20.50	137.58	88.90	9.66	2.42
BH-17	1.00	30.00	27.50	21.00	140.09	91.21	9.66	2.42

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	5.89	0.00	22	-	4.00	7.59	1.00	-	3.25	4.00	4.42	8.84	4.71	0.00	0.00	0.00	0.00	4.40
2	4.00	5.50	1.50	Granular	5.89	0.00	22	-	4.00	7.59	1.00	-	4.75	5.50	13.26	17.68	4.71	0.00	0.00	0.00	0.00	6.05
3	5.50	7.00	1.50	Granular	5.89	0.00	22	-	4.00	7.59	1.00	-	6.25	7.00	22.10	26.52	4.71	0.00	0.00	0.00	0.00	7.70
4	7.00	8.50	1.50	Granular	5.89	0.00	22	-	4.00	7.59	1.00	-	7.75	8.50	30.94	35.36	4.71	0.00	0.00	0.00	0.00	9.35
5	8.50	10.00	1.50	Granular	5.89	0.00	22	-	4.00	7.59	1.00	-	9.25	10.00	39.78	44.20	4.71	7.22	27.36	34.58	13.83	13.02
6	10.00	11.50	1.50	Granular	5.89	0.00	22	-	4.00	7.59	1.00	-	10.75	11.50	48.62	53.04	4.71	8.83	32.64	48.70	19.48	17.14
7	11.50	13.00	1.50	Granular	7.70	0.00	22	-	4.00	7.59	1.00	-	12.25	13.00	58.82	64.59	4.71	10.68	39.84	66.57	26.63	21.78
7	13.00	14.50	1.50	Granular	7.70	0.00	22	-	4.00	7.59	1.00	-	13.75	14.50	70.37	76.14	4.71	12.78	46.74	86.25	34.50	27.01
8	14.50	16.00	1.50	Granular	7.70	0.00	22	-	4.00	7.59	1.00	-	15.25	16.00	76.14	76.14	4.71	13.83	46.74	100.08	40.03	32.53
9	16.00	17.50	1.50	Granular	7.70	0.00	22	-	4.00	7.59	1.00	-	16.75	17.50	76.14	76.14	4.71	13.83	46.74	113.91	45.56	38.05
10	17.50	19.00	1.50	Granular	8.00	0.00	23	-	6.00	8.68	1.00	-	18.25	19.00	76.14	76.14	4.71	14.46	54.01	135.63	54.25	43.75
11	19.00	20.50	1.50	Granular	8.00	0.00	23	-	6.00	8.68	1.00	-	19.75	20.50	76.14	76.14	4.71	14.46	54.01	150.08	60.03	49.44
12	20.50	22.00	1.50	Granular	8.00	0.00	27	-	13.80	15.50	1.00	-	21.25	22.00	76.14	76.14	4.71	16.97	97.40	210.44	84.18	55.84
13	22.00	23.50	1.50	Granular	8.00	0.00	27	-	13.80	15.50	1.00	-	22.75	23.50	76.14	76.14	4.71	16.97	97.40	227.41	90.96	62.24
14	23.50	25.00	1.50	Granular	8.00	0.00	27	-	13.80	15.50	1.00	-	24.25	25.00	76.14	76.14	4.71	16.97	97.40	244.38	97.75	68.64
15	25.00	26.50	1.50	Granular	9.90	0.00	27	-	13.80	15.50	1.00	-	25.75	26.50	76.14	76.14	4.71	16.97	98.43	262.38	104.95	75.04
16	26.50	28.00	1.50	Granular	9.90	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	76.14	76.14	4.71	18.85	142.28	325.09	130.04	81.97
17	28.00	29.50	1.50	Granular	9.90	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	76.14	76.14	4.71	18.85	142.28	343.94	137.58	88.90
18	29.50	30.00	0.50	Granular	9.90	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	76.14	76.14	1.57	6.28	142.28	350.23	140.09	91.21

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	12	2.96E+07	4.91E-02	1.69E+03	3.86	2.33	1.91	1.80	7.37	6.95	0.229	0.915	8.75	2.19	32.22	15.18	20.99	5.25	77.33	36.44
2	22.50	12	2.96E+07	4.91E-02	1.69E+03	3.86	2.33	1.91	1.80	7.37	6.95	0.229	0.915	8.75	2.19	32.22	15.18	20.99	5.25	77.33	36.44
3	24.00	13	2.96E+07	4.91E-02	1.83E+03	3.80	2.37	1.91	1.80	7.24	6.83	0.217	0.869	9.21	2.30	33.35	15.73	22.11	5.53	80.05	37.74
4	25.50	14	2.96E+07	4.91E-02	1.98E+03	3.74	2.40	1.90	1.80	7.13	6.73	0.207	0.828	9.66	2.42	34.43	16.24	23.19	5.80	82.64	38.98
5	27.00	14	2.96E+07	4.91E-02	1.98E+03	3.74	2.40	1.90	1.80	7.13	6.73	0.207	0.828	9.66	2.42	34.43	16.24	23.19	5.80	82.64	38.98
6	28.50	14	2.96E+07	4.91E-02	1.98E+03	3.74	2.40	1.90	1.80	7.13	6.73	0.207	0.828	9.66	2.42	34.43	16.24	23.19	5.80	82.64	38.98
7	30.00	14	2.96E+07	4.91E-02	1.98E+03	3.74	2.40	1.90	1.80	7.13	6.73	0.207	0.828	9.66	2.42	34.43	16.24	23.19	5.80	82.64	38.98

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-17	-
Chainage	1+587	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	99.24	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	9.00	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-17	1.20	22.00	19.50	13.00	135.82	78.90	11.41	2.85
BH-17	1.20	23.50	21.00	14.50	146.44	88.71	11.41	2.85
BH-17	1.20	25.00	22.50	16.00	157.05	98.52	12.02	3.01
BH-17	1.20	26.50	24.00	17.50	168.38	108.32	12.61	3.15
BH-17	1.20	28.00	25.50	19.00	212.97	118.95	12.61	3.15
BH-17	1.20	29.50	27.00	20.50	224.76	129.59	12.61	3.15
BH-17	1.20	30.00	27.50	21.00	228.69	133.13	12.61	3.15

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	5.89	0.00	22	-	4.00	7.59	1.00	-	3.25	4.00	4.42	8.84	5.65	0.00	0.00	0.00	0.00	6.33
2	4.00	5.50	1.50	Granular	5.89	0.00	22	-	4.00	7.59	1.00	-	4.75	5.50	13.26	17.68	5.65	0.00	0.00	0.00	0.00	8.71
3	5.50	7.00	1.50	Granular	5.89	0.00	22	-	4.00	7.59	1.00	-	6.25	7.00	22.10	26.52	5.65	0.00	0.00	0.00	0.00	11.08
4	7.00	8.50	1.50	Granular	5.89	0.00	22	-	4.00	7.59	1.00	-	7.75	8.50	30.94	35.36	5.65	0.00	0.00	0.00	0.00	13.46
5	8.50	10.00	1.50	Granular	5.89	0.00	22	-	4.00	7.59	1.00	-	9.25	10.00	39.78	44.20	5.65	8.67	39.66	48.33	19.33	18.26
6	10.00	11.50	1.50	Granular	5.89	0.00	22	-	4.00	7.59	1.00	-	10.75	11.50	48.62	53.04	5.65	10.59	47.28	66.54	26.62	23.60
7	11.50	13.00	1.50	Granular	7.70	0.00	22	-	4.00	7.59	1.00	-	12.25	13.00	58.82	64.59	5.65	12.82	57.71	89.79	35.92	29.57
7	13.00	14.50	1.50	Granular	7.70	0.00	22	-	4.00	7.59	1.00	-	13.75	14.50	70.37	76.14	5.65	15.33	67.66	115.07	46.03	36.23
8	14.50	16.00	1.50	Granular	7.70	0.00	22	-	4.00	7.59	1.00	-	15.25	16.00	81.92	87.69	5.65	17.85	77.60	142.87	57.15	43.61
9	16.00	17.50	1.50	Granular	7.70	0.00	22	-	4.00	7.59	1.00	-	16.75	17.50	93.47	99.24	5.65	20.37	87.55	173.18	69.27	51.69
10	17.50	19.00	1.50	Granular	8.00	0.00	23	-	6.00	8.68	1.00	-	18.25	19.00	99.24	99.24	5.65	22.61	101.09	209.33	83.73	60.39
11	19.00	20.50	1.50	Granular	8.00	0.00	23	-	6.00	8.68	1.00	-	19.75	20.50	99.24	99.24	5.65	22.61	101.09	231.94	92.77	69.10
12	20.50	22.00	1.50	Granular	8.00	0.00	27	-	13.80	15.50	1.00	-	21.25	22.00	99.24	99.24	5.65	26.54	182.16	339.55	135.82	78.90
13	22.00	23.50	1.50	Granular	8.00	0.00	27	-	13.80	15.50	1.00	-	22.75	23.50	99.24	99.24	5.65	26.54	182.16	366.09	146.44	88.71
14	23.50	25.00	1.50	Granular	8.00	0.00	27	-	13.80	15.50	1.00	-	24.25	25.00	99.24	99.24	5.65	26.54	182.16	392.63	157.05	98.52
15	25.00	26.50	1.50	Granular	9.90	0.00	27	-	13.80	15.50	1.00	-	25.75	26.50	99.24	99.24	5.65	26.54	183.94	420.96	168.38	108.32
16	26.50	28.00	1.50	Granular	9.90	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	99.24	99.24	5.65	29.49	265.92	532.42	212.97	118.95
17	28.00	29.50	1.50	Granular	9.90	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	99.24	99.24	5.65	29.49	265.92	561.91	224.76	129.59
18	29.50	30.00	0.50	Granular	9.90	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	99.24	99.24	1.88	9.83	265.92	571.74	228.69	133.13

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	12	2.96E+07	1.02E-01	1.69E+03	4.47	2.01	1.92	1.80	8.60	8.06	0.175	0.701	11.41	2.85	49.06	23.00	27.38	6.85	117.73	55.19
2	22.50	12	2.96E+07	1.02E-01	1.69E+03	4.47	2.01	1.92	1.80	8.60	8.06	0.175	0.701	11.41	2.85	49.06	23.00	27.38	6.85	117.73	55.19
3	24.00	13	2.96E+07	1.02E-01	1.83E+03	4.40	2.05	1.92	1.80	8.45	7.93	0.166	0.666	12.02	3.01	50.79	23.83	28.85	7.21	121.90	57.18
4	25.50	14	2.96E+07	1.02E-01	1.98E+03	4.33	2.08	1.92	1.80	8.32	7.81	0.159	0.634	12.61	3.15	52.45	24.62	30.27	7.57	125.88	59.08
5	27.00	14	2.96E+07	1.02E-01	1.98E+03	4.33	2.08	1.92	1.80	8.32	7.81	0.159	0.634	12.61	3.15	52.45	24.62	30.27	7.57	125.88	59.08
6	28.50	14	2.96E+07	1.02E-01	1.98E+03	4.33	2.08	1.92	1.80	8.32	7.81	0.159	0.634	12.61	3.15	52.45	24.62	30.27	7.57	125.88	59.08
7	30.00	14	2.96E+07	1.02E-01	1.98E+03	4.33	2.08	1.92	1.80	8.32	7.81	0.159	0.634	12.61	3.15	52.45	24.62	30.27	7.57	125.88	59.08

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-20	-
Chainage	1+869	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	93.91	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-20	1.00	22.00	19.50	19.50	147.74	79.32	9.56	2.39
BH-20	1.00	23.50	21.00	21.00	157.84	87.48	9.56	2.39
BH-20	1.00	25.00	22.50	22.50	167.14	95.64	9.56	2.39
BH-20	1.00	26.50	24.00	24.00	176.44	103.80	9.56	2.39
BH-20	1.00	28.00	25.50	25.50	185.75	111.96	9.56	2.39
BH-20	1.00	29.50	27.00	27.00	195.05	120.12	9.56	2.39
BH-20	1.00	30.00	27.50	27.50	198.15	122.84	9.56	2.39

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.79	0.00	27	-	13.80	15.50	1.00	-	3.25	4.00	5.85	11.69	4.71	1.30	18.52	19.83	7.93	4.76
2	4.00	5.50	1.50	Granular	7.79	0.00	27	-	13.80	15.50	1.00	-	4.75	5.50	17.54	23.38	4.71	3.91	32.81	38.02	15.21	7.51
3	5.50	7.00	1.50	Granular	7.79	0.00	30	-	19.50	22.44	1.00	-	6.25	7.00	29.23	35.07	4.71	7.24	68.02	80.47	32.19	11.18
4	7.00	8.50	1.50	Granular	7.79	0.00	30	-	19.50	22.44	1.00	-	7.75	8.50	40.92	46.76	4.71	10.13	88.70	111.28	44.51	15.67
5	8.50	10.00	1.50	Granular	7.79	0.00	25	-	10.00	10.88	1.00	-	9.25	10.00	52.61	58.45	4.71	10.86	53.20	86.63	34.65	20.36
6	10.00	11.50	1.50	Granular	7.89	0.00	25	-	10.00	10.88	1.00	-	10.75	11.50	64.37	70.29	4.71	13.28	63.39	110.11	44.04	25.73
7	11.50	13.00	1.50	Granular	7.89	0.00	25	-	10.00	10.88	1.00	-	12.25	13.00	76.21	82.13	4.71	15.73	73.54	135.99	54.40	31.78
7	13.00	14.50	1.50	Granular	7.85	0.00	25	-	10.00	10.88	1.00	-	13.75	14.50	88.02	93.91	4.71	18.16	83.63	164.23	65.69	38.51
8	14.50	16.00	1.50	Granular	7.85	0.00	30	-	19.50	22.44	1.00	-	15.25	16.00	93.91	93.91	4.71	23.25	172.13	275.99	110.40	46.67
9	16.00	17.50	1.50	Granular	9.40	0.00	30	-	19.50	22.44	1.00	-	16.75	17.50	93.91	93.91	4.71	23.25	173.32	300.44	120.17	54.83
10	17.50	19.00	1.50	Granular	9.40	0.00	30	-	19.50	22.44	1.00	-	18.25	19.00	93.91	93.91	4.71	23.25	173.32	323.69	129.48	62.99
11	19.00	20.50	1.50	Granular	8.30	0.00	30	-	19.50	22.44	1.00	-	19.75	20.50	93.91	93.91	4.71	23.25	172.48	346.10	138.44	71.16
12	20.50	22.00	1.50	Granular	8.30	0.00	30	-	19.50	22.44	1.00	-	21.25	22.00	93.91	93.91	4.71	23.25	172.48	369.35	147.74	79.32
13	22.00	23.50	1.50	Granular	10.90	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	93.91	93.91	4.71	23.25	174.47	394.60	157.84	87.48
14	23.50	25.00	1.50	Granular	10.90	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	93.91	93.91	4.71	23.25	174.47	417.86	167.14	95.64
15	25.00	26.50	1.50	Granular	10.90	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	93.91	93.91	4.71	23.25	174.47	441.11	176.44	103.80
16	26.50	28.00	1.50	Granular	10.90	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	93.91	93.91	4.71	23.25	174.47	464.36	185.75	111.96
17	28.00	29.50	1.50	Granular	10.90	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	93.91	93.91	4.71	23.25	174.47	487.62	195.05	120.12
18	29.50	30.00	0.50	Granular	10.90	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	93.91	93.91	1.57	7.75	174.47	495.37	198.15	122.84

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_i/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
2	22.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
3	24.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
4	25.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
5	27.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
6	28.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
7	30.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-20	-
Chainage	1+869	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	119.78	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-20	1.20	22.00	19.50	19.50	233.11	109.50	12.52	3.13
BH-20	1.20	23.50	21.00	21.00	248.73	121.84	12.52	3.13
BH-20	1.20	25.00	22.50	22.50	262.96	134.18	12.52	3.13
BH-20	1.20	26.50	24.00	24.00	277.20	146.52	12.52	3.13
BH-20	1.20	28.00	25.50	25.50	291.44	158.86	12.52	3.13
BH-20	1.20	29.50	27.00	27.00	305.67	171.20	12.52	3.13
BH-20	1.20	30.00	27.50	27.50	310.42	175.32	12.52	3.13

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.79	0.00	27	-	13.80	15.50	1.00	-	3.25	4.00	5.85	11.69	5.65	1.56	27.90	29.46	11.78	6.77
2	4.00	5.50	1.50	Granular	7.79	0.00	27	-	13.80	15.50	1.00	-	4.75	5.50	17.54	23.38	5.65	4.69	48.47	54.72	21.89	10.46
3	5.50	7.00	1.50	Granular	7.79	0.00	30	-	19.50	22.44	1.00	-	6.25	7.00	29.23	35.07	5.65	8.68	99.67	114.61	45.84	15.27
4	7.00	8.50	1.50	Granular	7.79	0.00	30	-	19.50	22.44	1.00	-	7.75	8.50	40.92	46.76	5.65	12.16	129.45	156.54	62.62	21.05
5	8.50	10.00	1.50	Granular	7.79	0.00	25	-	10.00	10.88	1.00	-	9.25	10.00	52.61	58.45	5.65	13.03	77.49	117.61	47.04	27.07
6	10.00	11.50	1.50	Granular	7.89	0.00	25	-	10.00	10.88	1.00	-	10.75	11.50	64.37	70.29	5.65	15.94	92.18	148.24	59.30	33.91
7	11.50	13.00	1.50	Granular	7.89	0.00	25	-	10.00	10.88	1.00	-	12.25	13.00	76.21	82.13	5.65	18.87	106.80	181.73	72.69	41.57
7	13.00	14.50	1.50	Granular	7.85	0.00	25	-	10.00	10.88	1.00	-	13.75	14.50	88.02	93.91	5.65	21.80	121.31	218.04	87.22	50.04
8	14.50	16.00	1.50	Granular	7.85	0.00	30	-	19.50	22.44	1.00	-	15.25	16.00	99.79	105.68	5.65	29.65	279.60	405.98	162.39	60.72
9	16.00	17.50	1.50	Granular	9.40	0.00	30	-	19.50	22.44	1.00	-	16.75	17.50	112.73	119.78	5.65	33.50	317.57	477.45	190.98	72.48
10	17.50	19.00	1.50	Granular	9.40	0.00	30	-	19.50	22.44	1.00	-	18.25	19.00	119.78	119.78	5.65	35.59	317.57	513.04	205.22	84.82
11	19.00	20.50	1.50	Granular	8.30	0.00	30	-	19.50	22.44	1.00	-	19.75	20.50	119.78	119.78	5.65	35.59	316.11	547.17	218.87	97.16
12	20.50	22.00	1.50	Granular	8.30	0.00	30	-	19.50	22.44	1.00	-	21.25	22.00	119.78	119.78	5.65	35.59	316.11	582.77	233.11	109.50
13	22.00	23.50	1.50	Granular	10.90	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	119.78	119.78	5.65	35.59	319.56	621.81	248.73	121.84
14	23.50	25.00	1.50	Granular	10.90	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	119.78	119.78	5.65	35.59	319.56	657.41	262.96	134.18
15	25.00	26.50	1.50	Granular	10.90	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	119.78	119.78	5.65	35.59	319.56	693.00	277.20	146.52
16	26.50	28.00	1.50	Granular	10.90	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	119.78	119.78	5.65	35.59	319.56	728.59	291.44	158.86
17	28.00	29.50	1.50	Granular	10.90	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	119.78	119.78	5.65	35.59	319.56	764.19	305.67	171.20
18	29.50	30.00	0.50	Granular	10.90	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	119.78	119.78	1.88	11.86	319.56	776.05	310.42	175.32

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
2	22.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
3	24.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
4	25.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
5	27.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
6	28.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
7	30.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-21	-
Chainage	1+925	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	84.26	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	3.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-21	1.00	22.00	19.50	18.50	114.25	69.62	10.13	2.53
BH-21	1.00	23.50	21.00	20.00	121.98	76.73	10.13	2.53
BH-21	1.00	25.00	22.50	21.50	129.77	83.83	10.13	2.53
BH-21	1.00	26.50	24.00	23.00	151.21	91.32	10.13	2.53
BH-21	1.00	28.00	25.50	24.50	159.56	98.81	10.46	2.61
BH-21	1.00	29.50	27.00	26.00	167.90	106.30	10.46	2.61
BH-21	1.00	30.00	27.50	26.50	170.69	108.80	10.78	2.69

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (Ki)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	6.19	0.00	24	-	8.00	9.78	1.00	-	3.25	4.00	4.65	9.29	4.71	0.00	9.12	9.12	3.65	4.40
2	4.00	5.50	1.50	Granular	6.19	0.00	24	-	8.00	9.78	1.00	-	4.75	5.50	13.94	18.58	4.71	2.76	16.28	19.04	7.62	6.82
3	5.50	7.00	1.50	Granular	6.19	0.00	25	-	10.00	10.88	1.00	-	6.25	7.00	23.23	27.87	4.71	4.79	26.34	33.90	13.56	9.81
4	7.00	8.50	1.50	Granular	6.19	0.00	25	-	10.00	10.88	1.00	-	7.75	8.50	32.52	37.16	4.71	6.71	34.31	48.57	19.43	13.34
5	8.50	10.00	1.50	Granular	7.85	0.00	25	-	10.00	10.88	1.00	-	9.25	10.00	43.05	48.94	4.71	8.88	45.06	68.21	27.28	17.48
6	10.00	11.50	1.50	Granular	7.85	0.00	27	-	13.80	15.50	1.00	-	10.75	11.50	54.82	60.71	4.71	12.22	78.46	113.83	45.53	22.55
7	11.50	13.00	1.50	Granular	7.85	0.00	27	-	13.80	15.50	1.00	-	12.25	13.00	66.60	72.49	4.71	14.84	92.85	143.06	57.22	28.35
7	13.00	14.50	1.50	Granular	7.85	0.00	27	-	13.80	15.50	1.00	-	13.75	14.50	78.37	84.26	4.71	17.47	107.24	174.91	69.97	34.89
8	14.50	16.00	1.50	Granular	7.85	0.00	27	-	13.80	15.50	1.00	-	15.25	16.00	84.26	84.26	4.71	18.78	107.24	193.69	77.48	41.80
9	16.00	17.50	1.50	Granular	9.90	0.00	27	-	13.80	15.50	1.00	-	16.75	17.50	84.26	84.26	4.71	18.78	108.36	213.59	85.43	48.71
10	17.50	19.00	1.50	Granular	9.90	0.00	27	-	13.80	15.50	1.00	-	18.25	19.00	84.26	84.26	4.71	18.78	108.36	232.36	92.95	55.61
11	19.00	20.50	1.50	Granular	8.15	0.00	27	-	13.80	15.50	1.00	-	19.75	20.50	84.26	84.26	4.71	18.78	107.40	250.19	100.08	62.52
12	20.50	22.00	1.50	Granular	8.15	0.00	28	-	15.70	17.82	1.00	-	21.25	22.00	84.26	84.26	4.71	19.47	123.37	285.63	114.25	69.62
13	22.00	23.50	1.50	Granular	7.90	0.00	28	-	15.70	17.82	1.00	-	22.75	23.50	84.26	84.26	4.71	19.47	123.21	304.95	121.98	76.73
14	23.50	25.00	1.50	Granular	7.90	0.00	28	-	15.70	17.82	1.00	-	24.25	25.00	84.26	84.26	4.71	19.47	123.21	324.43	129.77	83.83
15	25.00	26.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	84.26	84.26	4.71	20.87	155.95	378.03	151.21	91.32
16	26.50	28.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	84.26	84.26	4.71	20.87	155.95	398.89	159.56	98.81
17	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	84.26	84.26	4.71	20.87	155.95	419.76	167.90	106.30
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	84.26	84.26	1.57	6.96	155.95	426.72	170.69	108.80

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_i/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	1.01	2.02	1.83	7.02	6.38	0.197	0.790	10.13	2.53	35.54	16.17	24.32	6.08	85.30	38.80
2	22.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	1.01	2.02	1.83	7.02	6.38	0.197	0.790	10.13	2.53	35.54	16.17	24.32	6.08	85.30	38.80
3	24.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	1.01	2.02	1.83	7.02	6.38	0.197	0.790	10.13	2.53	35.54	16.17	24.32	6.08	85.30	38.80
4	25.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	1.01	2.02	1.83	7.02	6.38	0.197	0.790	10.13	2.53	35.54	16.17	24.32	6.08	85.30	38.80
5	27.00	21	2.96E+07	4.91E-02	2.98E+03	3.45	1.02	2.01	1.83	6.94	6.32	0.191	0.765	10.46	2.61	36.30	16.52	25.10	6.27	87.11	39.65
6	28.50	21	2.96E+07	4.91E-02	2.98E+03	3.45	1.02	2.01	1.83	6.94	6.32	0.191	0.765	10.46	2.61	36.30	16.52	25.10	6.27	87.11	39.65
7	30.00	22	2.96E+07	4.91E-02	3.13E+03	3.41	1.03	2.01	1.83	6.87	6.26	0.186	0.742	10.78	2.69	37.03	16.86	25.86	6.47	88.88	40.46

CALCULATION OF NET SAFE PILE BEARING CAPACITY

Borehole ID	BH-21	-
Chainage	1+925	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	110.89	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	3.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-21	1.20	22.00	19.50	18.50	182.40	97.29	13.21	3.30
BH-21	1.20	23.50	21.00	20.00	194.59	108.27	13.21	3.30
BH-21	1.20	25.00	22.50	21.50	206.89	119.26	13.21	3.30
BH-21	1.20	26.50	24.00	23.00	244.75	130.86	13.21	3.30
BH-21	1.20	28.00	25.50	24.50	257.93	142.46	13.63	3.41
BH-21	1.20	29.50	27.00	26.00	271.11	154.06	13.63	3.41
BH-21	1.20	30.00	27.50	26.50	275.51	157.93	14.04	3.51

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	6.19	0.00	24	-	8.00	9.78	1.00	-	3.25	4.00	4.65	9.29	5.65	0.00	13.69	13.69	5.48	6.33
2	4.00	5.50	1.50	Granular	6.19	0.00	24	-	8.00	9.78	1.00	-	4.75	5.50	13.94	18.58	5.65	3.31	24.00	27.32	10.93	9.64
3	5.50	7.00	1.50	Granular	6.19	0.00	25	-	10.00	10.88	1.00	-	6.25	7.00	23.23	27.87	5.65	5.75	38.64	47.70	19.08	13.62
4	7.00	8.50	1.50	Granular	6.19	0.00	25	-	10.00	10.88	1.00	-	7.75	8.50	32.52	37.16	5.65	8.05	50.11	67.22	26.89	18.25
5	8.50	10.00	1.50	Granular	7.85	0.00	25	-	10.00	10.88	1.00	-	9.25	10.00	43.05	48.94	5.65	10.66	65.78	93.55	37.42	23.61
6	10.00	11.50	1.50	Granular	7.85	0.00	27	-	13.80	15.50	1.00	-	10.75	11.50	54.82	60.71	5.65	14.66	114.21	156.65	62.66	30.09
7	11.50	13.00	1.50	Granular	7.85	0.00	27	-	13.80	15.50	1.00	-	12.25	13.00	66.60	72.49	5.65	17.81	134.93	195.18	78.07	37.45
7	13.00	14.50	1.50	Granular	7.85	0.00	27	-	13.80	15.50	1.00	-	13.75	14.50	78.37	84.26	5.65	20.96	155.66	236.86	94.75	45.70
8	14.50	16.00	1.50	Granular	7.85	0.00	27	-	13.80	15.50	1.00	-	15.25	16.00	90.15	96.04	5.65	24.11	176.38	281.69	112.68	54.82
9	16.00	17.50	1.50	Granular	9.90	0.00	27	-	13.80	15.50	1.00	-	16.75	17.50	103.46	110.89	5.65	27.67	204.44	337.42	134.97	64.94
10	17.50	19.00	1.50	Granular	9.90	0.00	27	-	13.80	15.50	1.00	-	18.25	19.00	110.89	110.89	5.65	29.65	204.44	367.08	146.83	75.62
11	19.00	20.50	1.50	Granular	8.15	0.00	27	-	13.80	15.50	1.00	-	19.75	20.50	110.89	110.89	5.65	29.65	202.79	395.09	158.04	86.30
12	20.50	22.00	1.50	Granular	8.15	0.00	28	-	15.70	17.82	1.00	-	21.25	22.00	110.89	110.89	5.65	30.75	232.95	455.99	182.40	97.29
13	22.00	23.50	1.50	Granular	7.90	0.00	28	-	15.70	17.82	1.00	-	22.75	23.50	110.89	110.89	5.65	30.75	232.68	486.48	194.59	108.27
14	23.50	25.00	1.50	Granular	7.90	0.00	28	-	15.70	17.82	1.00	-	24.25	25.00	110.89	110.89	5.65	30.75	232.68	517.23	206.89	119.26
15	25.00	26.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	110.89	110.89	5.65	32.95	294.38	611.89	244.75	130.86
16	26.50	28.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	110.89	110.89	5.65	32.95	294.38	644.84	257.93	142.46
17	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	110.89	110.89	5.65	32.95	294.38	677.79	271.11	154.06
18	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	110.89	110.89	1.88	10.98	294.38	688.77	275.51	157.93

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.87	2.03	1.84	8.19	7.41	0.151	0.606	13.21	3.30	54.08	24.46	31.70	7.92	129.80	58.70
2	22.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.87	2.03	1.84	8.19	7.41	0.151	0.606	13.21	3.30	54.08	24.46	31.70	7.92	129.80	58.70
3	24.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.87	2.03	1.84	8.19	7.41	0.151	0.606	13.21	3.30	54.08	24.46	31.70	7.92	129.80	58.70
4	25.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.87	2.03	1.84	8.19	7.41	0.151	0.606	13.21	3.30	54.08	24.46	31.70	7.92	129.80	58.70
5	27.00	21	2.96E+07	1.02E-01	2.98E+03	3.99	0.88	2.03	1.84	8.10	7.33	0.147	0.587	13.63	3.41	55.23	24.99	32.71	8.18	132.55	59.97
6	28.50	21	2.96E+07	1.02E-01	2.98E+03	3.99	0.88	2.03	1.84	8.10	7.33	0.147	0.587	13.63	3.41	55.23	24.99	32.71	8.18	132.55	59.97
7	30.00	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.89	2.03	1.84	8.02	7.26	0.142	0.570	14.04	3.51	56.34	25.50	33.70	8.43	135.22	61.20

A.3. Zone 3: CH: 1+925 km to 2+586 km (BH-22 to BH-27)

The following table presents the recommended safe capacities of bored cast-in-situ RCC piles, considering mobilization of both skin friction and end bearing, under compression, uplift, and lateral loading. The capacities are based on an assumed cut-off level at 2.5m below the existing ground level (EGL).

BH ID	Pile Dia	Total Depth of Pile	Effective Shaft Depth	Grip Length	CASE_1 GW at Encountered Level				CASE_2 GW at Ground Level			
					Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)
-	(m)	(m)	(m)	(m)	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne
BH-22	1.00	22.00	19.50	18.50	240.01	130.05	8.41	2.10	99.68	67.06	8.41	2.10
BH-22	1.00	23.50	21.00	20.00	256.49	142.82	8.41	2.10	106.98	73.40	8.41	2.10
BH-22	1.00	25.00	22.50	21.50	314.05	156.83	8.77	2.19	131.82	80.27	8.77	2.19
BH-22	1.00	26.50	24.00	23.00	331.70	170.83	8.77	2.19	139.27	87.13	8.77	2.19
BH-22	1.00	28.00	25.50	24.50	349.35	184.84	8.77	2.19	146.72	94.00	8.77	2.19
BH-22	1.00	29.50	27.00	26.00	367.00	198.84	9.12	2.28	154.17	100.86	9.12	2.28
BH-22	1.00	30.00	27.50	26.50	372.88	203.51	9.12	2.28	156.66	103.15	9.12	2.28
BH-22	1.20	22.00	19.50	18.50	335.95	168.87	10.97	2.74	155.47	93.27	10.97	2.74
BH-22	1.20	23.50	21.00	20.00	358.50	186.31	10.97	2.74	167.01	103.00	10.97	2.74
BH-22	1.20	25.00	22.50	21.50	447.37	205.42	11.44	2.86	211.21	113.55	11.44	2.86
BH-22	1.20	26.50	24.00	23.00	471.28	224.53	11.44	2.86	222.88	124.09	11.44	2.86
BH-22	1.20	28.00	25.50	24.50	495.19	243.64	11.44	2.86	234.55	134.63	11.44	2.86
BH-22	1.20	29.50	27.00	26.00	519.10	262.75	11.89	2.97	246.22	145.18	11.89	2.97
BH-22	1.20	30.00	27.50	26.50	527.07	269.13	11.89	2.97	250.11	148.69	11.89	2.97
BH-23	1.00	22.00	19.50	19.50	299.23	143.40	9.56	2.39	143.38	80.05	9.56	2.39
BH-23	1.00	23.50	21.00	21.00	318.29	158.39	9.56	2.39	152.58	88.14	9.56	2.39
BH-23	1.00	25.00	22.50	22.50	337.35	173.38	9.56	2.39	161.78	96.22	9.56	2.39
BH-23	1.00	26.50	24.00	24.00	371.86	188.83	9.56	2.39	178.58	104.54	9.56	2.39
BH-23	1.00	28.00	25.50	25.50	391.57	204.28	9.56	2.39	188.10	112.85	9.56	2.39

BH ID	Pile Dia	Total Depth of Pile	Effective Shaft Depth	Grip Length	CASE_1 GW at Encountered Level				CASE_2 GW at Ground Level			
					Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)
-	(m)	(m)	(m)	(m)	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne
BH-23	1.00	29.50	27.00	27.00	411.29	219.73	9.56	2.39	197.61	121.16	9.56	2.39
BH-23	1.00	30.00	27.50	27.50	417.86	224.88	9.56	2.39	200.78	123.93	9.56	2.39
BH-23	1.20	22.00	19.50	19.50	424.98	185.81	12.52	3.13	222.27	109.78	12.52	3.13
BH-23	1.20	23.50	21.00	21.00	450.72	206.21	12.52	3.13	236.19	121.90	12.52	3.13
BH-23	1.20	25.00	22.50	22.50	476.47	226.61	12.52	3.13	250.10	134.02	12.52	3.13
BH-23	1.20	26.50	24.00	24.00	527.12	247.63	12.52	3.13	277.70	146.47	12.52	3.13
BH-23	1.20	28.00	25.50	25.50	553.76	268.65	12.52	3.13	292.10	158.92	12.52	3.13
BH-23	1.20	29.50	27.00	27.00	580.39	289.67	12.52	3.13	306.50	171.38	12.52	3.13
BH-23	1.20	30.00	27.50	27.50	589.27	296.68	12.52	3.13	311.30	175.53	12.52	3.13
BH-23A	1.00	22.00	19.50	19.50	299.64	143.21	8.61	2.15	124.76	73.08	8.61	2.15
BH-23A	1.00	23.50	21.00	21.00	318.84	158.30	8.93	2.23	132.69	80.28	8.93	2.23
BH-23A	1.00	25.00	22.50	22.50	353.57	173.86	8.93	2.23	147.19	87.67	8.93	2.23
BH-23A	1.00	26.50	24.00	24.00	373.62	189.41	8.93	2.23	155.59	95.07	8.93	2.23
BH-23A	1.00	28.00	25.50	25.50	393.49	204.97	8.93	2.23	163.80	102.47	8.93	2.23
BH-23A	1.00	29.50	27.00	27.00	413.35	220.52	9.25	2.31	172.00	109.86	9.25	2.31
BH-23A	1.00	30.00	27.50	27.50	419.97	225.71	9.25	2.31	174.74	112.33	9.25	2.31
BH-23A	1.20	22.00	19.50	19.50	422.72	184.99	11.28	2.82	194.94	100.83	11.28	2.82
BH-23A	1.20	23.50	21.00	21.00	448.39	205.34	11.70	2.93	207.09	111.71	11.70	2.93
BH-23A	1.20	25.00	22.50	22.50	498.83	226.30	11.70	2.93	231.19	122.88	11.70	2.93
BH-23A	1.20	26.50	24.00	24.00	525.71	247.27	11.70	2.93	244.08	134.06	11.70	2.93
BH-23A	1.20	28.00	25.50	25.50	552.27	268.23	11.70	2.93	256.65	145.23	11.70	2.93
BH-23A	1.20	29.50	27.00	27.00	578.82	289.20	12.11	3.03	269.22	156.40	12.11	3.03
BH-23A	1.20	30.00	27.50	27.50	587.67	296.19	12.11	3.03	273.41	160.13	12.11	3.03
BH-23B	1.00	22.00	19.50	19.50	282.81	136.27	10.16	2.54	126.79	72.80	10.16	2.54
BH-23B	1.00	23.50	21.00	21.00	301.15	150.62	10.16	2.54	135.26	80.24	10.16	2.54

BH ID	Pile Dia	Total Depth of Pile	Effective Shaft Depth	Grip Length	CASE_1 GW at Encountered Level				CASE_2 GW at Ground Level			
					Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)
-	(m)	(m)	(m)	(m)	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne
BH-23B	1.00	25.00	22.50	22.50	319.29	164.96	10.16	2.54	143.54	87.69	10.16	2.54
BH-23B	1.00	26.50	24.00	24.00	352.15	179.75	10.16	2.54	158.70	95.33	10.16	2.54
BH-23B	1.00	28.00	25.50	25.50	370.91	194.53	10.16	2.54	167.27	102.98	10.16	2.54
BH-23B	1.00	29.50	27.00	27.00	389.68	209.32	10.16	2.54	175.83	110.62	10.16	2.54
BH-23B	1.00	30.00	27.50	27.50	395.93	214.25	10.16	2.54	178.69	113.17	10.16	2.54
BH-23B	1.20	22.00	19.50	19.50	405.99	177.77	13.30	3.32	203.08	101.60	13.30	3.32
BH-23B	1.20	23.50	21.00	21.00	431.16	197.53	13.30	3.32	216.42	113.08	13.30	3.32
BH-23B	1.20	25.00	22.50	22.50	456.00	217.29	13.30	3.32	229.43	124.56	13.30	3.32
BH-23B	1.20	26.50	24.00	24.00	504.88	237.65	13.30	3.32	255.26	136.35	13.30	3.32
BH-23B	1.20	28.00	25.50	25.50	530.57	258.01	13.30	3.32	268.71	148.14	13.30	3.32
BH-23B	1.20	29.50	27.00	27.00	556.26	278.37	13.30	3.32	282.16	159.94	13.30	3.32
BH-23B	1.20	30.00	27.50	27.50	564.82	285.16	13.30	3.32	286.65	163.87	13.30	3.32
BH-24	1.00	22.00	19.50	19.50	280.84	136.97	9.56	2.39	123.02	72.24	9.56	2.39
BH-24	1.00	23.50	21.00	21.00	312.88	151.44	9.56	2.39	137.35	79.57	9.56	2.39
BH-24	1.00	25.00	22.50	22.50	331.18	165.90	9.56	2.39	145.46	86.89	9.56	2.39
BH-24	1.00	26.50	24.00	24.00	349.49	180.36	9.56	2.39	153.56	94.21	9.56	2.39
BH-24	1.00	28.00	25.50	25.50	367.79	194.82	9.56	2.39	161.67	101.53	9.56	2.39
BH-24	1.00	29.50	27.00	27.00	386.10	209.29	9.56	2.39	169.77	108.86	9.56	2.39
BH-24	1.00	30.00	27.50	27.50	392.20	214.11	9.56	2.39	172.47	111.30	9.56	2.39
BH-24	1.20	22.00	19.50	19.50	402.70	178.67	12.52	3.13	197.63	100.99	12.52	3.13
BH-24	1.20	23.50	21.00	21.00	450.43	198.61	12.52	3.13	222.31	112.37	12.52	3.13
BH-24	1.20	25.00	22.50	22.50	475.53	218.56	12.52	3.13	235.18	123.75	12.52	3.13
BH-24	1.20	26.50	24.00	24.00	500.64	238.51	12.52	3.13	248.04	135.13	12.52	3.13
BH-24	1.20	28.00	25.50	25.50	525.74	258.46	12.52	3.13	260.91	146.51	12.52	3.13
BH-24	1.20	29.50	27.00	27.00	550.84	278.40	12.52	3.13	273.77	157.89	12.52	3.13

BH ID	Pile Dia	Total Depth of Pile	Effective Shaft Depth	Grip Length	CASE_1 GW at Encountered Level				CASE_2 GW at Ground Level			
					Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)
-	(m)	(m)	(m)	(m)	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne
BH-24	1.20	30.00	27.50	27.50	559.21	285.05	12.52	3.13	278.06	161.68	12.52	3.13
BH-25	1.00	22.00	19.50	18.50	218.28	129.50	8.77	2.19	86.17	65.28	8.77	2.19
BH-25	1.00	23.50	21.00	20.00	234.39	142.35	8.77	2.19	92.56	71.33	8.77	2.19
BH-25	1.00	25.00	22.50	21.50	325.62	157.45	8.77	2.19	129.24	78.27	8.77	2.19
BH-25	1.00	26.50	24.00	23.00	344.83	172.55	8.77	2.19	136.80	85.21	8.77	2.19
BH-25	1.00	28.00	25.50	24.50	349.00	187.20	9.12	2.28	138.28	91.97	9.12	2.28
BH-25	1.00	29.50	27.00	26.00	382.61	202.29	9.12	2.28	151.66	98.91	9.12	2.28
BH-25	1.00	30.00	27.50	26.50	389.02	207.33	9.46	2.37	154.17	101.22	9.46	2.37
BH-25	1.20	22.00	19.50	18.50	298.61	167.43	11.44	2.86	130.38	90.37	11.44	2.86
BH-25	1.20	23.50	21.00	20.00	320.21	184.81	11.44	2.86	140.33	99.59	11.44	2.86
BH-25	1.20	25.00	22.50	21.50	461.84	205.20	11.44	2.86	206.21	110.18	11.44	2.86
BH-25	1.20	26.50	24.00	23.00	487.57	225.58	11.44	2.86	217.95	120.77	11.44	2.86
BH-25	1.20	28.00	25.50	24.50	489.26	245.37	11.89	2.97	218.47	131.09	11.89	2.97
BH-25	1.20	29.50	27.00	26.00	538.17	265.75	11.89	2.97	241.04	141.69	11.89	2.97
BH-25	1.20	30.00	27.50	26.50	546.74	272.55	12.34	3.09	244.95	145.22	12.34	3.09
BH-26	1.00	22.00	19.50	19.50	245.17	121.54	7.95	1.99	106.85	65.21	7.95	1.99
BH-26	1.00	23.50	21.00	21.00	291.01	136.03	7.95	1.99	127.48	72.55	7.95	1.99
BH-26	1.00	25.00	22.50	22.50	309.53	150.52	8.28	2.07	135.81	79.90	8.28	2.07
BH-26	1.00	26.50	24.00	24.00	327.88	165.01	8.28	2.07	143.95	87.25	8.28	2.07
BH-26	1.00	28.00	25.50	25.50	346.22	179.49	8.28	2.07	152.09	94.60	8.28	2.07
BH-26	1.00	29.50	27.00	27.00	364.56	193.98	8.61	2.15	160.23	101.95	8.61	2.15
BH-26	1.00	30.00	27.50	27.50	370.67	198.81	8.61	2.15	162.95	104.40	8.61	2.15
BH-26	1.20	22.00	19.50	19.50	349.72	158.64	10.42	2.60	169.86	91.04	10.42	2.60
BH-26	1.20	23.50	21.00	21.00	419.39	178.43	10.42	2.60	205.67	102.26	10.42	2.60
BH-26	1.20	25.00	22.50	22.50	444.58	198.21	10.85	2.71	218.62	113.48	10.85	2.71

BH ID	Pile Dia	Total Depth of Pile	Effective Shaft Depth	Grip Length	CASE_1 GW at Encountered Level				CASE_2 GW at Ground Level			
					Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head)	Lateral Capacity (Free Head)
-	(m)	(m)	(m)	(m)	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne	Tonne
BH-26	1.20	26.50	24.00	24.00	469.45	218.00	10.85	2.71	231.26	124.70	10.85	2.71
BH-26	1.20	28.00	25.50	25.50	494.32	237.78	10.85	2.71	243.89	135.91	10.85	2.71
BH-26	1.20	29.50	27.00	27.00	519.20	257.57	11.28	2.82	256.52	147.13	11.28	2.82
BH-26	1.20	30.00	27.50	27.50	527.49	264.16	11.28	2.82	260.73	150.87	11.28	2.82
BH-27	1.00	22.00	19.50	19.50	271.53	128.44	10.16	2.54	126.90	70.91	10.16	2.54
BH-27	1.00	23.50	21.00	21.00	288.58	141.85	10.16	2.54	135.22	78.21	10.16	2.54
BH-27	1.00	25.00	22.50	22.50	305.39	155.27	10.16	2.54	143.29	85.51	10.16	2.54
BH-27	1.00	26.50	24.00	24.00	322.21	168.69	10.16	2.54	151.36	92.81	10.16	2.54
BH-27	1.00	28.00	25.50	25.50	339.02	182.11	10.16	2.54	159.43	100.10	10.16	2.54
BH-27	1.00	29.50	27.00	27.00	355.83	195.52	10.16	2.54	167.50	107.40	10.16	2.54
BH-27	1.00	30.00	27.50	27.50	361.43	200.00	10.16	2.54	170.19	109.83	10.16	2.54
BH-27	1.20	22.00	19.50	19.50	393.29	168.23	13.30	3.32	204.76	99.20	13.30	3.32
BH-27	1.20	23.50	21.00	21.00	416.86	186.81	13.30	3.32	217.83	110.44	13.30	3.32
BH-27	1.20	25.00	22.50	22.50	440.00	205.38	13.30	3.32	230.48	121.67	13.30	3.32
BH-27	1.20	26.50	24.00	24.00	463.14	223.96	13.30	3.32	243.14	132.90	13.30	3.32
BH-27	1.20	28.00	25.50	25.50	486.28	242.53	13.30	3.32	255.79	144.13	13.30	3.32
BH-27	1.20	29.50	27.00	27.00	509.43	261.11	13.30	3.32	268.44	155.36	13.30	3.32
BH-27	1.20	30.00	27.50	27.50	517.14	267.30	13.30	3.32	272.66	159.10	13.30	3.32

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-22	-
Chainage	2+036	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	178.20	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	3.50	mtr
Groundwater Level from OGL	13.50	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-22	1.00	22.00	19.50	18.50	240.01	130.05	8.41	2.10
BH-22	1.00	23.50	21.00	20.00	256.49	142.82	8.41	2.10
BH-22	1.00	25.00	22.50	21.50	314.05	156.83	8.77	2.19
BH-22	1.00	26.50	24.00	23.00	331.70	170.83	8.77	2.19
BH-22	1.00	28.00	25.50	24.50	349.35	184.84	8.77	2.19
BH-22	1.00	29.50	27.00	26.00	367.00	198.84	9.12	2.28
BH-22	1.00	30.00	27.50	26.50	372.88	203.51	9.12	2.28

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion (C)	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	15.70	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	11.78	23.55	4.71	0.00	31.85	31.85	12.74	4.40
2	4.00	5.50	1.50	Granular	15.70	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	35.33	47.10	4.71	7.58	56.34	63.92	25.57	8.17
3	5.50	7.00	1.50	Granular	15.70	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	58.88	70.65	4.71	12.64	80.83	101.04	40.42	13.36
4	7.00	8.50	1.50	Granular	15.70	0.00	29	-	17.60	20.13	1.00	-	7.75	8.50	82.43	94.20	4.71	19.73	160.34	200.29	80.12	20.53
5	8.50	10.00	1.50	Granular	15.70	0.00	29	-	17.60	20.13	1.00	-	9.25	10.00	105.98	117.75	4.71	25.37	197.71	263.02	105.21	29.28
6	10.00	11.50	1.50	Granular	16.70	0.00	29	-	17.60	20.13	1.00	-	10.75	11.50	130.28	142.80	4.71	31.18	238.14	334.64	133.86	39.66
7	11.50	13.00	1.50	Granular	16.70	0.00	29	-	17.60	20.13	1.00	-	12.25	13.00	155.33	167.85	4.71	37.18	277.88	411.56	164.63	51.72
8	13.00	14.50	1.50	Granular	6.90	0.00	29	-	17.60	20.13	1.00	-	13.75	14.50	173.03	178.20	4.71	41.42	287.51	462.61	185.04	64.97
9	14.50	16.00	1.50	Granular	7.65	0.00	28	-	15.70	17.82	1.00	-	15.25	16.00	178.20	178.20	4.71	41.19	254.98	471.26	188.51	78.15
10	16.00	17.50	1.50	Granular	7.65	0.00	28	-	15.70	17.82	1.00	-	16.75	17.50	178.20	178.20	4.71	41.19	254.98	512.45	204.98	91.33
11	17.50	19.00	1.50	Granular	7.65	0.00	28	-	15.70	17.82	1.00	-	18.25	19.00	178.20	178.20	4.71	41.19	254.98	553.63	221.45	104.51
12	19.00	20.50	1.50	Granular	7.65	0.00	27	-	13.80	15.50	1.00	-	19.75	20.50	178.20	178.20	4.71	39.71	221.93	560.30	224.12	117.28
13	20.50	22.00	1.50	Granular	7.65	0.00	27	-	13.80	15.50	1.00	-	21.25	22.00	178.20	178.20	4.71	39.71	221.93	600.02	240.01	130.05
14	22.00	23.50	1.50	Granular	10.40	0.00	27	-	13.80	15.50	1.00	-	22.75	23.50	178.20	178.20	4.71	39.71	223.43	641.23	256.49	142.82
15	23.50	25.00	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	178.20	178.20	4.71	44.13	323.19	785.11	314.05	156.83
16	25.00	26.50	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	178.20	178.20	4.71	44.13	323.19	829.24	331.70	170.83
17	26.50	28.00	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	178.20	178.20	4.71	44.13	323.19	873.37	349.35	184.84
18	28.00	29.50	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	178.20	178.20	4.71	44.13	323.19	917.50	367.00	198.84
19	29.50	30.00	0.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	178.20	178.20	1.57	14.71	323.19	932.21	372.88	203.51

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.95	2.02	1.84	7.47	6.78	0.238	0.951	8.41	2.10	31.39	14.25	20.18	5.05	75.34	34.19
2	22.50	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.95	2.02	1.84	7.47	6.78	0.238	0.951	8.41	2.10	31.39	14.25	20.18	5.05	75.34	34.19
3	24.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.96	2.02	1.84	7.36	6.69	0.228	0.912	8.77	2.19	32.28	14.66	21.05	5.26	77.47	35.18
4	25.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.96	2.02	1.84	7.36	6.69	0.228	0.912	8.77	2.19	32.28	14.66	21.05	5.26	77.47	35.18
5	27.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.96	2.02	1.84	7.36	6.69	0.228	0.912	8.77	2.19	32.28	14.66	21.05	5.26	77.47	35.18
6	28.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.97	2.02	1.83	7.27	6.60	0.219	0.877	9.12	2.28	33.14	15.05	21.89	5.47	79.52	36.13
7	30.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.97	2.02	1.83	7.27	6.60	0.219	0.877	9.12	2.28	33.14	15.05	21.89	5.47	79.52	36.13

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-22	-
Chainage	2+036	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	201.15	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	3.50	mtr
Groundwater Level from OGL	13.50	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-22	1.20	22.00	19.50	18.50	335.95	168.87	10.97	2.74
BH-22	1.20	23.50	21.00	20.00	358.50	186.31	10.97	2.74
BH-22	1.20	25.00	22.50	21.50	447.37	205.42	11.44	2.86
BH-22	1.20	26.50	24.00	23.00	471.28	224.53	11.44	2.86
BH-22	1.20	28.00	25.50	24.50	495.19	243.64	11.44	2.86
BH-22	1.20	29.50	27.00	26.00	519.10	262.75	11.89	2.97
BH-22	1.20	30.00	27.50	26.50	527.07	269.13	11.89	2.97

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	15.70	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	11.78	23.55	5.65	0.00	47.99	47.99	19.19	6.33
2	4.00	5.50	1.50	Granular	15.70	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	35.33	47.10	5.65	9.10	83.25	92.35	36.94	11.26
3	5.50	7.00	1.50	Granular	15.70	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	58.88	70.65	5.65	15.16	118.51	142.77	57.11	17.88
4	7.00	8.50	1.50	Granular	15.70	0.00	29	-	17.60	20.13	1.00	-	7.75	8.50	82.43	94.20	5.65	23.68	234.03	281.97	112.79	26.88
5	8.50	10.00	1.50	Granular	15.70	0.00	29	-	17.60	20.13	1.00	-	9.25	10.00	105.98	117.75	5.65	30.44	287.83	366.21	146.48	37.78
6	10.00	11.50	1.50	Granular	16.70	0.00	29	-	17.60	20.13	1.00	-	10.75	11.50	130.28	142.80	5.65	37.42	346.26	462.06	184.82	50.63
7	11.50	13.00	1.50	Granular	16.70	0.00	29	-	17.60	20.13	1.00	-	12.25	13.00	155.33	167.85	5.65	44.62	403.49	563.91	225.56	65.50
8	13.00	14.50	1.50	Granular	6.90	0.00	29	-	17.60	20.13	1.00	-	13.75	14.50	173.03	178.20	5.65	49.70	415.39	625.51	250.20	81.79
9	14.50	16.00	1.50	Granular	7.65	0.00	28	-	15.70	17.82	1.00	-	15.25	16.00	183.94	189.68	5.65	51.01	391.74	652.87	261.15	98.45
10	16.00	17.50	1.50	Granular	7.65	0.00	28	-	15.70	17.82	1.00	-	16.75	17.50	195.41	201.15	5.65	54.20	414.94	730.27	292.11	116.00
11	17.50	19.00	1.50	Granular	7.65	0.00	28	-	15.70	17.82	1.00	-	18.25	19.00	201.15	201.15	5.65	55.79	414.94	786.06	314.42	134.00
12	19.00	20.50	1.50	Granular	7.65	0.00	27	-	13.80	15.50	1.00	-	19.75	20.50	201.15	201.15	5.65	53.80	361.17	786.08	314.43	151.43
13	20.50	22.00	1.50	Granular	7.65	0.00	27	-	13.80	15.50	1.00	-	21.25	22.00	201.15	201.15	5.65	53.80	361.17	839.87	335.95	168.87
14	22.00	23.50	1.50	Granular	10.40	0.00	27	-	13.80	15.50	1.00	-	22.75	23.50	201.15	201.15	5.65	53.80	363.75	896.25	358.50	186.31
15	23.50	25.00	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	201.15	201.15	5.65	59.77	526.15	1118.42	447.37	205.42
16	25.00	26.50	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	201.15	201.15	5.65	59.77	526.15	1178.19	471.28	224.53
17	26.50	28.00	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	201.15	201.15	5.65	59.77	526.15	1237.97	495.19	243.64
18	28.00	29.50	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	201.15	201.15	5.65	59.77	526.15	1297.74	519.10	262.75
19	29.50	30.00	0.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	201.15	201.15	1.88	19.92	526.15	1317.66	527.07	269.13

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.82	2.04	1.84	8.71	7.86	0.182	0.729	10.97	2.74	47.79	21.57	26.33	6.58	114.70	51.76
2	22.50	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.82	2.04	1.84	8.71	7.86	0.182	0.729	10.97	2.74	47.79	21.57	26.33	6.58	114.70	51.76
3	24.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.83	2.04	1.84	8.59	7.76	0.175	0.699	11.44	2.86	49.14	22.18	27.45	6.86	117.93	53.24
4	25.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.83	2.04	1.84	8.59	7.76	0.175	0.699	11.44	2.86	49.14	22.18	27.45	6.86	117.93	53.24
5	27.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.83	2.04	1.84	8.59	7.76	0.175	0.699	11.44	2.86	49.14	22.18	27.45	6.86	117.93	53.24
6	28.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.84	2.04	1.84	8.48	7.66	0.168	0.673	11.89	2.97	50.44	22.78	28.55	7.14	121.05	54.67
7	30.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.84	2.04	1.84	8.48	7.66	0.168	0.673	11.89	2.97	50.44	22.78	28.55	7.14	121.05	54.67

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-23	-
Chainage	2+116	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	199.05	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	13.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-23	1.00	22.00	19.50	19.50	299.23	143.40	9.56	2.39
BH-23	1.00	23.50	21.00	21.00	318.29	158.39	9.56	2.39
BH-23	1.00	25.00	22.50	22.50	337.35	173.38	9.56	2.39
BH-23	1.00	26.50	24.00	24.00	371.86	188.83	9.56	2.39
BH-23	1.00	28.00	25.50	25.50	391.57	204.28	9.56	2.39
BH-23	1.00	29.50	27.00	27.00	411.29	219.73	9.56	2.39
BH-23	1.00	30.00	27.50	27.50	417.86	224.88	9.56	2.39

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	17.55	0.00	27	-	13.80	15.50	1.00	-	3.25	4.00	13.16	26.33	4.71	2.93	41.72	44.65	17.86	5.22
2	4.00	5.50	1.50	Granular	17.55	0.00	27	-	13.80	15.50	1.00	-	4.75	5.50	39.49	52.65	4.71	8.80	73.89	85.62	34.25	9.33
3	5.50	7.00	1.50	Granular	17.90	0.00	27	-	13.80	15.50	1.00	-	6.25	7.00	66.08	79.50	4.71	14.73	106.89	133.35	53.34	15.11
4	7.00	8.50	1.50	Granular	17.90	0.00	27	-	13.80	15.50	1.00	-	7.75	8.50	92.93	106.35	4.71	20.71	139.70	186.87	74.75	22.55
5	8.50	10.00	1.50	Granular	17.90	0.00	27	-	13.80	15.50	1.00	-	9.25	10.00	119.78	133.20	4.71	26.69	172.51	246.38	98.55	31.68
6	10.00	11.50	1.50	Granular	17.90	0.00	28	-	15.70	17.82	1.00	-	10.75	11.50	146.63	160.05	4.71	33.89	235.83	343.59	137.43	42.82
7	11.50	13.00	1.50	Granular	17.90	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	173.48	186.90	4.71	40.09	273.54	421.38	168.55	55.69
8	13.00	14.50	1.50	Granular	8.10	0.00	28	-	15.70	17.82	1.00	-	13.75	14.50	192.98	199.05	4.71	44.60	284.54	476.98	190.79	69.83
9	14.50	16.00	1.50	Granular	8.35	0.00	28	-	15.70	17.82	1.00	-	15.25	16.00	199.05	199.05	4.71	46.00	284.69	523.14	209.26	84.36
10	16.00	17.50	1.50	Granular	8.35	0.00	28	-	15.70	17.82	1.00	-	16.75	17.50	199.05	199.05	4.71	46.00	284.69	569.15	227.66	98.89
11	17.50	19.00	1.50	Granular	12.30	0.00	28	-	15.70	17.82	1.00	-	18.25	19.00	199.05	199.05	4.71	46.00	287.14	617.60	247.04	113.42
12	19.00	20.50	1.50	Granular	12.30	0.00	29	-	17.60	20.13	1.00	-	19.75	20.50	199.05	199.05	4.71	47.65	324.33	702.44	280.98	128.41
13	20.50	22.00	1.50	Granular	9.40	0.00	29	-	17.60	20.13	1.00	-	21.25	22.00	199.05	199.05	4.71	47.65	322.32	748.07	299.23	143.40
14	22.00	23.50	1.50	Granular	9.40	0.00	29	-	17.60	20.13	1.00	-	22.75	23.50	199.05	199.05	4.71	47.65	322.32	795.72	318.29	158.39
15	23.50	25.00	1.50	Granular	9.40	0.00	29	-	17.60	20.13	1.00	-	24.25	25.00	199.05	199.05	4.71	47.65	322.32	843.37	337.35	173.38
16	25.00	26.50	1.50	Granular	9.40	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	199.05	199.05	4.71	49.29	359.30	929.64	371.86	188.83
17	26.50	28.00	1.50	Granular	9.40	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	199.05	199.05	4.71	49.29	359.30	978.93	391.57	204.28
18	28.00	29.50	1.50	Granular	9.40	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	199.05	199.05	4.71	49.29	359.30	1028.22	411.29	219.73
19	29.50	30.00	0.50	Granular	9.40	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	199.05	199.05	1.57	16.43	359.30	1044.65	417.86	224.88

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
2	22.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
3	24.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
4	25.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
5	27.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
6	28.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
7	30.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-23	-
Chainage	2+116	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	224.10	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	13.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-23	1.20	22.00	19.50	19.50	424.98	185.81	12.52	3.13
BH-23	1.20	23.50	21.00	21.00	450.72	206.21	12.52	3.13
BH-23	1.20	25.00	22.50	22.50	476.47	226.61	12.52	3.13
BH-23	1.20	26.50	24.00	24.00	527.12	247.63	12.52	3.13
BH-23	1.20	28.00	25.50	25.50	553.76	268.65	12.52	3.13
BH-23	1.20	29.50	27.00	27.00	580.39	289.67	12.52	3.13
BH-23	1.20	30.00	27.50	27.50	589.27	296.68	12.52	3.13

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Coeff. of Earth Pressure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	17.55	0.00	27	-	13.80	15.50	1.00	-	3.25	4.00	13.16	26.33	5.65	3.52	62.82	66.34	26.54	7.32
2	4.00	5.50	1.50	Granular	17.55	0.00	27	-	13.80	15.50	1.00	-	4.75	5.50	39.49	52.65	5.65	10.56	109.15	123.23	49.29	12.65
3	5.50	7.00	1.50	Granular	17.90	0.00	27	-	13.80	15.50	1.00	-	6.25	7.00	66.08	79.50	5.65	17.67	156.72	188.48	75.39	19.97
4	7.00	8.50	1.50	Granular	17.90	0.00	27	-	13.80	15.50	1.00	-	7.75	8.50	92.93	106.35	5.65	24.85	203.97	260.58	104.23	29.31
5	8.50	10.00	1.50	Granular	17.90	0.00	27	-	13.80	15.50	1.00	-	9.25	10.00	119.78	133.20	5.65	32.03	251.22	339.86	135.94	40.65
6	10.00	11.50	1.50	Granular	17.90	0.00	28	-	15.70	17.82	1.00	-	10.75	11.50	146.63	160.05	5.65	40.67	342.79	472.09	188.84	54.41
7	11.50	13.00	1.50	Granular	17.90	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	173.48	186.90	5.65	48.11	397.09	574.50	229.80	70.26
8	13.00	14.50	1.50	Granular	8.10	0.00	28	-	15.70	17.82	1.00	-	13.75	14.50	192.98	199.05	5.65	53.52	411.18	642.11	256.85	87.62
9	14.50	16.00	1.50	Granular	8.35	0.00	28	-	15.70	17.82	1.00	-	15.25	16.00	205.31	211.58	5.65	56.94	436.77	724.65	289.86	105.94
10	16.00	17.50	1.50	Granular	8.35	0.00	28	-	15.70	17.82	1.00	-	16.75	17.50	217.84	224.10	5.65	60.42	462.10	810.39	324.16	125.23
11	17.50	19.00	1.50	Granular	12.30	0.00	28	-	15.70	17.82	1.00	-	18.25	19.00	224.10	224.10	5.65	62.15	466.33	876.77	350.71	145.01
12	19.00	20.50	1.50	Granular	12.30	0.00	29	-	17.60	20.13	1.00	-	19.75	20.50	224.10	224.10	5.65	64.37	526.73	1001.54	400.62	165.41
13	20.50	22.00	1.50	Granular	9.40	0.00	29	-	17.60	20.13	1.00	-	21.25	22.00	224.10	224.10	5.65	64.37	523.25	1062.44	424.98	185.81
14	22.00	23.50	1.50	Granular	9.40	0.00	29	-	17.60	20.13	1.00	-	22.75	23.50	224.10	224.10	5.65	64.37	523.25	1126.81	450.72	206.21
15	23.50	25.00	1.50	Granular	9.40	0.00	29	-	17.60	20.13	1.00	-	24.25	25.00	224.10	224.10	5.65	64.37	523.25	1191.18	476.47	226.61
16	25.00	26.50	1.50	Granular	9.40	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	224.10	224.10	5.65	66.59	583.28	1317.80	527.12	247.63
17	26.50	28.00	1.50	Granular	9.40	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	224.10	224.10	5.65	66.59	583.28	1384.39	553.76	268.65
18	28.00	29.50	1.50	Granular	9.40	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	224.10	224.10	5.65	66.59	583.28	1450.99	580.39	289.67
19	29.50	30.00	0.50	Granular	9.40	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	224.10	224.10	1.88	22.20	583.28	1473.18	589.27	296.68

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
2	22.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
3	24.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
4	25.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
5	27.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
6	28.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
7	30.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-23A	-
Chainage	2+257	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	200.55	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	14.20	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-23A	1.00	22.00	19.50	19.50	299.64	143.21	8.61	2.15
BH-23A	1.00	23.50	21.00	21.00	318.84	158.30	8.93	2.23
BH-23A	1.00	25.00	22.50	22.50	353.57	173.86	8.93	2.23
BH-23A	1.00	26.50	24.00	24.00	373.62	189.41	8.93	2.23
BH-23A	1.00	28.00	25.50	25.50	393.49	204.97	8.93	2.23
BH-23A	1.00	29.50	27.00	27.00	413.35	220.52	9.25	2.31
BH-23A	1.00	30.00	27.50	27.50	419.97	225.71	9.25	2.31

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Coeff. of Earth Pressure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	16.40	0.00	27	-	13.80	15.50	1.00	-	3.25	4.00	12.30	24.60	4.71	2.74	38.98	41.72	16.69	5.17
2	4.00	5.50	1.50	Granular	16.40	0.00	27	-	13.80	15.50	1.00	-	4.75	5.50	36.90	49.20	4.71	8.22	69.05	80.01	32.00	9.12
3	5.50	7.00	1.50	Granular	16.40	0.00	27	-	13.80	15.50	1.00	-	6.25	7.00	61.50	73.80	4.71	13.71	99.11	123.78	49.51	14.60
4	7.00	8.50	1.50	Granular	16.70	0.00	27	-	13.80	15.50	1.00	-	7.75	8.50	86.33	98.85	4.71	19.24	129.88	173.79	69.52	21.64
5	8.50	10.00	1.50	Granular	16.70	0.00	27	-	13.80	15.50	1.00	-	9.25	10.00	111.38	123.90	4.71	24.82	160.50	229.23	91.69	30.24
6	10.00	11.50	1.50	Granular	16.70	0.00	29	-	17.60	20.13	1.00	-	10.75	11.50	136.43	148.95	4.71	32.66	247.90	349.29	139.71	41.03
7	11.50	13.00	1.50	Granular	17.20	0.00	29	-	17.60	20.13	1.00	-	12.25	13.00	161.85	174.75	4.71	38.74	289.18	429.31	171.72	53.53
8	13.00	14.50	1.50	Granular	17.20	0.00	29	-	17.60	20.13	1.00	-	13.75	14.50	187.65	200.55	4.71	44.92	330.11	515.16	206.06	67.76
9	14.50	16.00	1.50	Granular	7.40	0.00	29	-	17.60	20.13	1.00	-	15.25	16.00	200.55	200.55	4.71	48.01	323.31	556.37	222.55	82.85
10	16.00	17.50	1.50	Granular	7.85	0.00	29	-	17.60	20.13	1.00	-	16.75	17.50	200.55	200.55	4.71	48.01	323.63	604.69	241.88	97.94
11	17.50	19.00	1.50	Granular	7.85	0.00	29	-	17.60	20.13	1.00	-	18.25	19.00	200.55	200.55	4.71	48.01	323.63	652.69	261.08	113.03
12	19.00	20.50	1.50	Granular	7.85	0.00	29	-	17.60	20.13	1.00	-	19.75	20.50	200.55	200.55	4.71	48.01	323.63	700.70	280.28	128.12
13	20.50	22.00	1.50	Granular	8.40	0.00	29	-	17.60	20.13	1.00	-	21.25	22.00	200.55	200.55	4.71	48.01	324.01	749.09	299.64	143.21
14	22.00	23.50	1.50	Granular	8.40	0.00	29	-	17.60	20.13	1.00	-	22.75	23.50	200.55	200.55	4.71	48.01	324.01	797.10	318.84	158.30
15	23.50	25.00	1.50	Granular	8.40	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	200.55	200.55	4.71	49.66	361.18	883.93	353.57	173.86
16	25.00	26.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	200.55	200.55	4.71	49.66	361.65	934.06	373.62	189.41
17	26.50	28.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	200.55	200.55	4.71	49.66	361.65	983.72	393.49	204.97
18	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	200.55	200.55	4.71	49.66	361.65	1033.38	413.35	220.52
19	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	200.55	200.55	1.57	16.55	361.65	1049.94	419.97	225.71

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33
2	22.50	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
3	24.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
4	25.50	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
5	27.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
6	28.50	19	2.96E+07	4.91E-02	2.70E+03	3.52	0.71	2.06	1.85	7.23	6.49	0.216	0.865	9.25	2.31	33.44	15.01	22.19	5.55	80.26	36.03
7	30.00	19	2.96E+07	4.91E-02	2.70E+03	3.52	0.71	2.06	1.85	7.23	6.49	0.216	0.865	9.25	2.31	33.44	15.01	22.19	5.55	80.26	36.03

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-23A	-
Chainage	2+257	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	223.43	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	14.20	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-23A	1.20	22.00	19.50	19.50	422.72	184.99	11.28	2.82
BH-23A	1.20	23.50	21.00	21.00	448.39	205.34	11.70	2.93
BH-23A	1.20	25.00	22.50	22.50	498.83	226.30	11.70	2.93
BH-23A	1.20	26.50	24.00	24.00	525.71	247.27	11.70	2.93
BH-23A	1.20	28.00	25.50	25.50	552.27	268.23	11.70	2.93
BH-23A	1.20	29.50	27.00	27.00	578.82	289.20	12.11	3.03
BH-23A	1.20	30.00	27.50	27.50	587.67	296.19	12.11	3.03

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	16.40	0.00	27	-	13.80	15.50	1.00	-	3.25	4.00	12.30	24.60	5.65	3.29	58.70	61.99	24.80	7.25
2	4.00	5.50	1.50	Granular	16.40	0.00	27	-	13.80	15.50	1.00	-	4.75	5.50	36.90	49.20	5.65	9.87	101.99	115.15	46.06	12.39
3	5.50	7.00	1.50	Granular	16.40	0.00	27	-	13.80	15.50	1.00	-	6.25	7.00	61.50	73.80	5.65	16.45	145.28	174.89	69.96	19.37
4	7.00	8.50	1.50	Granular	16.70	0.00	27	-	13.80	15.50	1.00	-	7.75	8.50	86.33	98.85	5.65	23.09	189.65	242.34	96.94	28.21
5	8.50	10.00	1.50	Granular	16.70	0.00	27	-	13.80	15.50	1.00	-	9.25	10.00	111.38	123.90	5.65	29.79	233.73	316.21	126.48	38.93
6	10.00	11.50	1.50	Granular	16.70	0.00	29	-	17.60	20.13	1.00	-	10.75	11.50	136.43	148.95	5.65	39.19	360.31	481.98	192.79	52.28
7	11.50	13.00	1.50	Granular	17.20	0.00	29	-	17.60	20.13	1.00	-	12.25	13.00	161.85	174.75	5.65	46.49	419.85	588.01	235.20	67.67
8	13.00	14.50	1.50	Granular	17.20	0.00	29	-	17.60	20.13	1.00	-	13.75	14.50	187.65	200.55	5.65	53.90	478.80	700.86	280.34	85.14
9	14.50	16.00	1.50	Granular	7.40	0.00	29	-	17.60	20.13	1.00	-	15.25	16.00	206.10	211.65	5.65	59.20	492.41	773.67	309.47	104.09
10	16.00	17.50	1.50	Granular	7.85	0.00	29	-	17.60	20.13	1.00	-	16.75	17.50	217.54	223.43	5.65	62.49	519.85	863.60	345.44	123.96
11	17.50	19.00	1.50	Granular	7.85	0.00	29	-	17.60	20.13	1.00	-	18.25	19.00	223.43	223.43	5.65	64.18	519.85	927.78	371.11	144.30
12	19.00	20.50	1.50	Granular	7.85	0.00	29	-	17.60	20.13	1.00	-	19.75	20.50	223.43	223.43	5.65	64.18	519.85	991.96	396.78	164.65
13	20.50	22.00	1.50	Granular	8.40	0.00	29	-	17.60	20.13	1.00	-	21.25	22.00	223.43	223.43	5.65	64.18	520.51	1056.79	422.72	184.99
14	22.00	23.50	1.50	Granular	8.40	0.00	29	-	17.60	20.13	1.00	-	22.75	23.50	223.43	223.43	5.65	64.18	520.51	1120.97	448.39	205.34
15	23.50	25.00	1.50	Granular	8.40	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	223.43	223.43	5.65	66.39	580.23	1247.08	498.83	226.30
16	25.00	26.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	223.43	223.43	5.65	66.39	581.02	1314.27	525.71	247.27
17	26.50	28.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	223.43	223.43	5.65	66.39	581.02	1380.66	552.27	268.23
18	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	223.43	223.43	5.65	66.39	581.02	1447.05	578.82	289.20
19	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	223.43	223.43	1.88	22.13	581.02	1469.18	587.67	296.19

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17
2	22.50	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
3	24.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
4	25.50	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
5	27.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
6	28.50	19	2.96E+07	1.02E-01	2.70E+03	4.07	0.61	2.07	1.85	8.43	7.53	0.165	0.660	12.11	3.03	51.05	22.81	29.07	7.27	122.53	54.74
7	30.00	19	2.96E+07	1.02E-01	2.70E+03	4.07	0.61	2.07	1.85	8.43	7.53	0.165	0.660	12.11	3.03	51.05	22.81	29.07	7.27	122.53	54.74

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-23B	-
Chainage	2+190	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	189.45	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	13.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-23B	1.00	22.00	19.50	19.50	282.81	136.27	10.16	2.54
BH-23B	1.00	23.50	21.00	21.00	301.15	150.62	10.16	2.54
BH-23B	1.00	25.00	22.50	22.50	319.29	164.96	10.16	2.54
BH-23B	1.00	26.50	24.00	24.00	352.15	179.75	10.16	2.54
BH-23B	1.00	28.00	25.50	25.50	370.91	194.53	10.16	2.54
BH-23B	1.00	29.50	27.00	27.00	389.68	209.32	10.16	2.54
BH-23B	1.00	30.00	27.50	27.50	395.93	214.25	10.16	2.54

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Presure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	16.00	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	12.00	24.00	4.71	2.58	32.46	35.04	14.01	5.12
2	4.00	5.50	1.50	Granular	16.00	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	36.00	48.00	4.71	7.73	57.42	67.72	27.09	8.93
3	5.50	7.00	1.50	Granular	16.00	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	60.00	72.00	4.71	12.88	82.37	105.55	42.22	14.19
4	7.00	8.50	1.50	Granular	16.00	0.00	28	-	15.70	17.82	1.00	-	7.75	8.50	84.00	96.00	4.71	19.41	144.71	187.31	74.92	21.27
5	8.50	10.00	1.50	Granular	16.00	0.00	28	-	15.70	17.82	1.00	-	9.25	10.00	108.00	120.00	4.71	24.96	178.42	245.97	98.39	29.91
6	10.00	11.50	1.50	Granular	18.70	0.00	28	-	15.70	17.82	1.00	-	10.75	11.50	134.03	148.05	4.71	30.98	219.48	318.01	127.20	40.23
7	11.50	13.00	1.50	Granular	18.70	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	162.08	176.10	4.71	37.46	258.87	394.86	157.94	52.37
8	13.00	14.50	1.50	Granular	8.90	0.00	28	-	15.70	17.82	1.00	-	13.75	14.50	182.78	189.45	4.71	42.24	271.55	449.78	179.91	65.85
9	14.50	16.00	1.50	Granular	8.90	0.00	28	-	15.70	17.82	1.00	-	15.25	16.00	189.45	189.45	4.71	43.79	271.55	493.57	197.43	79.76
10	16.00	17.50	1.50	Granular	8.90	0.00	28	-	15.70	17.82	1.00	-	16.75	17.50	189.45	189.45	4.71	43.79	271.55	537.35	214.94	93.67
11	17.50	19.00	1.50	Granular	8.90	0.00	28	-	15.70	17.82	1.00	-	18.25	19.00	189.45	189.45	4.71	43.79	271.55	581.14	232.46	107.58
12	19.00	20.50	1.50	Granular	8.90	0.00	29	-	17.60	20.13	1.00	-	19.75	20.50	189.45	189.45	4.71	45.35	306.74	661.68	264.67	121.92
13	20.50	22.00	1.50	Granular	8.90	0.00	29	-	17.60	20.13	1.00	-	21.25	22.00	189.45	189.45	4.71	45.35	306.74	707.03	282.81	136.27
14	22.00	23.50	1.50	Granular	9.60	0.00	29	-	17.60	20.13	1.00	-	22.75	23.50	189.45	189.45	4.71	45.35	307.23	752.86	301.15	150.62
15	23.50	25.00	1.50	Granular	9.60	0.00	29	-	17.60	20.13	1.00	-	24.25	25.00	189.45	189.45	4.71	45.35	307.23	798.21	319.29	164.96
16	25.00	26.50	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	189.45	189.45	4.71	46.91	342.47	880.37	352.15	179.75
17	26.50	28.00	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	189.45	189.45	4.71	46.91	342.47	927.28	370.91	194.53
18	28.00	29.50	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	189.45	189.45	4.71	46.91	342.47	974.20	389.68	209.32
19	29.50	30.00	0.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	189.45	189.45	1.57	15.64	342.47	989.84	395.93	214.25

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40
2	22.50	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40
3	24.00	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40
4	25.50	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40
5	27.00	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40
6	28.50	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40
7	30.00	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-23B	-
Chainage	2+190	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	216.15	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	13.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-23B	1.20	22.00	19.50	19.50	405.99	177.77	13.30	3.32
BH-23B	1.20	23.50	21.00	21.00	431.16	197.53	13.30	3.32
BH-23B	1.20	25.00	22.50	22.50	456.00	217.29	13.30	3.32
BH-23B	1.20	26.50	24.00	24.00	504.88	237.65	13.30	3.32
BH-23B	1.20	28.00	25.50	25.50	530.57	258.01	13.30	3.32
BH-23B	1.20	29.50	27.00	27.00	556.26	278.37	13.30	3.32
BH-23B	1.20	30.00	27.50	27.50	564.82	285.16	13.30	3.32

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Coeff. of Earth Pressure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	16.00	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	12.00	24.00	5.65	3.09	48.90	51.99	20.80	7.20
2	4.00	5.50	1.50	Granular	16.00	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	36.00	48.00	5.65	9.27	84.84	97.20	38.88	12.17
3	5.50	7.00	1.50	Granular	16.00	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	60.00	72.00	5.65	15.45	120.78	148.59	59.44	18.87
4	7.00	8.50	1.50	Granular	16.00	0.00	28	-	15.70	17.82	1.00	-	7.75	8.50	84.00	96.00	5.65	23.30	211.24	262.35	104.94	27.77
5	8.50	10.00	1.50	Granular	16.00	0.00	28	-	15.70	17.82	1.00	-	9.25	10.00	108.00	120.00	5.65	29.95	259.77	340.83	136.33	38.53
6	10.00	11.50	1.50	Granular	18.70	0.00	28	-	15.70	17.82	1.00	-	10.75	11.50	134.03	148.05	5.65	37.17	319.38	437.62	175.05	51.31
7	11.50	13.00	1.50	Granular	18.70	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	162.08	176.10	5.65	44.95	376.10	539.29	215.72	66.28
8	13.00	14.50	1.50	Granular	8.90	0.00	28	-	15.70	17.82	1.00	-	13.75	14.50	182.78	189.45	5.65	50.69	392.62	606.50	242.60	82.84
9	14.50	16.00	1.50	Granular	8.90	0.00	28	-	15.70	17.82	1.00	-	15.25	16.00	196.13	202.80	5.65	54.39	419.62	687.89	275.16	100.45
10	16.00	17.50	1.50	Granular	8.90	0.00	28	-	15.70	17.82	1.00	-	16.75	17.50	209.48	216.15	5.65	58.10	446.61	772.98	309.19	119.09
11	17.50	19.00	1.50	Granular	8.90	0.00	28	-	15.70	17.82	1.00	-	18.25	19.00	216.15	216.15	5.65	59.95	446.61	832.93	333.17	138.25
12	19.00	20.50	1.50	Granular	8.90	0.00	29	-	17.60	20.13	1.00	-	19.75	20.50	216.15	216.15	5.65	62.09	504.49	952.89	381.16	158.01
13	20.50	22.00	1.50	Granular	8.90	0.00	29	-	17.60	20.13	1.00	-	21.25	22.00	216.15	216.15	5.65	62.09	504.49	1014.98	405.99	177.77
14	22.00	23.50	1.50	Granular	9.60	0.00	29	-	17.60	20.13	1.00	-	22.75	23.50	216.15	216.15	5.65	62.09	505.33	1077.91	431.16	197.53
15	23.50	25.00	1.50	Granular	9.60	0.00	29	-	17.60	20.13	1.00	-	24.25	25.00	216.15	216.15	5.65	62.09	505.33	1140.00	456.00	217.29
16	25.00	26.50	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	216.15	216.15	5.65	64.23	563.29	1262.19	504.88	237.65
17	26.50	28.00	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	216.15	216.15	5.65	64.23	563.29	1326.42	530.57	258.01
18	28.00	29.50	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	216.15	216.15	5.65	64.23	563.29	1390.65	556.26	278.37
19	29.50	30.00	0.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	216.15	216.15	1.88	21.41	563.29	1412.06	564.82	285.16

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32
2	22.50	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32
3	24.00	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32
4	25.50	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32
5	27.00	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32
6	28.50	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32
7	30.00	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-24	-
Chainage	2+338	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	184.80	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	13.60	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-24	1.00	22.00	19.50	19.50	280.84	136.97	9.56	2.39
BH-24	1.00	23.50	21.00	21.00	312.88	151.44	9.56	2.39
BH-24	1.00	25.00	22.50	22.50	331.18	165.90	9.56	2.39
BH-24	1.00	26.50	24.00	24.00	349.49	180.36	9.56	2.39
BH-24	1.00	28.00	25.50	25.50	367.79	194.82	9.56	2.39
BH-24	1.00	29.50	27.00	27.00	386.10	209.29	9.56	2.39
BH-24	1.00	30.00	27.50	27.50	392.20	214.11	9.56	2.39

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Presure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion (C)	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	16.00	0.00	28	-	15.70	17.82	1.00	-	3.25	4.00	12.00	24.00	4.71	2.77	43.60	46.38	18.55	5.17
2	4.00	5.50	1.50	Granular	16.00	0.00	28	-	15.70	17.82	1.00	-	4.75	5.50	36.00	48.00	4.71	8.32	77.31	88.40	35.36	9.15
3	5.50	7.00	1.50	Granular	16.00	0.00	28	-	15.70	17.82	1.00	-	6.25	7.00	60.00	72.00	4.71	13.87	111.01	135.97	54.39	14.69
4	7.00	8.50	1.50	Granular	17.00	0.00	28	-	15.70	17.82	1.00	-	7.75	8.50	84.75	97.50	4.71	19.59	147.44	191.99	76.79	21.82
5	8.50	10.00	1.50	Granular	17.00	0.00	28	-	15.70	17.82	1.00	-	9.25	10.00	110.25	123.00	4.71	25.48	183.25	253.28	101.31	30.60
6	10.00	11.50	1.50	Granular	17.00	0.00	28	-	15.70	17.82	1.00	-	10.75	11.50	135.75	148.50	4.71	31.37	219.06	320.46	128.18	41.04
7	11.50	13.00	1.50	Granular	17.00	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	161.25	174.00	4.71	37.27	254.87	393.54	157.42	53.12
8	13.00	14.50	1.50	Granular	7.20	0.00	29	-	17.60	20.13	1.00	-	13.75	14.50	179.40	184.80	4.71	42.94	298.19	479.80	191.92	66.80
9	14.50	16.00	1.50	Granular	8.80	0.00	29	-	17.60	20.13	1.00	-	15.25	16.00	184.80	184.80	4.71	44.24	299.30	525.15	210.06	80.83
10	16.00	17.50	1.50	Granular	8.80	0.00	29	-	17.60	20.13	1.00	-	16.75	17.50	184.80	184.80	4.71	44.24	299.30	569.38	227.75	94.87
11	17.50	19.00	1.50	Granular	8.80	0.00	29	-	17.60	20.13	1.00	-	18.25	19.00	184.80	184.80	4.71	44.24	299.30	613.62	245.45	108.90
12	19.00	20.50	1.50	Granular	8.80	0.00	29	-	17.60	20.13	1.00	-	19.75	20.50	184.80	184.80	4.71	44.24	299.30	657.86	263.14	122.94
13	20.50	22.00	1.50	Granular	8.80	0.00	29	-	17.60	20.13	1.00	-	21.25	22.00	184.80	184.80	4.71	44.24	299.30	702.09	280.84	136.97
14	22.00	23.50	1.50	Granular	8.80	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	184.80	184.80	4.71	45.76	333.63	782.19	312.88	151.44
15	23.50	25.00	1.50	Granular	8.80	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	184.80	184.80	4.71	45.76	333.63	827.95	331.18	165.90
16	25.00	26.50	1.50	Granular	8.80	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	184.80	184.80	4.71	45.76	333.63	873.72	349.49	180.36
17	26.50	28.00	1.50	Granular	8.80	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	184.80	184.80	4.71	45.76	333.63	919.48	367.79	194.82
18	28.00	29.50	1.50	Granular	8.80	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	184.80	184.80	4.71	45.76	333.63	965.24	386.10	209.29
19	29.50	30.00	0.50	Granular	8.80	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	184.80	184.80	1.57	15.25	333.63	980.49	392.20	214.11

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
2	22.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
3	24.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
4	25.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
5	27.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
6	28.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
7	30.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-24	-
Chainage	2+338	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	211.20	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	13.60	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-24	1.20	22.00	19.50	19.50	402.70	178.67	12.52	3.13
BH-24	1.20	23.50	21.00	21.00	450.43	198.61	12.52	3.13
BH-24	1.20	25.00	22.50	22.50	475.53	218.56	12.52	3.13
BH-24	1.20	26.50	24.00	24.00	500.64	238.51	12.52	3.13
BH-24	1.20	28.00	25.50	25.50	525.74	258.46	12.52	3.13
BH-24	1.20	29.50	27.00	27.00	550.84	278.40	12.52	3.13
BH-24	1.20	30.00	27.50	27.50	559.21	285.05	12.52	3.13

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Presure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	16.00	0.00	28	-	15.70	17.82	1.00	-	3.25	4.00	12.00	24.00	5.65	3.33	65.64	68.97	27.59	7.27
2	4.00	5.50	1.50	Granular	16.00	0.00	28	-	15.70	17.82	1.00	-	4.75	5.50	36.00	48.00	5.65	9.98	114.17	127.49	50.99	12.44
3	5.50	7.00	1.50	Granular	16.00	0.00	28	-	15.70	17.82	1.00	-	6.25	7.00	60.00	72.00	5.65	16.64	162.71	192.66	77.06	19.47
4	7.00	8.50	1.50	Granular	17.00	0.00	28	-	15.70	17.82	1.00	-	7.75	8.50	84.75	97.50	5.65	23.50	215.34	268.80	107.52	28.43
5	8.50	10.00	1.50	Granular	17.00	0.00	28	-	15.70	17.82	1.00	-	9.25	10.00	110.25	123.00	5.65	30.58	266.91	350.94	140.38	39.36
6	10.00	11.50	1.50	Granular	17.00	0.00	28	-	15.70	17.82	1.00	-	10.75	11.50	135.75	148.50	5.65	37.65	318.47	440.16	176.06	52.28
7	11.50	13.00	1.50	Granular	17.00	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	161.25	174.00	5.65	44.72	370.04	536.44	214.58	67.18
8	13.00	14.50	1.50	Granular	7.20	0.00	29	-	17.60	20.13	1.00	-	13.75	14.50	179.40	184.80	5.65	51.53	430.83	648.77	259.51	83.98
9	14.50	16.00	1.50	Granular	8.80	0.00	29	-	17.60	20.13	1.00	-	15.25	16.00	191.40	198.00	5.65	54.98	462.90	735.82	294.33	101.75
10	16.00	17.50	1.50	Granular	8.80	0.00	29	-	17.60	20.13	1.00	-	16.75	17.50	204.60	211.20	5.65	58.77	493.06	824.75	329.90	120.58
11	17.50	19.00	1.50	Granular	8.80	0.00	29	-	17.60	20.13	1.00	-	18.25	19.00	211.20	211.20	5.65	60.67	493.06	885.42	354.17	139.94
12	19.00	20.50	1.50	Granular	8.80	0.00	29	-	17.60	20.13	1.00	-	19.75	20.50	211.20	211.20	5.65	60.67	493.06	946.08	378.43	159.31
13	20.50	22.00	1.50	Granular	8.80	0.00	29	-	17.60	20.13	1.00	-	21.25	22.00	211.20	211.20	5.65	60.67	493.06	1006.75	402.70	178.67
14	22.00	23.50	1.50	Granular	8.80	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	211.20	211.20	5.65	62.76	549.62	1126.07	450.43	198.61
15	23.50	25.00	1.50	Granular	8.80	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	211.20	211.20	5.65	62.76	549.62	1188.83	475.53	218.56
16	25.00	26.50	1.50	Granular	8.80	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	211.20	211.20	5.65	62.76	549.62	1251.59	500.64	238.51
17	26.50	28.00	1.50	Granular	8.80	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	211.20	211.20	5.65	62.76	549.62	1314.35	525.74	258.46
18	28.00	29.50	1.50	Granular	8.80	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	211.20	211.20	5.65	62.76	549.62	1377.11	550.84	278.40
19	29.50	30.00	0.50	Granular	8.80	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	211.20	211.20	1.88	20.92	549.62	1398.03	559.21	285.05

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
2	22.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
3	24.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
4	25.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
5	27.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
6	28.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
7	30.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-25	-
Chainage	2+404	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	193.95	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	3.50	mtr
Groundwater Level from OGL	14.20	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-25	1.00	22.00	19.50	18.50	218.28	129.50	8.77	2.19
BH-25	1.00	23.50	21.00	20.00	234.39	142.35	8.77	2.19
BH-25	1.00	25.00	22.50	21.50	325.62	157.45	8.77	2.19
BH-25	1.00	26.50	24.00	23.00	344.83	172.55	8.77	2.19
BH-25	1.00	28.00	25.50	24.50	349.00	187.20	9.12	2.28
BH-25	1.00	29.50	27.00	26.00	382.61	202.29	9.12	2.28
BH-25	1.00	30.00	27.50	26.50	389.02	207.33	9.46	2.37

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Presure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	15.70	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	11.78	23.55	4.71	0.00	31.85	31.85	12.74	4.40
2	4.00	5.50	1.50	Granular	15.70	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	35.33	47.10	4.71	7.58	56.34	63.92	25.57	8.17
3	5.50	7.00	1.50	Granular	15.70	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	58.88	70.65	4.71	12.64	80.83	101.04	40.42	13.36
4	7.00	8.50	1.50	Granular	16.20	0.00	26	-	11.90	13.19	1.00	-	7.75	8.50	82.80	94.95	4.71	17.77	106.33	144.32	57.73	19.98
5	8.50	10.00	1.50	Granular	16.50	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	107.33	119.70	4.71	23.03	132.21	193.23	77.29	28.08
6	10.00	11.50	1.50	Granular	16.50	0.00	26	-	11.90	13.19	1.00	-	10.75	11.50	132.08	144.45	4.71	28.34	157.94	247.31	98.92	37.67
7	11.50	13.00	1.50	Granular	16.50	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	156.83	169.20	4.71	33.66	183.68	306.70	122.68	48.74
8	13.00	14.50	1.50	Granular	16.50	0.00	30	-	19.50	22.44	1.00	-	13.75	14.50	181.58	193.95	4.71	44.96	355.74	523.72	209.49	62.98
9	14.50	16.00	1.50	Granular	6.70	0.00	30	-	19.50	22.44	1.00	-	15.25	16.00	193.95	193.95	4.71	48.03	348.20	564.21	225.69	78.08
10	16.00	17.50	1.50	Granular	8.30	0.00	25	-	10.00	10.88	1.00	-	16.75	17.50	193.95	193.95	4.71	40.02	169.60	425.63	170.25	90.93
11	17.50	19.00	1.50	Granular	8.30	0.00	25	-	10.00	10.88	1.00	-	18.25	19.00	193.95	193.95	4.71	40.02	169.60	465.66	186.26	103.79
12	19.00	20.50	1.50	Granular	8.30	0.00	25	-	10.00	10.88	1.00	-	19.75	20.50	193.95	193.95	4.71	40.02	169.60	505.68	202.27	116.64
13	20.50	22.00	1.50	Granular	8.30	0.00	25	-	10.00	10.88	1.00	-	21.25	22.00	193.95	193.95	4.71	40.02	169.60	545.70	218.28	129.50
14	22.00	23.50	1.50	Granular	8.90	0.00	25	-	10.00	10.88	1.00	-	22.75	23.50	193.95	193.95	4.71	40.02	169.84	585.96	234.39	142.35
15	23.50	25.00	1.50	Granular	8.90	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	193.95	193.95	4.71	48.03	349.89	814.05	325.62	157.45
16	25.00	26.50	1.50	Granular	8.90	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	193.95	193.95	4.71	48.03	349.89	862.08	344.83	172.55
17	26.50	28.00	1.50	Granular	8.90	0.00	29	-	17.60	20.13	1.00	-	27.25	28.00	193.95	193.95	4.71	46.43	313.88	872.49	349.00	187.20
18	28.00	29.50	1.50	Granular	8.90	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	193.95	193.95	4.71	48.03	349.89	956.53	382.61	202.29
19	29.50	30.00	0.50	Granular	8.90	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	193.95	193.95	1.57	16.01	349.89	972.54	389.02	207.33

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.96	2.02	1.84	7.36	6.69	0.228	0.912	8.77	2.19	32.28	14.66	21.05	5.26	77.47	35.18
2	22.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.96	2.02	1.84	7.36	6.69	0.228	0.912	8.77	2.19	32.28	14.66	21.05	5.26	77.47	35.18
3	24.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.96	2.02	1.84	7.36	6.69	0.228	0.912	8.77	2.19	32.28	14.66	21.05	5.26	77.47	35.18
4	25.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.96	2.02	1.84	7.36	6.69	0.228	0.912	8.77	2.19	32.28	14.66	21.05	5.26	77.47	35.18
5	27.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.97	2.02	1.83	7.27	6.60	0.219	0.877	9.12	2.28	33.14	15.05	21.89	5.47	79.52	36.13
6	28.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.97	2.02	1.83	7.27	6.60	0.219	0.877	9.12	2.28	33.14	15.05	21.89	5.47	79.52	36.13
7	30.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.98	2.02	1.83	7.18	6.52	0.211	0.845	9.46	2.37	33.96	15.44	22.71	5.68	81.51	37.05

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-25	-
Chainage	2+404	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	216.45	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	3.50	mtr
Groundwater Level from OGL	14.20	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-25	1.20	22.00	19.50	18.50	298.61	167.43	11.44	2.86
BH-25	1.20	23.50	21.00	20.00	320.21	184.81	11.44	2.86
BH-25	1.20	25.00	22.50	21.50	461.84	205.20	11.44	2.86
BH-25	1.20	26.50	24.00	23.00	487.57	225.58	11.44	2.86
BH-25	1.20	28.00	25.50	24.50	489.26	245.37	11.89	2.97
BH-25	1.20	29.50	27.00	26.00	538.17	265.75	11.89	2.97
BH-25	1.20	30.00	27.50	26.50	546.74	272.55	12.34	3.09

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	15.70	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	11.78	23.55	5.65	0.00	47.99	47.99	19.19	6.33
2	4.00	5.50	1.50	Granular	15.70	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	35.33	47.10	5.65	9.10	83.25	92.35	36.94	11.26
3	5.50	7.00	1.50	Granular	15.70	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	58.88	70.65	5.65	15.16	118.51	142.77	57.11	17.88
4	7.00	8.50	1.50	Granular	16.20	0.00	26	-	11.90	13.19	1.00	-	7.75	8.50	82.80	94.95	5.65	21.32	155.30	200.89	80.35	26.22
5	8.50	10.00	1.50	Granular	16.50	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	107.33	119.70	5.65	27.64	192.60	265.83	106.33	36.34
6	10.00	11.50	1.50	Granular	16.50	0.00	26	-	11.90	13.19	1.00	-	10.75	11.50	132.08	144.45	5.65	34.01	229.66	336.90	134.76	48.24
7	11.50	13.00	1.50	Granular	16.50	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	156.83	169.20	5.65	40.39	266.72	414.35	165.74	61.92
8	13.00	14.50	1.50	Granular	16.50	0.00	30	-	19.50	22.44	1.00	-	13.75	14.50	181.58	193.95	5.65	53.96	515.91	717.49	287.00	79.40
9	14.50	16.00	1.50	Granular	6.70	0.00	30	-	19.50	22.44	1.00	-	15.25	16.00	198.98	204.00	5.65	59.13	528.49	789.20	315.68	98.33
10	16.00	17.50	1.50	Granular	8.30	0.00	25	-	10.00	10.88	1.00	-	16.75	17.50	210.23	216.45	5.65	52.06	272.95	585.72	234.29	115.28
11	17.50	19.00	1.50	Granular	8.30	0.00	25	-	10.00	10.88	1.00	-	18.25	19.00	216.45	216.45	5.65	53.60	272.95	639.32	255.73	132.67
12	19.00	20.50	1.50	Granular	8.30	0.00	25	-	10.00	10.88	1.00	-	19.75	20.50	216.45	216.45	5.65	53.60	272.95	692.92	277.17	150.05
13	20.50	22.00	1.50	Granular	8.30	0.00	25	-	10.00	10.88	1.00	-	21.25	22.00	216.45	216.45	5.65	53.60	272.95	746.51	298.61	167.43
14	22.00	23.50	1.50	Granular	8.90	0.00	25	-	10.00	10.88	1.00	-	22.75	23.50	216.45	216.45	5.65	53.60	273.36	800.52	320.21	184.81
15	23.50	25.00	1.50	Granular	8.90	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	216.45	216.45	5.65	64.32	563.13	1154.61	461.84	205.20
16	25.00	26.50	1.50	Granular	8.90	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	216.45	216.45	5.65	64.32	563.13	1218.93	487.57	225.58
17	26.50	28.00	1.50	Granular	8.90	0.00	29	-	17.60	20.13	1.00	-	27.25	28.00	216.45	216.45	5.65	62.18	505.17	1223.15	489.26	245.37
18	28.00	29.50	1.50	Granular	8.90	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	216.45	216.45	5.65	64.32	563.13	1345.42	538.17	265.75
19	29.50	30.00	0.50	Granular	8.90	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	216.45	216.45	1.88	21.44	563.13	1366.86	546.74	272.55

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.83	2.04	1.84	8.59	7.76	0.175	0.699	11.44	2.86	49.14	22.18	27.45	6.86	117.93	53.24
2	22.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.83	2.04	1.84	8.59	7.76	0.175	0.699	11.44	2.86	49.14	22.18	27.45	6.86	117.93	53.24
3	24.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.83	2.04	1.84	8.59	7.76	0.175	0.699	11.44	2.86	49.14	22.18	27.45	6.86	117.93	53.24
4	25.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.83	2.04	1.84	8.59	7.76	0.175	0.699	11.44	2.86	49.14	22.18	27.45	6.86	117.93	53.24
5	27.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.84	2.04	1.84	8.48	7.66	0.168	0.673	11.89	2.97	50.44	22.78	28.55	7.14	121.05	54.67
6	28.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.84	2.04	1.84	8.48	7.66	0.168	0.673	11.89	2.97	50.44	22.78	28.55	7.14	121.05	54.67
7	30.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.85	2.04	1.84	8.38	7.57	0.162	0.648	12.34	3.09	51.69	23.36	29.62	7.40	124.06	56.06

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-26	-
Chainage	2+532	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	185.18	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	13.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-26	1.00	22.00	19.50	19.50	245.17	121.54	7.95	1.99
BH-26	1.00	23.50	21.00	21.00	291.01	136.03	7.95	1.99
BH-26	1.00	25.00	22.50	22.50	309.53	150.52	8.28	2.07
BH-26	1.00	26.50	24.00	24.00	327.88	165.01	8.28	2.07
BH-26	1.00	28.00	25.50	25.50	346.22	179.49	8.28	2.07
BH-26	1.00	29.50	27.00	27.00	364.56	193.98	8.61	2.15
BH-26	1.00	30.00	27.50	27.50	370.67	198.81	8.61	2.15

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	15.70	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	11.78	23.55	4.71	2.53	31.85	34.38	13.75	5.11
2	4.00	5.50	1.50	Granular	15.70	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	35.33	47.10	4.71	7.58	56.34	66.45	26.58	8.88
3	5.50	7.00	1.50	Granular	15.70	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	58.88	70.65	4.71	12.64	80.83	103.57	41.43	14.07
4	7.00	8.50	1.50	Granular	16.20	0.00	28	-	15.70	17.82	1.00	-	7.75	8.50	82.80	94.95	4.71	19.14	143.36	185.24	74.10	21.07
5	8.50	10.00	1.50	Granular	17.50	0.00	28	-	15.70	17.82	1.00	-	9.25	10.00	108.08	121.20	4.71	24.98	181.03	247.89	99.16	29.72
6	10.00	11.50	1.50	Granular	17.50	0.00	28	-	15.70	17.82	1.00	-	10.75	11.50	134.33	147.45	4.71	31.05	217.89	315.80	126.32	40.06
7	11.50	13.00	1.50	Granular	17.50	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	160.58	173.70	4.71	37.11	254.76	389.77	155.91	52.10
8	13.00	14.50	1.50	Granular	7.65	0.00	28	-	15.70	17.82	1.00	-	13.75	14.50	179.44	185.18	4.71	41.47	264.78	441.26	176.50	65.36
9	14.50	16.00	1.50	Granular	7.65	0.00	28	-	15.70	17.82	1.00	-	15.25	16.00	185.18	185.18	4.71	0.00	264.78	441.26	176.50	67.01
10	16.00	17.50	1.50	Granular	8.40	0.00	28	-	15.70	17.82	1.00	-	16.75	17.50	185.18	185.18	4.71	42.80	265.24	484.52	193.81	80.64
11	17.50	19.00	1.50	Granular	8.40	0.00	28	-	15.70	17.82	1.00	-	18.25	19.00	185.18	185.18	4.71	42.80	265.24	527.32	210.93	94.27
12	19.00	20.50	1.50	Granular	8.40	0.00	28	-	15.70	17.82	1.00	-	19.75	20.50	185.18	185.18	4.71	42.80	265.24	570.12	228.05	107.91
13	20.50	22.00	1.50	Granular	8.40	0.00	28	-	15.70	17.82	1.00	-	21.25	22.00	185.18	185.18	4.71	42.80	265.24	612.92	245.17	121.54
14	22.00	23.50	1.50	Granular	8.40	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	185.18	185.18	4.71	45.85	333.99	727.52	291.01	136.03
15	23.50	25.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	185.18	185.18	4.71	45.85	334.45	773.84	309.53	150.52
16	25.00	26.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	185.18	185.18	4.71	45.85	334.45	819.69	327.88	165.01
17	26.50	28.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	185.18	185.18	4.71	45.85	334.45	865.55	346.22	179.49
18	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	185.18	185.18	4.71	45.85	334.45	911.40	364.56	193.98
19	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	185.18	185.18	1.57	15.28	334.45	926.69	370.67	198.81

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.68	2.06	1.85	7.61	6.82	0.252	1.007	7.95	1.99	30.23	13.55	19.07	4.77	72.55	32.51
2	22.50	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.68	2.06	1.85	7.61	6.82	0.252	1.007	7.95	1.99	30.23	13.55	19.07	4.77	72.55	32.51
3	24.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
4	25.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
5	27.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
6	28.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33
7	30.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-26	-
Chainage	2+532	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	209.25	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	13.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-26	1.20	22.00	19.50	19.50	349.72	158.64	10.42	2.60
BH-26	1.20	23.50	21.00	21.00	419.39	178.43	10.42	2.60
BH-26	1.20	25.00	22.50	22.50	444.58	198.21	10.85	2.71
BH-26	1.20	26.50	24.00	24.00	469.45	218.00	10.85	2.71
BH-26	1.20	28.00	25.50	25.50	494.32	237.78	10.85	2.71
BH-26	1.20	29.50	27.00	27.00	519.20	257.57	11.28	2.82
BH-26	1.20	30.00	27.50	27.50	527.49	264.16	11.28	2.82

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Presure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	15.70	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	11.78	23.55	5.65	3.03	47.99	51.02	20.41	7.18
2	4.00	5.50	1.50	Granular	15.70	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	35.33	47.10	5.65	9.10	83.25	95.38	38.15	12.10
3	5.50	7.00	1.50	Granular	15.70	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	58.88	70.65	5.65	15.16	118.51	145.80	58.32	18.73
4	7.00	8.50	1.50	Granular	16.20	0.00	28	-	15.70	17.82	1.00	-	7.75	8.50	82.80	94.95	5.65	22.96	209.33	259.58	103.83	27.53
5	8.50	10.00	1.50	Granular	17.50	0.00	28	-	15.70	17.82	1.00	-	9.25	10.00	108.08	121.20	5.65	29.97	263.80	344.03	137.61	38.30
6	10.00	11.50	1.50	Granular	17.50	0.00	28	-	15.70	17.82	1.00	-	10.75	11.50	134.33	147.45	5.65	37.25	316.88	434.37	173.75	51.10
7	11.50	13.00	1.50	Granular	17.50	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	160.58	173.70	5.65	44.53	369.97	531.99	212.79	65.95
8	13.00	14.50	1.50	Granular	7.65	0.00	28	-	15.70	17.82	1.00	-	13.75	14.50	179.44	185.18	5.65	49.77	382.64	594.42	237.77	82.26
9	14.50	16.00	1.50	Granular	7.65	0.00	28	-	15.70	17.82	1.00	-	15.25	16.00	190.91	196.65	5.65	0.00	405.84	617.63	247.05	84.63
10	16.00	17.50	1.50	Granular	8.40	0.00	28	-	15.70	17.82	1.00	-	16.75	17.50	202.95	209.25	5.65	56.29	432.13	700.20	280.08	102.77
11	17.50	19.00	1.50	Granular	8.40	0.00	28	-	15.70	17.82	1.00	-	18.25	19.00	209.25	209.25	5.65	58.03	432.13	758.23	303.29	121.39
12	19.00	20.50	1.50	Granular	8.40	0.00	28	-	15.70	17.82	1.00	-	19.75	20.50	209.25	209.25	5.65	58.03	432.13	816.27	326.51	140.02
13	20.50	22.00	1.50	Granular	8.40	0.00	28	-	15.70	17.82	1.00	-	21.25	22.00	209.25	209.25	5.65	58.03	432.13	874.30	349.72	158.64
14	22.00	23.50	1.50	Granular	8.40	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	209.25	209.25	5.65	62.18	544.12	1048.48	419.39	178.43
15	23.50	25.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	209.25	209.25	5.65	62.18	544.92	1111.45	444.58	198.21
16	25.00	26.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	209.25	209.25	5.65	62.18	544.92	1173.63	469.45	218.00
17	26.50	28.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	209.25	209.25	5.65	62.18	544.92	1235.81	494.32	237.78
18	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	209.25	209.25	5.65	62.18	544.92	1297.99	519.20	257.57
19	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	209.25	209.25	1.88	20.73	544.92	1318.72	527.49	264.16

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.59	2.08	1.85	8.86	7.91	0.192	0.768	10.42	2.60	46.16	20.59	25.00	6.25	110.80	49.43
2	22.50	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.59	2.08	1.85	8.86	7.91	0.192	0.768	10.42	2.60	46.16	20.59	25.00	6.25	110.80	49.43
3	24.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
4	25.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
5	27.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
6	28.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17
7	30.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-27	-
Chainage	2+586	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	169.73	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	13.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-27	1.00	22.00	19.50	19.50	271.53	128.44	10.16	2.54
BH-27	1.00	23.50	21.00	21.00	288.58	141.85	10.16	2.54
BH-27	1.00	25.00	22.50	22.50	305.39	155.27	10.16	2.54
BH-27	1.00	26.50	24.00	24.00	322.21	168.69	10.16	2.54
BH-27	1.00	28.00	25.50	25.50	339.02	182.11	10.16	2.54
BH-27	1.00	29.50	27.00	27.00	355.83	195.52	10.16	2.54
BH-27	1.00	30.00	27.50	27.50	361.43	200.00	10.16	2.54

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	15.60	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	11.70	23.40	4.71	2.51	31.65	34.16	13.66	5.10
2	4.00	5.50	1.50	Granular	15.60	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	35.10	46.80	4.71	7.53	55.98	66.02	26.41	8.86
3	5.50	7.00	1.50	Granular	15.60	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	58.50	70.20	4.71	12.55	80.31	102.91	41.16	14.02
4	7.00	8.50	1.50	Granular	16.20	0.00	26	-	11.90	13.19	1.00	-	7.75	8.50	82.35	94.50	4.71	17.67	105.86	146.13	58.45	20.62
5	8.50	10.00	1.50	Granular	17.20	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	107.40	120.30	4.71	23.05	133.16	196.48	78.59	28.73
6	10.00	11.50	1.50	Granular	17.20	0.00	26	-	11.90	13.19	1.00	-	10.75	11.50	133.20	146.10	4.71	28.59	159.99	251.89	100.76	38.38
7	11.50	13.00	1.50	Granular	7.35	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	151.61	157.13	4.71	32.54	166.83	291.27	116.51	49.14
8	13.00	14.50	1.50	Granular	8.40	0.00	29	-	17.60	20.13	1.00	-	13.75	14.50	163.43	169.73	4.71	39.12	275.10	438.67	175.47	61.74
9	14.50	16.00	1.50	Granular	8.40	0.00	29	-	17.60	20.13	1.00	-	15.25	16.00	169.73	169.73	4.71	40.63	275.10	479.29	191.72	74.77
10	16.00	17.50	1.50	Granular	8.25	0.00	30	-	19.50	22.44	1.00	-	16.75	17.50	169.73	169.73	4.71	42.03	306.55	552.77	221.11	88.18
11	17.50	19.00	1.50	Granular	8.20	0.00	30	-	19.50	22.44	1.00	-	18.25	19.00	169.73	169.73	4.71	42.03	306.51	594.76	237.90	101.60
12	19.00	20.50	1.50	Granular	8.20	0.00	30	-	19.50	22.44	1.00	-	19.75	20.50	169.73	169.73	4.71	42.03	306.51	636.79	254.71	115.02
13	20.50	22.00	1.50	Granular	8.20	0.00	30	-	19.50	22.44	1.00	-	21.25	22.00	169.73	169.73	4.71	42.03	306.51	678.82	271.53	128.44
14	22.00	23.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	169.73	169.73	4.71	42.03	307.12	721.46	288.58	141.85
15	23.50	25.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	169.73	169.73	4.71	42.03	307.12	763.49	305.39	155.27
16	25.00	26.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	169.73	169.73	4.71	42.03	307.12	805.52	322.21	168.69
17	26.50	28.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	169.73	169.73	4.71	42.03	307.12	847.54	339.02	182.11
18	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	169.73	169.73	4.71	42.03	307.12	889.57	355.83	195.52
19	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	169.73	169.73	1.57	14.01	307.12	903.58	361.43	200.00

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40
2	22.50	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40
3	24.00	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40
4	25.50	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40
5	27.00	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40
6	28.50	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40
7	30.00	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-27	-
Chainage	2+586	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	194.70	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	13.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-27	1.20	22.00	19.50	19.50	393.29	168.23	13.30	3.32
BH-27	1.20	23.50	21.00	21.00	416.86	186.81	13.30	3.32
BH-27	1.20	25.00	22.50	22.50	440.00	205.38	13.30	3.32
BH-27	1.20	26.50	24.00	24.00	463.14	223.96	13.30	3.32
BH-27	1.20	28.00	25.50	25.50	486.28	242.53	13.30	3.32
BH-27	1.20	29.50	27.00	27.00	509.43	261.11	13.30	3.32
BH-27	1.20	30.00	27.50	27.50	517.14	267.30	13.30	3.32

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Presure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	15.60	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	11.70	23.40	5.65	3.01	47.68	50.69	20.28	7.18
2	4.00	5.50	1.50	Granular	15.60	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	35.10	46.80	5.65	9.04	82.72	94.77	37.91	12.08
3	5.50	7.00	1.50	Granular	15.60	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	58.50	70.20	5.65	15.07	117.76	144.87	57.95	18.68
4	7.00	8.50	1.50	Granular	16.20	0.00	26	-	11.90	13.19	1.00	-	7.75	8.50	82.35	94.50	5.65	21.21	154.63	202.95	81.18	26.99
5	8.50	10.00	1.50	Granular	17.20	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	107.40	120.30	5.65	27.66	194.07	270.06	108.02	37.11
6	10.00	11.50	1.50	Granular	17.20	0.00	26	-	11.90	13.19	1.00	-	10.75	11.50	133.20	146.10	5.65	34.30	232.70	342.99	137.20	49.09
7	11.50	13.00	1.50	Granular	7.35	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	151.61	157.13	5.65	39.05	241.23	390.56	156.22	62.40
8	13.00	14.50	1.50	Granular	8.40	0.00	29	-	17.60	20.13	1.00	-	13.75	14.50	163.43	169.73	5.65	46.94	397.83	594.10	237.64	77.92
9	14.50	16.00	1.50	Granular	8.40	0.00	29	-	17.60	20.13	1.00	-	15.25	16.00	176.03	182.33	5.65	50.56	426.61	673.45	269.38	94.45
10	16.00	17.50	1.50	Granular	8.25	0.00	30	-	19.50	22.44	1.00	-	16.75	17.50	188.51	194.70	5.65	56.02	506.86	809.72	323.89	112.51
11	17.50	19.00	1.50	Granular	8.20	0.00	30	-	19.50	22.44	1.00	-	18.25	19.00	194.70	194.70	5.65	57.86	506.80	867.51	347.00	131.08
12	19.00	20.50	1.50	Granular	8.20	0.00	30	-	19.50	22.44	1.00	-	19.75	20.50	194.70	194.70	5.65	57.86	506.80	925.37	370.15	149.66
13	20.50	22.00	1.50	Granular	8.20	0.00	30	-	19.50	22.44	1.00	-	21.25	22.00	194.70	194.70	5.65	57.86	506.80	983.22	393.29	168.23
14	22.00	23.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	194.70	194.70	5.65	57.86	507.86	1042.14	416.86	186.81
15	23.50	25.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	194.70	194.70	5.65	57.86	507.86	1100.00	440.00	205.38
16	25.00	26.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	194.70	194.70	5.65	57.86	507.86	1157.85	463.14	223.96
17	26.50	28.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	194.70	194.70	5.65	57.86	507.86	1215.71	486.28	242.53
18	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	194.70	194.70	5.65	57.86	507.86	1273.57	509.43	261.11
19	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	194.70	194.70	1.88	19.29	507.86	1292.85	517.14	267.30

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32
2	22.50	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32
3	24.00	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32
4	25.50	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32
5	27.00	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32
6	28.50	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32
7	30.00	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-22	-
Chainage	2+036	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	75.23	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	3.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-22	1.00	22.00	19.50	18.50	99.68	67.06	8.41	2.10
BH-22	1.00	23.50	21.00	20.00	106.98	73.40	8.41	2.10
BH-22	1.00	25.00	22.50	21.50	131.82	80.27	8.77	2.19
BH-22	1.00	26.50	24.00	23.00	139.27	87.13	8.77	2.19
BH-22	1.00	28.00	25.50	24.50	146.72	94.00	8.77	2.19
BH-22	1.00	29.50	27.00	26.00	154.17	100.86	9.12	2.28
BH-22	1.00	30.00	27.50	26.50	156.66	103.15	9.12	2.28

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	5.89	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	4.42	8.84	4.71	0.00	11.96	11.96	4.78	4.40
2	4.00	5.50	1.50	Granular	5.89	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	13.26	17.68	4.71	2.85	21.15	23.99	9.60	6.84
3	5.50	7.00	1.50	Granular	5.89	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	22.10	26.52	4.71	4.74	30.34	37.93	15.17	9.82
4	7.00	8.50	1.50	Granular	5.89	0.00	29	-	17.60	20.13	1.00	-	7.75	8.50	30.94	35.36	4.71	7.41	60.19	75.18	30.07	13.54
5	8.50	10.00	1.50	Granular	5.89	0.00	29	-	17.60	20.13	1.00	-	9.25	10.00	39.78	44.20	4.71	9.52	74.21	98.73	39.49	17.86
6	10.00	11.50	1.50	Granular	6.89	0.00	29	-	17.60	20.13	1.00	-	10.75	11.50	49.37	54.54	4.71	11.82	91.31	127.65	51.06	22.82
7	11.50	13.00	1.50	Granular	6.89	0.00	29	-	17.60	20.13	1.00	-	12.25	13.00	59.71	64.88	4.71	14.29	107.72	158.34	63.34	28.47
8	13.00	14.50	1.50	Granular	6.90	0.00	29	-	17.60	20.13	1.00	-	13.75	14.50	70.06	75.23	4.71	16.77	124.14	191.54	76.62	34.81
9	14.50	16.00	1.50	Granular	7.65	0.00	28	-	15.70	17.82	1.00	-	15.25	16.00	75.23	75.23	4.71	17.39	110.38	195.16	78.07	41.33
10	16.00	17.50	1.50	Granular	7.65	0.00	28	-	15.70	17.82	1.00	-	16.75	17.50	75.23	75.23	4.71	17.39	110.38	212.55	85.02	47.85
11	17.50	19.00	1.50	Granular	7.65	0.00	28	-	15.70	17.82	1.00	-	18.25	19.00	75.23	75.23	4.71	17.39	110.38	229.94	91.98	54.37
12	19.00	20.50	1.50	Granular	7.65	0.00	27	-	13.80	15.50	1.00	-	19.75	20.50	75.23	75.23	4.71	16.77	96.10	232.42	92.97	60.71
13	20.50	22.00	1.50	Granular	7.65	0.00	27	-	13.80	15.50	1.00	-	21.25	22.00	75.23	75.23	4.71	16.77	96.10	249.19	99.68	67.06
14	22.00	23.50	1.50	Granular	10.40	0.00	27	-	13.80	15.50	1.00	-	22.75	23.50	75.23	75.23	4.71	16.77	97.59	267.45	106.98	73.40
15	23.50	25.00	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	75.23	75.23	4.71	18.63	141.06	329.55	131.82	80.27
16	25.00	26.50	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	75.23	75.23	4.71	18.63	141.06	348.17	139.27	87.13
17	26.50	28.00	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	75.23	75.23	4.71	18.63	141.06	366.80	146.72	94.00
18	28.00	29.50	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	75.23	75.23	4.71	18.63	141.06	385.43	154.17	100.86
19	29.50	30.00	0.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	75.23	75.23	1.57	6.21	141.06	391.64	156.66	103.15

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.95	2.02	1.84	7.47	6.78	0.238	0.951	8.41	2.10	31.39	14.25	20.18	5.05	75.34	34.19
2	22.50	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.95	2.02	1.84	7.47	6.78	0.238	0.951	8.41	2.10	31.39	14.25	20.18	5.05	75.34	34.19
3	24.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.96	2.02	1.84	7.36	6.69	0.228	0.912	8.77	2.19	32.28	14.66	21.05	5.26	77.47	35.18
4	25.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.96	2.02	1.84	7.36	6.69	0.228	0.912	8.77	2.19	32.28	14.66	21.05	5.26	77.47	35.18
5	27.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.96	2.02	1.84	7.36	6.69	0.228	0.912	8.77	2.19	32.28	14.66	21.05	5.26	77.47	35.18
6	28.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.97	2.02	1.83	7.27	6.60	0.219	0.877	9.12	2.28	33.14	15.05	21.89	5.47	79.52	36.13
7	30.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.97	2.02	1.83	7.27	6.60	0.219	0.877	9.12	2.28	33.14	15.05	21.89	5.47	79.52	36.13

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-22	-
Chainage	2+036	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	98.18	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	3.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-22	1.20	22.00	19.50	18.50	155.47	93.27	10.97	2.74
BH-22	1.20	23.50	21.00	20.00	167.01	103.00	10.97	2.74
BH-22	1.20	25.00	22.50	21.50	211.21	113.55	11.44	2.86
BH-22	1.20	26.50	24.00	23.00	222.88	124.09	11.44	2.86
BH-22	1.20	28.00	25.50	24.50	234.55	134.63	11.44	2.86
BH-22	1.20	29.50	27.00	26.00	246.22	145.18	11.89	2.97
BH-22	1.20	30.00	27.50	26.50	250.11	148.69	11.89	2.97

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Coeff. of Earth Pressure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	5.89	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	4.42	8.84	5.65	0.00	18.01	18.01	7.21	6.33
2	4.00	5.50	1.50	Granular	5.89	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	13.26	17.68	5.65	3.41	31.25	34.66	13.87	9.66
3	5.50	7.00	1.50	Granular	5.89	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	22.10	26.52	5.65	5.69	44.49	53.59	21.44	13.63
4	7.00	8.50	1.50	Granular	5.89	0.00	29	-	17.60	20.13	1.00	-	7.75	8.50	30.94	35.36	5.65	8.89	87.85	105.84	42.34	18.50
5	8.50	10.00	1.50	Granular	5.89	0.00	29	-	17.60	20.13	1.00	-	9.25	10.00	39.78	44.20	5.65	11.43	108.04	137.46	54.99	24.07
6	10.00	11.50	1.50	Granular	6.89	0.00	29	-	17.60	20.13	1.00	-	10.75	11.50	49.37	54.54	5.65	14.18	132.87	176.47	70.59	30.42
7	11.50	13.00	1.50	Granular	6.89	0.00	29	-	17.60	20.13	1.00	-	12.25	13.00	59.71	64.88	5.65	17.15	156.49	217.24	86.90	37.59
8	13.00	14.50	1.50	Granular	6.90	0.00	29	-	17.60	20.13	1.00	-	13.75	14.50	70.06	75.23	5.65	20.12	180.14	261.02	104.41	45.60
9	14.50	16.00	1.50	Granular	7.65	0.00	28	-	15.70	17.82	1.00	-	15.25	16.00	80.97	86.71	5.65	22.46	183.51	286.85	114.74	54.27
10	16.00	17.50	1.50	Granular	7.65	0.00	28	-	15.70	17.82	1.00	-	16.75	17.50	92.44	98.18	5.65	25.64	206.72	335.69	134.28	63.82
11	17.50	19.00	1.50	Granular	7.65	0.00	28	-	15.70	17.82	1.00	-	18.25	19.00	98.18	98.18	5.65	27.23	206.72	362.92	145.17	73.82
12	19.00	20.50	1.50	Granular	7.65	0.00	27	-	13.80	15.50	1.00	-	19.75	20.50	98.18	98.18	5.65	26.26	179.96	362.42	144.97	83.55
13	20.50	22.00	1.50	Granular	7.65	0.00	27	-	13.80	15.50	1.00	-	21.25	22.00	98.18	98.18	5.65	26.26	179.96	388.68	155.47	93.27
14	22.00	23.50	1.50	Granular	10.40	0.00	27	-	13.80	15.50	1.00	-	22.75	23.50	98.18	98.18	5.65	26.26	182.55	417.52	167.01	103.00
15	23.50	25.00	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	98.18	98.18	5.65	29.17	263.88	528.03	211.21	113.55
16	25.00	26.50	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	98.18	98.18	5.65	29.17	263.88	557.20	222.88	124.09
17	26.50	28.00	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	98.18	98.18	5.65	29.17	263.88	586.38	234.55	134.63
18	28.00	29.50	1.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	98.18	98.18	5.65	29.17	263.88	615.55	246.22	145.18
19	29.50	30.00	0.50	Granular	10.40	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	98.18	98.18	1.88	9.72	263.88	625.28	250.11	148.69

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.82	2.04	1.84	8.71	7.86	0.182	0.729	10.97	2.74	47.79	21.57	26.33	6.58	114.70	51.76
2	22.50	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.82	2.04	1.84	8.71	7.86	0.182	0.729	10.97	2.74	47.79	21.57	26.33	6.58	114.70	51.76
3	24.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.83	2.04	1.84	8.59	7.76	0.175	0.699	11.44	2.86	49.14	22.18	27.45	6.86	117.93	53.24
4	25.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.83	2.04	1.84	8.59	7.76	0.175	0.699	11.44	2.86	49.14	22.18	27.45	6.86	117.93	53.24
5	27.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.83	2.04	1.84	8.59	7.76	0.175	0.699	11.44	2.86	49.14	22.18	27.45	6.86	117.93	53.24
6	28.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.84	2.04	1.84	8.48	7.66	0.168	0.673	11.89	2.97	50.44	22.78	28.55	7.14	121.05	54.67
7	30.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.84	2.04	1.84	8.48	7.66	0.168	0.673	11.89	2.97	50.44	22.78	28.55	7.14	121.05	54.67

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-23	-
Chainage	2+116	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	96.08	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-23	1.00	22.00	19.50	19.50	143.38	80.05	9.56	2.39
BH-23	1.00	23.50	21.00	21.00	152.58	88.14	9.56	2.39
BH-23	1.00	25.00	22.50	22.50	161.78	96.22	9.56	2.39
BH-23	1.00	26.50	24.00	24.00	178.58	104.54	9.56	2.39
BH-23	1.00	28.00	25.50	25.50	188.10	112.85	9.56	2.39
BH-23	1.00	29.50	27.00	27.00	197.61	121.16	9.56	2.39
BH-23	1.00	30.00	27.50	27.50	200.78	123.93	9.56	2.39

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Presure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.74	0.00	27	-	13.80	15.50	1.00	-	3.25	4.00	5.81	11.62	4.71	1.29	18.41	19.70	7.88	4.76
2	4.00	5.50	1.50	Granular	7.74	0.00	27	-	13.80	15.50	1.00	-	4.75	5.50	17.42	23.23	4.71	3.88	32.60	37.78	15.11	7.50
3	5.50	7.00	1.50	Granular	8.09	0.00	27	-	13.80	15.50	1.00	-	6.25	7.00	29.30	35.37	4.71	6.53	47.63	59.33	23.73	10.97
4	7.00	8.50	1.50	Granular	8.09	0.00	27	-	13.80	15.50	1.00	-	7.75	8.50	41.44	47.51	4.71	9.24	62.46	83.40	33.36	15.21
5	8.50	10.00	1.50	Granular	8.09	0.00	27	-	13.80	15.50	1.00	-	9.25	10.00	53.58	59.65	4.71	11.94	77.30	110.18	44.07	20.20
6	10.00	11.50	1.50	Granular	8.09	0.00	28	-	15.70	17.82	1.00	-	10.75	11.50	65.72	71.79	4.71	15.19	105.82	153.90	61.56	26.11
7	11.50	13.00	1.50	Granular	8.09	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	77.86	83.93	4.71	18.00	122.87	188.94	75.58	32.79
8	13.00	14.50	1.50	Granular	8.10	0.00	28	-	15.70	17.82	1.00	-	13.75	14.50	90.01	96.08	4.71	20.80	139.94	226.81	90.72	40.27
9	14.50	16.00	1.50	Granular	8.35	0.00	28	-	15.70	17.82	1.00	-	15.25	16.00	96.08	96.08	4.71	22.21	140.09	249.17	99.67	48.13
10	16.00	17.50	1.50	Granular	8.35	0.00	28	-	15.70	17.82	1.00	-	16.75	17.50	96.08	96.08	4.71	22.21	140.09	271.37	108.55	56.00
11	17.50	19.00	1.50	Granular	12.30	0.00	28	-	15.70	17.82	1.00	-	18.25	19.00	96.08	96.08	4.71	22.21	142.54	296.02	118.41	63.87
12	19.00	20.50	1.50	Granular	12.30	0.00	29	-	17.60	20.13	1.00	-	19.75	20.50	96.08	96.08	4.71	23.00	160.97	337.45	134.98	71.96
13	20.50	22.00	1.50	Granular	9.40	0.00	29	-	17.60	20.13	1.00	-	21.25	22.00	96.08	96.08	4.71	23.00	158.96	358.44	143.38	80.05
14	22.00	23.50	1.50	Granular	9.40	0.00	29	-	17.60	20.13	1.00	-	22.75	23.50	96.08	96.08	4.71	23.00	158.96	381.44	152.58	88.14
15	23.50	25.00	1.50	Granular	9.40	0.00	29	-	17.60	20.13	1.00	-	24.25	25.00	96.08	96.08	4.71	23.00	158.96	404.44	161.78	96.22
16	25.00	26.50	1.50	Granular	9.40	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	96.08	96.08	4.71	23.79	177.17	446.45	178.58	104.54
17	26.50	28.00	1.50	Granular	9.40	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	96.08	96.08	4.71	23.79	177.17	470.24	188.10	112.85
18	28.00	29.50	1.50	Granular	9.40	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	96.08	96.08	4.71	23.79	177.17	494.03	197.61	121.16
19	29.50	30.00	0.50	Granular	9.40	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	96.08	96.08	1.57	7.93	177.17	501.96	200.78	123.93

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
2	22.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
3	24.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
4	25.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
5	27.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
6	28.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
7	30.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-23	-
Chainage	2+116	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	121.13	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-23	1.20	22.00	19.50	19.50	222.27	109.78	12.52	3.13
BH-23	1.20	23.50	21.00	21.00	236.19	121.90	12.52	3.13
BH-23	1.20	25.00	22.50	22.50	250.10	134.02	12.52	3.13
BH-23	1.20	26.50	24.00	24.00	277.70	146.47	12.52	3.13
BH-23	1.20	28.00	25.50	25.50	292.10	158.92	12.52	3.13
BH-23	1.20	29.50	27.00	27.00	306.50	171.38	12.52	3.13
BH-23	1.20	30.00	27.50	27.50	311.30	175.53	12.52	3.13

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Presure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	7.74	0.00	27	-	13.80	15.50	1.00	-	3.25	4.00	5.81	11.62	5.65	1.55	27.72	29.27	11.71	6.77
2	4.00	5.50	1.50	Granular	7.74	0.00	27	-	13.80	15.50	1.00	-	4.75	5.50	17.42	23.23	5.65	4.66	48.16	54.37	21.75	10.45
3	5.50	7.00	1.50	Granular	8.09	0.00	27	-	13.80	15.50	1.00	-	6.25	7.00	29.30	35.37	5.65	7.84	69.85	83.90	33.56	15.02
4	7.00	8.50	1.50	Granular	8.09	0.00	27	-	13.80	15.50	1.00	-	7.75	8.50	41.44	47.51	5.65	11.08	91.21	116.34	46.54	20.50
5	8.50	10.00	1.50	Granular	8.09	0.00	27	-	13.80	15.50	1.00	-	9.25	10.00	53.58	59.65	5.65	14.33	112.58	152.04	60.82	26.88
6	10.00	11.50	1.50	Granular	8.09	0.00	28	-	15.70	17.82	1.00	-	10.75	11.50	65.72	71.79	5.65	18.23	153.83	211.51	84.61	34.36
7	11.50	13.00	1.50	Granular	8.09	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	77.86	83.93	5.65	21.59	178.38	257.66	103.06	42.78
8	13.00	14.50	1.50	Granular	8.10	0.00	28	-	15.70	17.82	1.00	-	13.75	14.50	90.01	96.08	5.65	24.96	202.95	307.20	122.88	52.15
9	14.50	16.00	1.50	Granular	8.35	0.00	28	-	15.70	17.82	1.00	-	15.25	16.00	102.34	108.61	5.65	28.38	228.55	361.18	144.47	62.47
10	16.00	17.50	1.50	Granular	8.35	0.00	28	-	15.70	17.82	1.00	-	16.75	17.50	114.87	121.13	5.65	31.86	253.88	418.36	167.35	73.76
11	17.50	19.00	1.50	Granular	12.30	0.00	28	-	15.70	17.82	1.00	-	18.25	19.00	121.13	121.13	5.65	33.59	258.10	456.18	182.47	85.55
12	19.00	20.50	1.50	Granular	12.30	0.00	29	-	17.60	20.13	1.00	-	19.75	20.50	121.13	121.13	5.65	34.79	291.48	524.35	209.74	97.66
13	20.50	22.00	1.50	Granular	9.40	0.00	29	-	17.60	20.13	1.00	-	21.25	22.00	121.13	121.13	5.65	34.79	288.00	555.67	222.27	109.78
14	22.00	23.50	1.50	Granular	9.40	0.00	29	-	17.60	20.13	1.00	-	22.75	23.50	121.13	121.13	5.65	34.79	288.00	590.47	236.19	121.90
15	23.50	25.00	1.50	Granular	9.40	0.00	29	-	17.60	20.13	1.00	-	24.25	25.00	121.13	121.13	5.65	34.79	288.00	625.26	250.10	134.02
16	25.00	26.50	1.50	Granular	9.40	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	121.13	121.13	5.65	35.99	321.01	694.26	277.70	146.47
17	26.50	28.00	1.50	Granular	9.40	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	121.13	121.13	5.65	35.99	321.01	730.25	292.10	158.92
18	28.00	29.50	1.50	Granular	9.40	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	121.13	121.13	5.65	35.99	321.01	766.25	306.50	171.38
19	29.50	30.00	0.50	Granular	9.40	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	121.13	121.13	1.88	12.00	321.01	778.25	311.30	175.53

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
2	22.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
3	24.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
4	25.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
5	27.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
6	28.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
7	30.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-23A	-
Chainage	2+257	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	82.87	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-23A	1.00	22.00	19.50	19.50	124.76	73.08	8.61	2.15
BH-23A	1.00	23.50	21.00	21.00	132.69	80.28	8.93	2.23
BH-23A	1.00	25.00	22.50	22.50	147.19	87.67	8.93	2.23
BH-23A	1.00	26.50	24.00	24.00	155.59	95.07	8.93	2.23
BH-23A	1.00	28.00	25.50	25.50	163.80	102.47	8.93	2.23
BH-23A	1.00	29.50	27.00	27.00	172.00	109.86	9.25	2.31
BH-23A	1.00	30.00	27.50	27.50	174.74	112.33	9.25	2.31

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Coeff. of Earth Pressure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	6.59	0.00	27	-	13.80	15.50	1.00	-	3.25	4.00	4.95	9.89	4.71	1.10	15.67	16.77	6.71	4.71
2	4.00	5.50	1.50	Granular	6.59	0.00	27	-	13.80	15.50	1.00	-	4.75	5.50	14.84	19.78	4.71	3.31	27.76	32.17	12.87	7.28
3	5.50	7.00	1.50	Granular	6.59	0.00	27	-	13.80	15.50	1.00	-	6.25	7.00	24.73	29.67	4.71	5.51	39.84	49.76	19.91	10.47
4	7.00	8.50	1.50	Granular	6.89	0.00	27	-	13.80	15.50	1.00	-	7.75	8.50	34.84	40.01	4.71	7.76	52.64	70.33	28.13	14.30
5	8.50	10.00	1.50	Granular	6.89	0.00	27	-	13.80	15.50	1.00	-	9.25	10.00	45.18	50.35	4.71	10.07	65.28	93.03	37.21	18.77
6	10.00	11.50	1.50	Granular	6.89	0.00	29	-	17.60	20.13	1.00	-	10.75	11.50	55.52	60.69	4.71	13.29	101.07	142.11	56.84	24.14
7	11.50	13.00	1.50	Granular	7.39	0.00	29	-	17.60	20.13	1.00	-	12.25	13.00	66.24	71.78	4.71	15.85	119.01	175.91	70.36	30.23
8	13.00	14.50	1.50	Granular	7.39	0.00	29	-	17.60	20.13	1.00	-	13.75	14.50	77.33	82.87	4.71	18.51	136.61	212.01	84.80	37.06
9	14.50	16.00	1.50	Granular	7.40	0.00	29	-	17.60	20.13	1.00	-	15.25	16.00	82.87	82.87	4.71	19.84	136.61	231.85	92.74	44.26
10	16.00	17.50	1.50	Granular	7.85	0.00	29	-	17.60	20.13	1.00	-	16.75	17.50	82.87	82.87	4.71	19.84	136.92	252.00	100.80	51.46
11	17.50	19.00	1.50	Granular	7.85	0.00	29	-	17.60	20.13	1.00	-	18.25	19.00	82.87	82.87	4.71	19.84	136.92	271.84	108.74	58.67
12	19.00	20.50	1.50	Granular	7.85	0.00	29	-	17.60	20.13	1.00	-	19.75	20.50	82.87	82.87	4.71	19.84	136.92	291.68	116.67	65.87
13	20.50	22.00	1.50	Granular	8.40	0.00	29	-	17.60	20.13	1.00	-	21.25	22.00	82.87	82.87	4.71	19.84	137.30	311.90	124.76	73.08
14	22.00	23.50	1.50	Granular	8.40	0.00	29	-	17.60	20.13	1.00	-	22.75	23.50	82.87	82.87	4.71	19.84	137.30	331.73	132.69	80.28
15	23.50	25.00	1.50	Granular	8.40	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	82.87	82.87	4.71	20.52	153.03	367.98	147.19	87.67
16	25.00	26.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	82.87	82.87	4.71	20.52	153.50	388.97	155.59	95.07
17	26.50	28.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	82.87	82.87	4.71	20.52	153.50	409.49	163.80	102.47
18	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	82.87	82.87	4.71	20.52	153.50	430.01	172.00	109.86
19	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	82.87	82.87	1.57	6.84	153.50	436.85	174.74	112.33

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33
2	22.50	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
3	24.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
4	25.50	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
5	27.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.70	2.06	1.85	7.32	6.57	0.224	0.896	8.93	2.23	32.68	14.67	21.44	5.36	78.43	35.20
6	28.50	19	2.96E+07	4.91E-02	2.70E+03	3.52	0.71	2.06	1.85	7.23	6.49	0.216	0.865	9.25	2.31	33.44	15.01	22.19	5.55	80.26	36.03
7	30.00	19	2.96E+07	4.91E-02	2.70E+03	3.52	0.71	2.06	1.85	7.23	6.49	0.216	0.865	9.25	2.31	33.44	15.01	22.19	5.55	80.26	36.03

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-23A	-
Chainage	2+257	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	105.75	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-23A	1.20	22.00	19.50	19.50	194.94	100.83	11.28	2.82
BH-23A	1.20	23.50	21.00	21.00	207.09	111.71	11.70	2.93
BH-23A	1.20	25.00	22.50	22.50	231.19	122.88	11.70	2.93
BH-23A	1.20	26.50	24.00	24.00	244.08	134.06	11.70	2.93
BH-23A	1.20	28.00	25.50	25.50	256.65	145.23	11.70	2.93
BH-23A	1.20	29.50	27.00	27.00	269.22	156.40	12.11	3.03
BH-23A	1.20	30.00	27.50	27.50	273.41	160.13	12.11	3.03

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	6.59	0.00	27	-	13.80	15.50	1.00	-	3.25	4.00	4.95	9.89	5.65	1.32	23.60	24.92	9.97	6.70
2	4.00	5.50	1.50	Granular	6.59	0.00	27	-	13.80	15.50	1.00	-	4.75	5.50	14.84	19.78	5.65	3.97	41.00	46.29	18.52	10.19
3	5.50	7.00	1.50	Granular	6.59	0.00	27	-	13.80	15.50	1.00	-	6.25	7.00	24.73	29.67	5.65	6.61	58.41	70.31	28.12	14.42
4	7.00	8.50	1.50	Granular	6.89	0.00	27	-	13.80	15.50	1.00	-	7.75	8.50	34.84	40.01	5.65	9.32	76.89	98.11	39.24	19.40
5	8.50	10.00	1.50	Granular	6.89	0.00	27	-	13.80	15.50	1.00	-	9.25	10.00	45.18	50.35	5.65	12.08	95.08	128.39	51.35	25.16
6	10.00	11.50	1.50	Granular	6.89	0.00	29	-	17.60	20.13	1.00	-	10.75	11.50	55.52	60.69	5.65	15.95	146.92	196.17	78.47	32.00
7	11.50	13.00	1.50	Granular	7.39	0.00	29	-	17.60	20.13	1.00	-	12.25	13.00	66.24	71.78	5.65	19.03	172.85	241.13	96.45	39.70
8	13.00	14.50	1.50	Granular	7.39	0.00	29	-	17.60	20.13	1.00	-	13.75	14.50	77.33	82.87	5.65	22.21	198.19	288.68	115.47	48.30
9	14.50	16.00	1.50	Granular	7.40	0.00	29	-	17.60	20.13	1.00	-	15.25	16.00	88.42	93.97	5.65	25.40	223.56	339.44	135.78	57.78
10	16.00	17.50	1.50	Granular	7.85	0.00	29	-	17.60	20.13	1.00	-	16.75	17.50	99.86	105.75	5.65	28.68	251.00	395.57	158.23	68.19
11	17.50	19.00	1.50	Granular	7.85	0.00	29	-	17.60	20.13	1.00	-	18.25	19.00	105.75	105.75	5.65	30.38	251.00	425.94	170.38	79.07
12	19.00	20.50	1.50	Granular	7.85	0.00	29	-	17.60	20.13	1.00	-	19.75	20.50	105.75	105.75	5.65	30.38	251.00	456.32	182.53	89.95
13	20.50	22.00	1.50	Granular	8.40	0.00	29	-	17.60	20.13	1.00	-	21.25	22.00	105.75	105.75	5.65	30.38	251.66	487.35	194.94	100.83
14	22.00	23.50	1.50	Granular	8.40	0.00	29	-	17.60	20.13	1.00	-	22.75	23.50	105.75	105.75	5.65	30.38	251.66	517.73	207.09	111.71
15	23.50	25.00	1.50	Granular	8.40	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	105.75	105.75	5.65	31.42	280.49	577.99	231.19	122.88
16	25.00	26.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	105.75	105.75	5.65	31.42	281.29	610.21	244.08	134.06
17	26.50	28.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	105.75	105.75	5.65	31.42	281.29	641.63	256.65	145.23
18	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	105.75	105.75	5.65	31.42	281.29	673.05	269.22	156.40
19	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	105.75	105.75	1.88	10.47	281.29	683.53	273.41	160.13

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17
2	22.50	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
3	24.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
4	25.50	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
5	27.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.61	2.07	1.85	8.53	7.62	0.171	0.684	11.70	2.93	49.89	22.28	28.09	7.02	119.74	53.48
6	28.50	19	2.96E+07	1.02E-01	2.70E+03	4.07	0.61	2.07	1.85	8.43	7.53	0.165	0.660	12.11	3.03	51.05	22.81	29.07	7.27	122.53	54.74
7	30.00	19	2.96E+07	1.02E-01	2.70E+03	4.07	0.61	2.07	1.85	8.43	7.53	0.165	0.660	12.11	3.03	51.05	22.81	29.07	7.27	122.53	54.74

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-23B	-
Chainage	2+190	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	86.48	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-23B	1.00	22.00	19.50	19.50	126.79	72.80	10.16	2.54
BH-23B	1.00	23.50	21.00	21.00	135.26	80.24	10.16	2.54
BH-23B	1.00	25.00	22.50	22.50	143.54	87.69	10.16	2.54
BH-23B	1.00	26.50	24.00	24.00	158.70	95.33	10.16	2.54
BH-23B	1.00	28.00	25.50	25.50	167.27	102.98	10.16	2.54
BH-23B	1.00	29.50	27.00	27.00	175.83	110.62	10.16	2.54
BH-23B	1.00	30.00	27.50	27.50	178.69	113.17	10.16	2.54

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	6.19	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	4.65	9.29	4.71	1.00	12.56	13.56	5.42	4.68
2	4.00	5.50	1.50	Granular	6.19	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	13.94	18.58	4.71	2.99	22.22	26.21	10.48	7.16
3	5.50	7.00	1.50	Granular	6.19	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	23.23	27.87	4.71	4.98	31.88	40.86	16.34	10.21
4	7.00	8.50	1.50	Granular	6.19	0.00	28	-	15.70	17.82	1.00	-	7.75	8.50	32.52	37.16	4.71	7.51	56.02	72.50	29.00	13.96
5	8.50	10.00	1.50	Granular	6.19	0.00	28	-	15.70	17.82	1.00	-	9.25	10.00	41.81	46.45	4.71	9.66	69.06	95.21	38.08	18.32
6	10.00	11.50	1.50	Granular	8.89	0.00	28	-	15.70	17.82	1.00	-	10.75	11.50	53.12	59.79	4.71	12.28	89.47	127.89	51.16	23.40
7	11.50	13.00	1.50	Granular	8.89	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	66.46	73.13	4.71	15.36	108.20	161.99	64.79	29.35
8	13.00	14.50	1.50	Granular	8.90	0.00	28	-	15.70	17.82	1.00	-	13.75	14.50	79.81	86.48	4.71	18.44	126.95	199.18	79.67	36.17
9	14.50	16.00	1.50	Granular	8.90	0.00	28	-	15.70	17.82	1.00	-	15.25	16.00	86.48	86.48	4.71	19.99	126.95	219.17	87.67	43.41
10	16.00	17.50	1.50	Granular	8.90	0.00	28	-	15.70	17.82	1.00	-	16.75	17.50	86.48	86.48	4.71	19.99	126.95	239.16	95.66	50.66
11	17.50	19.00	1.50	Granular	8.90	0.00	28	-	15.70	17.82	1.00	-	18.25	19.00	86.48	86.48	4.71	19.99	126.95	259.14	103.66	57.91
12	19.00	20.50	1.50	Granular	8.90	0.00	29	-	17.60	20.13	1.00	-	19.75	20.50	86.48	86.48	4.71	20.70	143.38	296.27	118.51	65.35
13	20.50	22.00	1.50	Granular	8.90	0.00	29	-	17.60	20.13	1.00	-	21.25	22.00	86.48	86.48	4.71	20.70	143.38	316.97	126.79	72.80
14	22.00	23.50	1.50	Granular	9.60	0.00	29	-	17.60	20.13	1.00	-	22.75	23.50	86.48	86.48	4.71	20.70	143.86	338.16	135.26	80.24
15	23.50	25.00	1.50	Granular	9.60	0.00	29	-	17.60	20.13	1.00	-	24.25	25.00	86.48	86.48	4.71	20.70	143.86	358.86	143.54	87.69
16	25.00	26.50	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	86.48	86.48	4.71	21.41	160.34	396.75	158.70	95.33
17	26.50	28.00	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	86.48	86.48	4.71	21.41	160.34	418.17	167.27	102.98
18	28.00	29.50	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	86.48	86.48	4.71	21.41	160.34	439.58	175.83	110.62
19	29.50	30.00	0.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	86.48	86.48	1.57	7.14	160.34	446.72	178.69	113.17

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40
2	22.50	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40
3	24.00	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40
4	25.50	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40
5	27.00	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40
6	28.50	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40
7	30.00	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-23B	-
Chainage	2+190	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	113.18	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-23B	1.20	22.00	19.50	19.50	203.08	101.60	13.30	3.32
BH-23B	1.20	23.50	21.00	21.00	216.42	113.08	13.30	3.32
BH-23B	1.20	25.00	22.50	22.50	229.43	124.56	13.30	3.32
BH-23B	1.20	26.50	24.00	24.00	255.26	136.35	13.30	3.32
BH-23B	1.20	28.00	25.50	25.50	268.71	148.14	13.30	3.32
BH-23B	1.20	29.50	27.00	27.00	282.16	159.94	13.30	3.32
BH-23B	1.20	30.00	27.50	27.50	286.65	163.87	13.30	3.32

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Presure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	6.19	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	4.65	9.29	5.65	1.20	18.93	20.13	8.05	6.67
2	4.00	5.50	1.50	Granular	6.19	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	13.94	18.58	5.65	3.59	32.84	37.63	15.05	10.05
3	5.50	7.00	1.50	Granular	6.19	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	23.23	27.87	5.65	5.98	46.75	57.52	23.01	14.10
4	7.00	8.50	1.50	Granular	6.19	0.00	28	-	15.70	17.82	1.00	-	7.75	8.50	32.52	37.16	5.65	9.02	81.77	101.55	40.62	19.00
5	8.50	10.00	1.50	Granular	6.19	0.00	28	-	15.70	17.82	1.00	-	9.25	10.00	41.81	46.45	5.65	11.59	100.55	131.93	52.77	24.62
6	10.00	11.50	1.50	Granular	8.89	0.00	28	-	15.70	17.82	1.00	-	10.75	11.50	53.12	59.79	5.65	14.73	130.42	176.53	70.61	31.12
7	11.50	13.00	1.50	Granular	8.89	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	66.46	73.13	5.65	18.43	157.39	221.94	88.77	38.66
8	13.00	14.50	1.50	Granular	8.90	0.00	28	-	15.70	17.82	1.00	-	13.75	14.50	79.81	86.48	5.65	22.13	184.40	271.07	108.43	47.23
9	14.50	16.00	1.50	Granular	8.90	0.00	28	-	15.70	17.82	1.00	-	15.25	16.00	93.16	99.83	5.65	25.84	211.39	323.90	129.56	56.84
10	16.00	17.50	1.50	Granular	8.90	0.00	28	-	15.70	17.82	1.00	-	16.75	17.50	106.51	113.18	5.65	29.54	238.39	380.44	152.18	67.48
11	17.50	19.00	1.50	Granular	8.90	0.00	28	-	15.70	17.82	1.00	-	18.25	19.00	113.18	113.18	5.65	31.39	238.39	411.83	164.73	78.65
12	19.00	20.50	1.50	Granular	8.90	0.00	29	-	17.60	20.13	1.00	-	19.75	20.50	113.18	113.18	5.65	32.51	269.24	475.19	190.08	90.13
13	20.50	22.00	1.50	Granular	8.90	0.00	29	-	17.60	20.13	1.00	-	21.25	22.00	113.18	113.18	5.65	32.51	269.24	507.70	203.08	101.60
14	22.00	23.50	1.50	Granular	9.60	0.00	29	-	17.60	20.13	1.00	-	22.75	23.50	113.18	113.18	5.65	32.51	270.08	541.05	216.42	113.08
15	23.50	25.00	1.50	Granular	9.60	0.00	29	-	17.60	20.13	1.00	-	24.25	25.00	113.18	113.18	5.65	32.51	270.08	573.56	229.43	124.56
16	25.00	26.50	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	113.18	113.18	5.65	33.63	301.02	638.14	255.26	136.35
17	26.50	28.00	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	113.18	113.18	5.65	33.63	301.02	671.77	268.71	148.14
18	28.00	29.50	1.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	113.18	113.18	5.65	33.63	301.02	705.40	282.16	159.94
19	29.50	30.00	0.50	Granular	9.60	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	113.18	113.18	1.88	11.21	301.02	716.61	286.65	163.87

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32
2	22.50	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32
3	24.00	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32
4	25.50	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32
5	27.00	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32
6	28.50	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32
7	30.00	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-24	-
Chainage	2+338	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	81.83	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-24	1.00	22.00	19.50	19.50	123.02	72.24	9.56	2.39
BH-24	1.00	23.50	21.00	21.00	137.35	79.57	9.56	2.39
BH-24	1.00	25.00	22.50	22.50	145.46	86.89	9.56	2.39
BH-24	1.00	26.50	24.00	24.00	153.56	94.21	9.56	2.39
BH-24	1.00	28.00	25.50	25.50	161.67	101.53	9.56	2.39
BH-24	1.00	29.50	27.00	27.00	169.77	108.86	9.56	2.39
BH-24	1.00	30.00	27.50	27.50	172.47	111.30	9.56	2.39

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Presure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	6.19	0.00	28	-	15.70	17.82	1.00	-	3.25	4.00	4.65	9.29	4.71	1.07	16.88	17.95	7.18	4.70
2	4.00	5.50	1.50	Granular	6.19	0.00	28	-	15.70	17.82	1.00	-	4.75	5.50	13.94	18.58	4.71	3.22	29.92	34.22	13.69	7.25
3	5.50	7.00	1.50	Granular	6.19	0.00	28	-	15.70	17.82	1.00	-	6.25	7.00	23.23	27.87	4.71	5.37	42.97	52.63	21.05	10.40
4	7.00	8.50	1.50	Granular	7.19	0.00	28	-	15.70	17.82	1.00	-	7.75	8.50	33.27	38.66	4.71	7.69	58.74	76.09	30.44	14.20
5	8.50	10.00	1.50	Granular	7.19	0.00	28	-	15.70	17.82	1.00	-	9.25	10.00	44.06	49.45	4.71	10.18	73.89	101.43	40.57	18.70
6	10.00	11.50	1.50	Granular	7.19	0.00	28	-	15.70	17.82	1.00	-	10.75	11.50	54.85	60.24	4.71	12.68	89.05	129.25	51.70	23.90
7	11.50	13.00	1.50	Granular	7.19	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	65.64	71.03	4.71	15.17	104.20	159.58	63.83	29.80
8	13.00	14.50	1.50	Granular	7.20	0.00	29	-	17.60	20.13	1.00	-	13.75	14.50	76.43	81.83	4.71	18.30	134.82	208.49	83.40	36.57
9	14.50	16.00	1.50	Granular	8.80	0.00	29	-	17.60	20.13	1.00	-	15.25	16.00	81.83	81.83	4.71	19.59	135.93	229.19	91.68	43.71
10	16.00	17.50	1.50	Granular	8.80	0.00	29	-	17.60	20.13	1.00	-	16.75	17.50	81.83	81.83	4.71	19.59	135.93	248.78	99.51	50.84
11	17.50	19.00	1.50	Granular	8.80	0.00	29	-	17.60	20.13	1.00	-	18.25	19.00	81.83	81.83	4.71	19.59	135.93	268.37	107.35	57.97
12	19.00	20.50	1.50	Granular	8.80	0.00	29	-	17.60	20.13	1.00	-	19.75	20.50	81.83	81.83	4.71	19.59	135.93	287.96	115.18	65.11
13	20.50	22.00	1.50	Granular	8.80	0.00	29	-	17.60	20.13	1.00	-	21.25	22.00	81.83	81.83	4.71	19.59	135.93	307.54	123.02	72.24
14	22.00	23.50	1.50	Granular	8.80	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	81.83	81.83	4.71	20.26	151.50	343.38	137.35	79.57
15	23.50	25.00	1.50	Granular	8.80	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	81.83	81.83	4.71	20.26	151.50	363.64	145.46	86.89
16	25.00	26.50	1.50	Granular	8.80	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	81.83	81.83	4.71	20.26	151.50	383.91	153.56	94.21
17	26.50	28.00	1.50	Granular	8.80	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	81.83	81.83	4.71	20.26	151.50	404.17	161.67	101.53
18	28.00	29.50	1.50	Granular	8.80	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	81.83	81.83	4.71	20.26	151.50	424.43	169.77	108.86
19	29.50	30.00	0.50	Granular	8.80	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	81.83	81.83	1.57	6.75	151.50	431.19	172.47	111.30

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
2	22.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
3	24.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
4	25.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
5	27.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
6	28.50	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84
7	30.00	20	2.96E+07	4.91E-02	2.84E+03	3.48	0.72	2.05	1.85	7.15	6.43	0.209	0.837	9.56	2.39	34.18	15.35	22.94	5.73	82.04	36.84

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-24	-
Chainage	2+338	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	108.23	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-24	1.20	22.00	19.50	19.50	197.63	100.99	12.52	3.13
BH-24	1.20	23.50	21.00	21.00	222.31	112.37	12.52	3.13
BH-24	1.20	25.00	22.50	22.50	235.18	123.75	12.52	3.13
BH-24	1.20	26.50	24.00	24.00	248.04	135.13	12.52	3.13
BH-24	1.20	28.00	25.50	25.50	260.91	146.51	12.52	3.13
BH-24	1.20	29.50	27.00	27.00	273.77	157.89	12.52	3.13
BH-24	1.20	30.00	27.50	27.50	278.06	161.68	12.52	3.13

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Presure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	6.19	0.00	28	-	15.70	17.82	1.00	-	3.25	4.00	4.65	9.29	5.65	1.29	25.41	26.70	10.68	6.69
2	4.00	5.50	1.50	Granular	6.19	0.00	28	-	15.70	17.82	1.00	-	4.75	5.50	13.94	18.58	5.65	3.86	44.19	49.35	19.74	10.15
3	5.50	7.00	1.50	Granular	6.19	0.00	28	-	15.70	17.82	1.00	-	6.25	7.00	23.23	27.87	5.65	6.44	62.98	74.58	29.83	14.33
4	7.00	8.50	1.50	Granular	7.19	0.00	28	-	15.70	17.82	1.00	-	7.75	8.50	33.27	38.66	5.65	9.23	85.87	106.69	42.68	19.29
5	8.50	10.00	1.50	Granular	7.19	0.00	28	-	15.70	17.82	1.00	-	9.25	10.00	44.06	49.45	5.65	12.22	107.69	140.73	56.29	25.08
6	10.00	11.50	1.50	Granular	7.19	0.00	28	-	15.70	17.82	1.00	-	10.75	11.50	54.85	60.24	5.65	15.21	129.51	177.76	71.10	31.72
7	11.50	13.00	1.50	Granular	7.19	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	65.64	71.03	5.65	18.20	151.33	217.78	87.11	39.19
8	13.00	14.50	1.50	Granular	7.20	0.00	29	-	17.60	20.13	1.00	-	13.75	14.50	76.43	81.83	5.65	21.95	195.58	283.99	113.60	47.71
9	14.50	16.00	1.50	Granular	8.80	0.00	29	-	17.60	20.13	1.00	-	15.25	16.00	88.43	95.03	5.65	25.40	227.66	341.46	136.59	57.20
10	16.00	17.50	1.50	Granular	8.80	0.00	29	-	17.60	20.13	1.00	-	16.75	17.50	101.63	108.23	5.65	29.19	257.81	400.81	160.33	67.75
11	17.50	19.00	1.50	Granular	8.80	0.00	29	-	17.60	20.13	1.00	-	18.25	19.00	108.23	108.23	5.65	31.09	257.81	431.90	172.76	78.83
12	19.00	20.50	1.50	Granular	8.80	0.00	29	-	17.60	20.13	1.00	-	19.75	20.50	108.23	108.23	5.65	31.09	257.81	462.99	185.20	89.91
13	20.50	22.00	1.50	Granular	8.80	0.00	29	-	17.60	20.13	1.00	-	21.25	22.00	108.23	108.23	5.65	31.09	257.81	494.08	197.63	100.99
14	22.00	23.50	1.50	Granular	8.80	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	108.23	108.23	5.65	32.16	287.35	555.78	222.31	112.37
15	23.50	25.00	1.50	Granular	8.80	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	108.23	108.23	5.65	32.16	287.35	587.94	235.18	123.75
16	25.00	26.50	1.50	Granular	8.80	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	108.23	108.23	5.65	32.16	287.35	620.11	248.04	135.13
17	26.50	28.00	1.50	Granular	8.80	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	108.23	108.23	5.65	32.16	287.35	652.27	260.91	146.51
18	28.00	29.50	1.50	Granular	8.80	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	108.23	108.23	5.65	32.16	287.35	684.43	273.77	157.89
19	29.50	30.00	0.50	Granular	8.80	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	108.23	108.23	1.88	10.72	287.35	695.15	278.06	161.68

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
2	22.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
3	24.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
4	25.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
5	27.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
6	28.50	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97
7	30.00	20	2.96E+07	1.02E-01	2.84E+03	4.03	0.62	2.07	1.85	8.34	7.45	0.160	0.639	12.52	3.13	52.18	23.32	30.04	7.51	125.23	55.97

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-25	-
Chainage	2+404	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	76.27	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	3.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-25	1.00	22.00	19.50	18.50	86.17	65.28	8.77	2.19
BH-25	1.00	23.50	21.00	20.00	92.56	71.33	8.77	2.19
BH-25	1.00	25.00	22.50	21.50	129.24	78.27	8.77	2.19
BH-25	1.00	26.50	24.00	23.00	136.80	85.21	8.77	2.19
BH-25	1.00	28.00	25.50	24.50	138.28	91.97	9.12	2.28
BH-25	1.00	29.50	27.00	26.00	151.66	98.91	9.12	2.28
BH-25	1.00	30.00	27.50	26.50	154.17	101.22	9.46	2.37

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Presure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	5.89	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	4.42	8.84	4.71	0.00	11.96	11.96	4.78	4.40
2	4.00	5.50	1.50	Granular	5.89	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	13.26	17.68	4.71	2.85	21.15	23.99	9.60	6.84
3	5.50	7.00	1.50	Granular	5.89	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	22.10	26.52	4.71	4.74	30.34	37.93	15.17	9.82
4	7.00	8.50	1.50	Granular	6.39	0.00	26	-	11.90	13.19	1.00	-	7.75	8.50	31.32	36.11	4.71	6.72	40.55	54.86	21.94	13.35
5	8.50	10.00	1.50	Granular	6.69	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	41.13	46.15	4.71	8.83	51.13	74.26	29.71	17.47
6	10.00	11.50	1.50	Granular	6.69	0.00	26	-	11.90	13.19	1.00	-	10.75	11.50	51.17	56.19	4.71	10.98	61.57	95.69	38.27	22.20
7	11.50	13.00	1.50	Granular	6.69	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	61.21	66.23	4.71	13.14	72.01	119.26	47.70	27.53
8	13.00	14.50	1.50	Granular	6.69	0.00	30	-	19.50	22.44	1.00	-	13.75	14.50	71.25	76.27	4.71	17.64	140.05	204.95	81.98	34.11
9	14.50	16.00	1.50	Granular	6.70	0.00	30	-	19.50	22.44	1.00	-	15.25	16.00	76.27	76.27	4.71	18.89	140.05	223.84	89.54	41.05
10	16.00	17.50	1.50	Granular	8.30	0.00	25	-	10.00	10.88	1.00	-	16.75	17.50	76.27	76.27	4.71	15.74	68.68	168.20	67.28	47.11
11	17.50	19.00	1.50	Granular	8.30	0.00	25	-	10.00	10.88	1.00	-	18.25	19.00	76.27	76.27	4.71	15.74	68.68	183.94	73.58	53.17
12	19.00	20.50	1.50	Granular	8.30	0.00	25	-	10.00	10.88	1.00	-	19.75	20.50	76.27	76.27	4.71	15.74	68.68	199.68	79.87	59.22
13	20.50	22.00	1.50	Granular	8.30	0.00	25	-	10.00	10.88	1.00	-	21.25	22.00	76.27	76.27	4.71	15.74	68.68	215.42	86.17	65.28
14	22.00	23.50	1.50	Granular	8.90	0.00	25	-	10.00	10.88	1.00	-	22.75	23.50	76.27	76.27	4.71	15.74	68.92	231.40	92.56	71.33
15	23.50	25.00	1.50	Granular	8.90	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	76.27	76.27	4.71	18.89	141.74	323.11	129.24	78.27
16	25.00	26.50	1.50	Granular	8.90	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	76.27	76.27	4.71	18.89	141.74	342.00	136.80	85.21
17	26.50	28.00	1.50	Granular	8.90	0.00	29	-	17.60	20.13	1.00	-	27.25	28.00	76.27	76.27	4.71	18.26	127.18	345.69	138.28	91.97
18	28.00	29.50	1.50	Granular	8.90	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	76.27	76.27	4.71	18.89	141.74	379.14	151.66	98.91
19	29.50	30.00	0.50	Granular	8.90	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	76.27	76.27	1.57	6.30	141.74	385.44	154.17	101.22

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_f/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.96	2.02	1.84	7.36	6.69	0.228	0.912	8.77	2.19	32.28	14.66	21.05	5.26	77.47	35.18
2	22.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.96	2.02	1.84	7.36	6.69	0.228	0.912	8.77	2.19	32.28	14.66	21.05	5.26	77.47	35.18
3	24.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.96	2.02	1.84	7.36	6.69	0.228	0.912	8.77	2.19	32.28	14.66	21.05	5.26	77.47	35.18
4	25.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.96	2.02	1.84	7.36	6.69	0.228	0.912	8.77	2.19	32.28	14.66	21.05	5.26	77.47	35.18
5	27.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.97	2.02	1.83	7.27	6.60	0.219	0.877	9.12	2.28	33.14	15.05	21.89	5.47	79.52	36.13
6	28.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.97	2.02	1.83	7.27	6.60	0.219	0.877	9.12	2.28	33.14	15.05	21.89	5.47	79.52	36.13
7	30.00	18	2.96E+07	4.91E-02	2.55E+03	3.56	0.98	2.02	1.83	7.18	6.52	0.211	0.845	9.46	2.37	33.96	15.44	22.71	5.68	81.51	37.05

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-25	-
Chainage	2+404	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	98.77	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	3.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-25	1.20	22.00	19.50	18.50	130.38	90.37	11.44	2.86
BH-25	1.20	23.50	21.00	20.00	140.33	99.59	11.44	2.86
BH-25	1.20	25.00	22.50	21.50	206.21	110.18	11.44	2.86
BH-25	1.20	26.50	24.00	23.00	217.95	120.77	11.44	2.86
BH-25	1.20	28.00	25.50	24.50	218.47	131.09	11.89	2.97
BH-25	1.20	29.50	27.00	26.00	241.04	141.69	11.89	2.97
BH-25	1.20	30.00	27.50	26.50	244.95	145.22	12.34	3.09

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	5.89	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	4.42	8.84	5.65	0.00	18.01	18.01	7.21	6.33
2	4.00	5.50	1.50	Granular	5.89	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	13.26	17.68	5.65	3.41	31.25	34.66	13.87	9.66
3	5.50	7.00	1.50	Granular	5.89	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	22.10	26.52	5.65	5.69	44.49	53.59	21.44	13.63
4	7.00	8.50	1.50	Granular	6.39	0.00	26	-	11.90	13.19	1.00	-	7.75	8.50	31.32	36.11	5.65	8.06	59.25	76.42	30.57	18.27
5	8.50	10.00	1.50	Granular	6.69	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	41.13	46.15	5.65	10.59	74.53	102.29	40.92	23.61
6	10.00	11.50	1.50	Granular	6.69	0.00	26	-	11.90	13.19	1.00	-	10.75	11.50	51.17	56.19	5.65	13.18	89.56	130.50	52.20	29.67
7	11.50	13.00	1.50	Granular	6.69	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	61.21	66.23	5.65	15.76	104.59	161.30	64.52	36.46
8	13.00	14.50	1.50	Granular	6.69	0.00	30	-	19.50	22.44	1.00	-	13.75	14.50	71.25	76.27	5.65	21.17	203.15	281.03	112.41	44.76
9	14.50	16.00	1.50	Granular	6.70	0.00	30	-	19.50	22.44	1.00	-	15.25	16.00	81.30	86.32	5.65	24.16	228.76	330.79	132.32	53.90
10	16.00	17.50	1.50	Granular	8.30	0.00	25	-	10.00	10.88	1.00	-	16.75	17.50	92.55	98.77	5.65	22.92	127.63	252.58	101.03	62.70
11	17.50	19.00	1.50	Granular	8.30	0.00	25	-	10.00	10.88	1.00	-	18.25	19.00	98.77	98.77	5.65	24.46	127.63	277.04	110.81	71.92
12	19.00	20.50	1.50	Granular	8.30	0.00	25	-	10.00	10.88	1.00	-	19.75	20.50	98.77	98.77	5.65	24.46	127.63	301.49	120.60	81.14
13	20.50	22.00	1.50	Granular	8.30	0.00	25	-	10.00	10.88	1.00	-	21.25	22.00	98.77	98.77	5.65	24.46	127.63	325.95	130.38	90.37
14	22.00	23.50	1.50	Granular	8.90	0.00	25	-	10.00	10.88	1.00	-	22.75	23.50	98.77	98.77	5.65	24.46	128.04	350.82	140.33	99.59
15	23.50	25.00	1.50	Granular	8.90	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	98.77	98.77	5.65	29.35	263.39	515.53	206.21	110.18
16	25.00	26.50	1.50	Granular	8.90	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	98.77	98.77	5.65	29.35	263.39	544.88	217.95	120.77
17	26.50	28.00	1.50	Granular	8.90	0.00	29	-	17.60	20.13	1.00	-	27.25	28.00	98.77	98.77	5.65	28.37	236.32	546.18	218.47	131.09
18	28.00	29.50	1.50	Granular	8.90	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	98.77	98.77	5.65	29.35	263.39	602.60	241.04	141.69
19	29.50	30.00	0.50	Granular	8.90	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	98.77	98.77	1.88	9.78	263.39	612.38	244.95	145.22

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.83	2.04	1.84	8.59	7.76	0.175	0.699	11.44	2.86	49.14	22.18	27.45	6.86	117.93	53.24
2	22.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.83	2.04	1.84	8.59	7.76	0.175	0.699	11.44	2.86	49.14	22.18	27.45	6.86	117.93	53.24
3	24.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.83	2.04	1.84	8.59	7.76	0.175	0.699	11.44	2.86	49.14	22.18	27.45	6.86	117.93	53.24
4	25.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.83	2.04	1.84	8.59	7.76	0.175	0.699	11.44	2.86	49.14	22.18	27.45	6.86	117.93	53.24
5	27.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.84	2.04	1.84	8.48	7.66	0.168	0.673	11.89	2.97	50.44	22.78	28.55	7.14	121.05	54.67
6	28.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.84	2.04	1.84	8.48	7.66	0.168	0.673	11.89	2.97	50.44	22.78	28.55	7.14	121.05	54.67
7	30.00	18	2.96E+07	1.02E-01	2.55E+03	4.11	0.85	2.04	1.84	8.38	7.57	0.162	0.648	12.34	3.09	51.69	23.36	29.62	7.40	124.06	56.06

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-26	-
Chainage	2+532	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	82.21	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-26	1.00	22.00	19.50	19.50	106.85	65.21	7.95	1.99
BH-26	1.00	23.50	21.00	21.00	127.48	72.55	7.95	1.99
BH-26	1.00	25.00	22.50	22.50	135.81	79.90	8.28	2.07
BH-26	1.00	26.50	24.00	24.00	143.95	87.25	8.28	2.07
BH-26	1.00	28.00	25.50	25.50	152.09	94.60	8.28	2.07
BH-26	1.00	29.50	27.00	27.00	160.23	101.95	8.61	2.15
BH-26	1.00	30.00	27.50	27.50	162.95	104.40	8.61	2.15

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Pressure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion (C)	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	5.89	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	4.42	8.84	4.71	0.95	11.96	12.90	5.16	4.66
2	4.00	5.50	1.50	Granular	5.89	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	13.26	17.68	4.71	2.85	21.15	24.94	9.98	7.11
3	5.50	7.00	1.50	Granular	5.89	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	22.10	26.52	4.71	4.74	30.34	38.88	15.55	10.09
4	7.00	8.50	1.50	Granular	6.39	0.00	28	-	15.70	17.82	1.00	-	7.75	8.50	31.32	36.11	4.71	7.24	54.67	70.44	28.18	13.76
5	8.50	10.00	1.50	Granular	7.69	0.00	28	-	15.70	17.82	1.00	-	9.25	10.00	41.88	47.65	4.71	9.68	71.68	97.13	38.85	18.12
6	10.00	11.50	1.50	Granular	7.69	0.00	28	-	15.70	17.82	1.00	-	10.75	11.50	53.42	59.19	4.71	12.35	87.88	125.68	50.27	23.23
7	11.50	13.00	1.50	Granular	7.69	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	64.96	70.73	4.71	15.01	104.09	156.90	62.76	29.08
8	13.00	14.50	1.50	Granular	7.65	0.00	28	-	15.70	17.82	1.00	-	13.75	14.50	76.47	82.21	4.71	17.67	120.17	190.66	76.26	35.68
9	14.50	16.00	1.50	Granular	7.65	0.00	28	-	15.70	17.82	1.00	-	15.25	16.00	82.21	82.21	4.71	0.00	120.17	190.66	76.26	37.33
10	16.00	17.50	1.50	Granular	8.40	0.00	28	-	15.70	17.82	1.00	-	16.75	17.50	82.21	82.21	4.71	19.00	120.64	210.13	84.05	44.30
11	17.50	19.00	1.50	Granular	8.40	0.00	28	-	15.70	17.82	1.00	-	18.25	19.00	82.21	82.21	4.71	19.00	120.64	229.12	91.65	51.27
12	19.00	20.50	1.50	Granular	8.40	0.00	28	-	15.70	17.82	1.00	-	19.75	20.50	82.21	82.21	4.71	19.00	120.64	248.12	99.25	58.24
13	20.50	22.00	1.50	Granular	8.40	0.00	28	-	15.70	17.82	1.00	-	21.25	22.00	82.21	82.21	4.71	19.00	120.64	267.12	106.85	65.21
14	22.00	23.50	1.50	Granular	8.40	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	82.21	82.21	4.71	20.36	151.86	318.70	127.48	72.55
15	23.50	25.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	82.21	82.21	4.71	20.36	152.32	339.52	135.81	79.90
16	25.00	26.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	82.21	82.21	4.71	20.36	152.32	359.87	143.95	87.25
17	26.50	28.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	82.21	82.21	4.71	20.36	152.32	380.23	152.09	94.60
18	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	82.21	82.21	4.71	20.36	152.32	400.59	160.23	101.95
19	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	82.21	82.21	1.57	6.79	152.32	407.37	162.95	104.40

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.68	2.06	1.85	7.61	6.82	0.252	1.007	7.95	1.99	30.23	13.55	19.07	4.77	72.55	32.51
2	22.50	15	2.96E+07	4.91E-02	2.12E+03	3.69	0.68	2.06	1.85	7.61	6.82	0.252	1.007	7.95	1.99	30.23	13.55	19.07	4.77	72.55	32.51
3	24.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
4	25.50	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
5	27.00	16	2.96E+07	4.91E-02	2.26E+03	3.64	0.69	2.06	1.85	7.50	6.73	0.241	0.966	8.28	2.07	31.07	13.93	19.88	4.97	74.58	33.44
6	28.50	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33
7	30.00	17	2.96E+07	4.91E-02	2.41E+03	3.60	0.69	2.06	1.85	7.41	6.64	0.232	0.929	8.61	2.15	31.89	14.31	20.67	5.17	76.54	34.33

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-26	-
Chainage	2+532	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	106.28	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-26	1.20	22.00	19.50	19.50	169.86	91.04	10.42	2.60
BH-26	1.20	23.50	21.00	21.00	205.67	102.26	10.42	2.60
BH-26	1.20	25.00	22.50	22.50	218.62	113.48	10.85	2.71
BH-26	1.20	26.50	24.00	24.00	231.26	124.70	10.85	2.71
BH-26	1.20	28.00	25.50	25.50	243.89	135.91	10.85	2.71
BH-26	1.20	29.50	27.00	27.00	256.52	147.13	11.28	2.82
BH-26	1.20	30.00	27.50	27.50	260.73	150.87	11.28	2.82

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Coeff. of Earth Pressure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	5.89	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	4.42	8.84	5.65	1.14	18.01	19.15	7.66	6.65
2	4.00	5.50	1.50	Granular	5.89	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	13.26	17.68	5.65	3.41	31.25	35.80	14.32	9.98
3	5.50	7.00	1.50	Granular	5.89	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	22.10	26.52	5.65	5.69	44.49	54.73	21.89	13.95
4	7.00	8.50	1.50	Granular	6.39	0.00	28	-	15.70	17.82	1.00	-	7.75	8.50	31.32	36.11	5.65	8.69	79.86	98.79	39.51	18.76
5	8.50	10.00	1.50	Granular	7.69	0.00	28	-	15.70	17.82	1.00	-	9.25	10.00	41.88	47.65	5.65	11.62	104.58	135.13	54.05	24.39
6	10.00	11.50	1.50	Granular	7.69	0.00	28	-	15.70	17.82	1.00	-	10.75	11.50	53.42	59.19	5.65	14.82	127.92	173.28	69.31	30.91
7	11.50	13.00	1.50	Granular	7.69	0.00	28	-	15.70	17.82	1.00	-	12.25	13.00	64.96	70.73	5.65	18.02	151.26	214.63	85.85	38.33
8	13.00	14.50	1.50	Granular	7.65	0.00	28	-	15.70	17.82	1.00	-	13.75	14.50	76.47	82.21	5.65	21.21	174.41	259.00	103.60	46.64
9	14.50	16.00	1.50	Granular	7.65	0.00	28	-	15.70	17.82	1.00	-	15.25	16.00	87.94	93.68	5.65	0.00	197.62	282.20	112.88	49.02
10	16.00	17.50	1.50	Granular	8.40	0.00	28	-	15.70	17.82	1.00	-	16.75	17.50	99.98	106.28	5.65	27.73	223.90	336.21	134.49	59.16
11	17.50	19.00	1.50	Granular	8.40	0.00	28	-	15.70	17.82	1.00	-	18.25	19.00	106.28	106.28	5.65	29.48	223.90	365.69	146.28	69.79
12	19.00	20.50	1.50	Granular	8.40	0.00	28	-	15.70	17.82	1.00	-	19.75	20.50	106.28	106.28	5.65	29.48	223.90	395.17	158.07	80.41
13	20.50	22.00	1.50	Granular	8.40	0.00	28	-	15.70	17.82	1.00	-	21.25	22.00	106.28	106.28	5.65	29.48	223.90	424.64	169.86	91.04
14	22.00	23.50	1.50	Granular	8.40	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	106.28	106.28	5.65	31.58	281.86	514.18	205.67	102.26
15	23.50	25.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	106.28	106.28	5.65	31.58	282.65	546.56	218.62	113.48
16	25.00	26.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	106.28	106.28	5.65	31.58	282.65	578.14	231.26	124.70
17	26.50	28.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	106.28	106.28	5.65	31.58	282.65	609.72	243.89	135.91
18	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	106.28	106.28	5.65	31.58	282.65	641.30	256.52	147.13
19	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	106.28	106.28	1.88	10.53	282.65	651.83	260.73	150.87

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.59	2.08	1.85	8.86	7.91	0.192	0.768	10.42	2.60	46.16	20.59	25.00	6.25	110.80	49.43
2	22.50	15	2.96E+07	1.02E-01	2.12E+03	4.27	0.59	2.08	1.85	8.86	7.91	0.192	0.768	10.42	2.60	46.16	20.59	25.00	6.25	110.80	49.43
3	24.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
4	25.50	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
5	27.00	16	2.96E+07	1.02E-01	2.26E+03	4.21	0.59	2.07	1.85	8.74	7.80	0.184	0.737	10.85	2.71	47.45	21.18	26.05	6.51	113.88	50.83
6	28.50	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17
7	30.00	17	2.96E+07	1.02E-01	2.41E+03	4.16	0.60	2.07	1.85	8.63	7.71	0.177	0.709	11.28	2.82	48.69	21.74	27.08	6.77	116.86	52.17

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-27	-
Chainage	2+586	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.00	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	15.00	mtr
Maximum OBP	81.47	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-27	1.00	22.00	19.50	19.50	126.90	70.91	10.16	2.54
BH-27	1.00	23.50	21.00	21.00	135.22	78.21	10.16	2.54
BH-27	1.00	25.00	22.50	22.50	143.29	85.51	10.16	2.54
BH-27	1.00	26.50	24.00	24.00	151.36	92.81	10.16	2.54
BH-27	1.00	28.00	25.50	25.50	159.43	100.10	10.16	2.54
BH-27	1.00	29.50	27.00	27.00	167.50	107.40	10.16	2.54
BH-27	1.00	30.00	27.50	27.50	170.19	109.83	10.16	2.54

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Co-eff. of Earth Presure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion ©	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	5.79	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	4.35	8.69	4.71	0.93	11.75	12.69	5.07	4.66
2	4.00	5.50	1.50	Granular	5.79	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	13.04	17.38	4.71	2.80	20.79	24.52	9.81	7.09
3	5.50	7.00	1.50	Granular	5.79	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	21.73	26.07	4.71	4.66	29.83	38.22	15.29	10.05
4	7.00	8.50	1.50	Granular	6.39	0.00	26	-	11.90	13.19	1.00	-	7.75	8.50	30.87	35.66	4.71	6.62	40.08	55.10	22.04	13.55
5	8.50	10.00	1.50	Granular	7.39	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	41.21	46.75	4.71	8.84	52.08	75.94	30.38	17.68
6	10.00	11.50	1.50	Granular	7.39	0.00	26	-	11.90	13.19	1.00	-	10.75	11.50	52.30	57.84	4.71	11.22	63.61	98.69	39.48	22.47
7	11.50	13.00	1.50	Granular	7.35	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	63.35	68.87	4.71	13.60	75.05	123.73	49.49	27.92
8	13.00	14.50	1.50	Granular	8.40	0.00	29	-	17.60	20.13	1.00	-	13.75	14.50	75.17	81.47	4.71	17.99	135.07	201.75	80.70	34.61
9	14.50	16.00	1.50	Granular	8.40	0.00	29	-	17.60	20.13	1.00	-	15.25	16.00	81.47	81.47	4.71	19.50	135.07	221.25	88.50	41.72
10	16.00	17.50	1.50	Granular	8.25	0.00	30	-	19.50	22.44	1.00	-	16.75	17.50	81.47	81.47	4.71	20.17	150.43	256.78	102.71	49.02
11	17.50	19.00	1.50	Granular	8.20	0.00	30	-	19.50	22.44	1.00	-	18.25	19.00	81.47	81.47	4.71	20.17	150.40	276.91	110.77	56.32
12	19.00	20.50	1.50	Granular	8.20	0.00	30	-	19.50	22.44	1.00	-	19.75	20.50	81.47	81.47	4.71	20.17	150.40	297.09	118.83	63.61
13	20.50	22.00	1.50	Granular	8.20	0.00	30	-	19.50	22.44	1.00	-	21.25	22.00	81.47	81.47	4.71	20.17	150.40	317.26	126.90	70.91
14	22.00	23.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	81.47	81.47	4.71	20.17	151.01	338.05	135.22	78.21
15	23.50	25.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	81.47	81.47	4.71	20.17	151.01	358.22	143.29	85.51
16	25.00	26.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	81.47	81.47	4.71	20.17	151.01	378.39	151.36	92.81
17	26.50	28.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	81.47	81.47	4.71	20.17	151.01	398.57	159.43	100.10
18	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	81.47	81.47	4.71	20.17	151.01	418.74	167.50	107.40
19	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	81.47	81.47	1.57	6.72	151.01	425.46	170.19	109.83

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40
2	22.50	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40
3	24.00	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40
4	25.50	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40
5	27.00	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40
6	28.50	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40
7	30.00	22	2.96E+07	4.91E-02	3.13E+03	3.41	0.73	2.05	1.85	7.01	6.30	0.197	0.788	10.16	2.54	35.60	16.00	24.38	6.09	85.45	38.40

SUMMARY OF PILE LOAD CARRYING CAPACITY

Borehole ID	BH-27	-
Chainage	2+586	km
Bottom Depth of pile	30.00	mtr
Cut off length	2.50	mtr
Dia of Pile	1.20	mtr
Strength of Pile Concrete	35.00	N/mm^2
Factor of Safety	2.50	mtr
Critical Depth(15D)	18.00	mtr
Maximum OBP	106.44	kN/m^2
Pile shaft Length Below cut-off	27.50	mtr
RL of Ground Level	0.00	mtr
Maximum of Scour or Liqufiable Soil Depth	2.50	mtr
Groundwater Level from OGL	0.00	mtr

BH ID	Pile Dia	Total Depth of Pile from EGL	Effective Pile Depth from Cutoff Level	Grip Length (Total Pile Depth-Liquefiable Depth)	Total Pile Axial Capacity	Uplift Capacity (IRC-78-2014)	Lateral Capacity (Fixed Head) (5mm)	Lateral Capacity (Free Head) (5mm)
-	mtr	mtr	mtr	mtr	T	T	T	T
BH-27	1.20	22.00	19.50	19.50	204.76	99.20	13.30	3.32
BH-27	1.20	23.50	21.00	21.00	217.83	110.44	13.30	3.32
BH-27	1.20	25.00	22.50	22.50	230.48	121.67	13.30	3.32
BH-27	1.20	26.50	24.00	24.00	243.14	132.90	13.30	3.32
BH-27	1.20	28.00	25.50	25.50	255.79	144.13	13.30	3.32
BH-27	1.20	29.50	27.00	27.00	268.44	155.36	13.30	3.32
BH-27	1.20	30.00	27.50	27.50	272.66	159.10	13.30	3.32

LOAD CARRYING CAPACITY OF PILES - STATIC ANALYSIS (AS PER IS-2911:2010)

Layer No	Soil Layer							Bearing Capacity Factor			Coeff. of Earth Presure (K_i)	Adhesion Factor (α)	Effective Depth		Effective Overburden Pressure		Surface Area of Pile Shaft (A_{si})	Ultimate Bearing Capacity by Skin Friction	Ultimate Bearing Capacity by End Bearing Resistance	Ultimate Total Pile Axial Capacity	Safe Total Pile Axial Capacity	Safe Pile Uplift Capacity
	Start	End	Thick of Layer	Soil Layer	Effective Soil Weight (γ)	Cohesion (C)	Angle of Internal Friction (φ)	N_c	N_q	N_γ			at Mid of Pile Shaft	at Pile Tip	at Mid of Pile Shaft (P_{Di})	at Pile Tip (P_D)						
	mtr	mtr	mtr	-	kN/m^3	kN/m^2	Degree	-	-	-	-	-	mtr	mtr	kN/m^2	kN/m^2	m^2	T	T	T	T	T
1	2.50	4.00	1.50	Granular	5.79	0.00	26	-	11.90	13.19	1.00	-	3.25	4.00	4.35	8.69	5.65	1.12	17.71	18.83	7.53	6.65
2	4.00	5.50	1.50	Granular	5.79	0.00	26	-	11.90	13.19	1.00	-	4.75	5.50	13.04	17.38	5.65	3.36	30.72	35.20	14.08	9.96
3	5.50	7.00	1.50	Granular	5.79	0.00	26	-	11.90	13.19	1.00	-	6.25	7.00	21.73	26.07	5.65	5.59	43.73	53.80	21.52	13.90
4	7.00	8.50	1.50	Granular	6.39	0.00	26	-	11.90	13.19	1.00	-	7.75	8.50	30.87	35.66	5.65	7.95	58.58	76.60	30.64	18.50
5	8.50	10.00	1.50	Granular	7.39	0.00	26	-	11.90	13.19	1.00	-	9.25	10.00	41.21	46.75	5.65	10.61	75.99	104.62	41.85	23.85
6	10.00	11.50	1.50	Granular	7.39	0.00	26	-	11.90	13.19	1.00	-	10.75	11.50	52.30	57.84	5.65	13.47	92.60	134.70	53.88	30.00
7	11.50	13.00	1.50	Granular	7.35	0.00	26	-	11.90	13.19	1.00	-	12.25	13.00	63.35	68.87	5.65	16.32	109.07	167.49	66.99	36.94
8	13.00	14.50	1.50	Granular	8.40	0.00	29	-	17.60	20.13	1.00	-	13.75	14.50	75.17	81.47	5.65	21.59	196.19	276.19	110.48	45.36
9	14.50	16.00	1.50	Granular	8.40	0.00	29	-	17.60	20.13	1.00	-	15.25	16.00	87.77	94.07	5.65	25.21	224.97	330.19	132.07	54.79
10	16.00	17.50	1.50	Granular	8.25	0.00	30	-	19.50	22.44	1.00	-	16.75	17.50	100.25	106.44	5.65	29.79	282.06	417.07	166.83	65.51
11	17.50	19.00	1.50	Granular	8.20	0.00	30	-	19.50	22.44	1.00	-	18.25	19.00	106.44	106.44	5.65	31.63	282.00	448.63	179.45	76.74
12	19.00	20.50	1.50	Granular	8.20	0.00	30	-	19.50	22.44	1.00	-	19.75	20.50	106.44	106.44	5.65	31.63	282.00	480.26	192.10	87.97
13	20.50	22.00	1.50	Granular	8.20	0.00	30	-	19.50	22.44	1.00	-	21.25	22.00	106.44	106.44	5.65	31.63	282.00	511.89	204.76	99.20
14	22.00	23.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	22.75	23.50	106.44	106.44	5.65	31.63	283.06	544.58	217.83	110.44
15	23.50	25.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	24.25	25.00	106.44	106.44	5.65	31.63	283.06	576.21	230.48	121.67
16	25.00	26.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	25.75	26.50	106.44	106.44	5.65	31.63	283.06	607.84	243.14	132.90
17	26.50	28.00	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	27.25	28.00	106.44	106.44	5.65	31.63	283.06	639.47	255.79	144.13
18	28.00	29.50	1.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	28.75	29.50	106.44	106.44	5.65	31.63	283.06	671.10	268.44	155.36
19	29.50	30.00	0.50	Granular	9.00	0.00	30	-	19.50	22.44	1.00	-	29.75	30.00	106.44	106.44	1.88	10.54	283.06	681.64	272.66	159.10

LATERALLY LOAD CARING CAPACITY OF PILE (AS PER IS-2911:2010)

SR No.	Depth of Pile	SPT N Value	Young's Modulus of Pile Material (E)	Moment of Intertia of Pile Section (I)	Modulus of Subgrade Reaction (n_h)	Stiffness Factor (T)	L_i/T Ratio	L_f/T Ratio		Depth to Point of Fixity (z_f)		Deflection for 1 Ton Lateral Load (y)		Lateral Load, for 5 mm deflection, (H)		Fixed End Moment (M_F)		Lateral Load, for 12 mm deflection, (H)		Fixed End Moment (M_F)	
								Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head	Fixed Head	Free Head
-	mtr	-	kN/m^2	m^4	kN/m^3	mtr	-	-	-	mtr	mtr	mm	mm	T	T	T.m	T.m	T	T	T.m	T.m
1	21.00	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32
2	22.50	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32
3	24.00	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32
4	25.50	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32
5	27.00	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32
6	28.50	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32
7	30.00	22	2.96E+07	1.02E-01	3.13E+03	3.95	0.63	2.07	1.85	8.17	7.31	0.150	0.602	13.30	3.32	54.33	24.30	31.92	7.98	130.40	58.32

Appendix B Summary Liquefaction Potential Assessment

B.1. Zone 1: CH: 0+000 km to 1+004 km (BH-01 to BH-11)

Based on the geotechnical investigation and analysis, the table below provides a summary of liquefiable soil layers, including the computed factor of safety values for liquefaction assessment.

Borehole ID	Top of Layer	Bottom of Layer	N_{SPT}	N_{60}	$(N1)_{60}$	$(N1)_{60cs}$	CRR	CSR	FS_{liq}	Liquefaction Potential
BH-01	0.00	1.50	9	8	14	18	0.35	0.39	0.88	Liquefiable Soil
BH-01	16.50	18.50	10	13	12	15	0.31	0.28	1.10	Liquefiable Soil
BH-02	0.00	1.50	11	10	18	22	0.42	0.35	1.19	Liquefiable Soil
BH-04	0.00	1.50	9	8	14	18	0.33	0.33	0.99	Liquefiable Soil
BH-05	0.00	1.50	5	5	8	10	0.20	0.33	0.60	Liquefiable Soil
BH-05	1.50	3.50	8	8	13	16	0.23	0.33	0.70	Liquefiable Soil
BH-05	16.50	18.50	9	11	9	12	0.23	0.24	0.99	Liquefiable Soil
BH-06	0.00	1.50	6	6	10	12	0.24	0.38	0.63	Liquefiable Soil
BH-06	1.50	3.50	12	11	19	24	0.38	0.38	1.01	Liquefiable Soil
BH-07	0.00	1.50	7	7	11	14	0.27	0.38	0.71	Liquefiable Soil
BH-07	1.50	3.50	10	9	16	20	0.30	0.38	0.80	Liquefiable Soil
BH-07	3.50	4.50	12	13	22	27	0.43	0.37	1.15	Liquefiable Soil
BH-07	12.50	13.50	17	21	22	26	0.32	0.30	1.09	Liquefiable Soil
BH-07	15.50	16.50	18	23	20	25	0.28	0.27	1.06	Liquefiable Soil
BH-08	1.50	3.50	11	10	18	22	0.33	0.36	0.92	Liquefiable Soil
BH-08	16.50	18.50	11	14	12	15	0.30	0.26	1.19	Liquefiable Soil
BH-08A	0.00	1.50	6	6	10	12	0.24	0.40	0.61	Liquefiable Soil
BH-08A	1.50	3.50	10	9	16	20	0.31	0.40	0.78	Liquefiable Soil
BH-08A	7.50	9.50	13	16	20	25	0.32	0.35	0.91	Liquefiable Soil
BH-08B	0.00	1.50	8	8	13	16	0.31	0.38	0.80	Liquefiable Soil
BH-08B	1.50	3.50	11	10	18	22	0.34	0.38	0.90	Liquefiable Soil
BH-08B	7.50	9.50	11	13	17	21	0.25	0.35	0.72	Liquefiable Soil
BH-08B	9.50	10.50	14	18	21	26	0.33	0.34	0.97	Liquefiable Soil
BH-09	0.00	1.50	9	8	14	18	0.35	0.41	0.86	Liquefiable Soil
BH-09	6.50	7.50	11	13	21	26	0.37	0.41	0.91	Liquefiable Soil
BH-10	0.00	1.50	6	6	10	12	0.26	0.48	0.54	Liquefiable Soil
BH-10	1.50	3.50	9	8	14	18	0.29	0.47	0.62	Liquefiable Soil
BH-10	3.50	4.50	12	13	22	27	0.46	0.47	0.98	Liquefiable Soil
BH-11	10.50	12.50	14	18	18	22	0.25	0.30	0.84	Liquefiable Soil
BH-11	12.50	13.50	18	23	22	27	0.33	0.28	1.16	Liquefiable Soil

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Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-01
Chainage	0+031
Ground Level (m)	207.05

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Inorganic silt of lowPlasticity with sand and gravel (ML)	0.00	17.25	16.18	6.37
2	Inorganic Clay of LowPlasticity with gravel (CL)	17.25	22.00	18.53	8.72
3	Medium-dense to dense, brownish, fine-grained silty sand (SM)	22.00	25.00	20.16	10.35
4	Dense to very dense, brownish, fine-grained silty sand (SM).	25.00	30.00	15.50	5.69

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{max}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $N_1)_{60CS}$ > 30)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	12.14	4.78	9	0.75	0.90	1.33	1.05	8	1.70	14	84.38	0.50	1.20	18	0.19	1.00	0.16	0.80	1.84	1.00	0.35	0.99	0.394	0.88	Liquefiable Soil
2	1.50	3.50	2.50	40.45	15.93	14	0.75	0.90	1.33	1.05	13	1.70	22	84.38	0.50	1.20	27	0.35	1.00	0.23	0.80	1.44	1.00	0.51	0.98	0.388	1.30	Non Liquefiable Soil
3	3.50	4.50	4.00	64.72	25.49	13	0.85	0.90	1.33	1.05	14	1.70	24	82.10	0.50	1.20	29	0.40	1.00	0.24	0.80	1.31	1.00	0.53	0.97	0.384	1.38	Non Liquefiable Soil
4	4.50	6.50	5.50	88.99	35.05	20	0.85	0.90	1.33	1.05	21	1.69	36	82.10	0.50	1.20	44	NL	1.00	0.36	0.80	1.23	1.00	NL	0.96	0.379	NL	Non Liquefiable Soil
5	6.50	7.50	7.00	113.26	44.61	19	0.95	0.90	1.33	1.05	23	1.50	34	94.27	0.50	1.20	41	NL	1.00	0.38	0.80	1.18	1.00	NL	0.95	0.375	NL	Non Liquefiable Soil
6	7.50	9.50	8.50	137.53	54.17	21	0.95	0.90	1.33	1.05	25	1.36	34	94.27	0.50	1.20	41	NL	1.00	0.41	0.79	1.14	1.00	NL	0.93	0.370	NL	Non Liquefiable Soil
7	9.50	10.50	10.00	161.80	63.73	22	1.00	0.90	1.33	1.05	28	1.25	35	83.95	0.50	1.20	42	NL	1.00	0.46	0.77	1.11	1.00	NL	0.91	0.359	NL	Non Liquefiable Soil
8	10.50	12.50	11.50	186.07	73.29	24	1.00	0.90	1.33	1.05	30	1.17	35	83.95	0.50	1.20	43	NL	1.00	0.49	0.75	1.08	1.00	NL	0.87	0.343	NL	Non Liquefiable Soil
9	12.50	13.50	13.00	210.34	82.85	31	1.00	0.90	1.33	1.05	39	1.10	43	86.59	0.50	1.20	52	NL	1.00	0.63	0.68	1.06	1.00	NL	0.83	0.327	NL	Non Liquefiable Soil
10	13.50	15.50	14.50	234.61	92.41	40	1.00	0.90	1.33	1.05	50	1.04	52	86.59	0.50	1.20	63	NL	1.00	0.85	0.60	1.03	1.00	NL	0.79	0.312	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	258.88	101.97	44	1.00	0.90	1.33	1.05	55	0.99	55	79.18	0.50	1.20	66	NL	1.00	0.85	0.60	0.99	1.00	NL	0.75	0.296	NL	Non Liquefiable Soil
12	16.50	18.50	17.50	283.74	112.12	10	1.00	0.90	1.33	1.05	13	0.94	12	79.18	0.50	1.20	15	0.16	1.00	0.22	0.80	0.98	2.00	0.31	0.71	0.279	1.10	Liquefiable Soil
13	18.50	19.50	19.00	311.53	125.21	14	1.00	0.90	1.33	1.05	18	0.89	16	79.85	0.50	1.20	19	0.21	1.00	0.30	0.80	0.96	3.00	0.60	0.67	0.259	2.30	Non Liquefiable Soil
14	19.50	21.50	20.50	339.33	138.29	19	1.00	0.90	1.33	1.05	24	0.85	20	79.85	0.50	1.20	25	0.29	1.00	0.40	0.80	0.94	4.00	1.08	0.63	0.240	4.52	Non Liquefiable Soil
15	21.50	22.50	22.00	367.12	151.38	39	1.00	0.90	1.33	1.05	49	0.81	40	70.52	0.50	1.20	48	NL	1.00	0.85	0.60	0.85	5.00	NL	0.59	0.222	NL	Non Liquefiable Soil
16	22.50	24.50	23.50	397.36	166.91	50	1.00	0.90	1.33	1.05	63	0.77	49	70.52	0.50	1.20	59	NL	1.00	0.85	0.60	0.81	6.00	NL	0.55	0.203	NL	Non Liquefiable Soil
17	24.50	25.50	25.00	427.60	182.44	55	1.00	0.90	1.33	1.05	69	0.74	51	27.85	4.55	1.14	63	NL	1.00	0.85	0.60	0.79	7.00	NL	0.51	0.185	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	450.85	190.98	57	1.00	0.90	1.33	1.05	72	0.72	52	27.85	4.55	1.14	63	NL	1.00	0.85	0.60	0.77	8.00	NL	0.47	0.172	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	474.10	199.52	60	1.00	0.90	1.33	1.05	75	0.71	53	78.49	0.50	1.20	65	NL	1.00	0.85	0.60	0.76	9.00	NL	0.43	0.158	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	493.48	206.63	79	1.00	0.90	1.33	1.05	99	0.70	69	78.49	0.50	1.20	83	NL	1.00	0.85	0.60	0.75	10.00	NL	0.39	0.146	NL	Non Liquefiable Soil

Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-02
Chainage	0+124
Ground Level (m)	206.73

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Inorganic silt of lowPlasticity with sand and gravel (ML)	0.00	17.25	17.45	7.64
2	Inorganic Clay of LowPlasticity with gravel (CL)	17.25	20.25	16.48	6.67
3	Inorganic silt of low compressibility with sand and gravel (ML)	20.25	24.25	17.16	7.35
4	Dense to very dense, brownish, fine-grained silty sand (SM).	24.25	30.00	18.00	8.19

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{max}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $N_1)_{60CS} > 30$)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	13.09	5.73	11	0.75	0.90	1.33	1.05	10	1.70	18	77.35	0.50	1.20	22	0.24	1.00	0.19	0.80	1.77	1.00	0.42	0.99	0.354	1.19	Liquefiable Soil
2	1.50	3.50	2.50	43.63	19.11	15	0.75	0.90	1.33	1.05	14	1.70	24	77.35	0.50	1.20	29	0.43	1.00	0.24	0.80	1.39	1.00	0.60	0.98	0.349	1.70	Non Liquefiable Soil
3	3.50	4.50	4.00	69.80	30.57	12	0.85	0.90	1.33	1.05	13	1.70	22	92.33	0.50	1.20	27	0.33	1.00	0.22	0.80	1.27	1.00	0.42	0.97	0.345	1.21	Non Liquefiable Soil
4	4.50	6.50	5.50	95.98	42.04	19	0.85	0.90	1.33	1.05	20	1.54	31	92.33	0.50	1.20	38	NL	1.00	0.34	0.80	1.19	1.00	NL	0.96	0.341	NL	Non Liquefiable Soil
5	6.50	7.50	7.00	122.15	53.50	14	0.95	0.90	1.33	1.05	17	1.37	23	95.34	0.50	1.20	28	0.37	1.00	0.28	0.80	1.13	1.00	0.42	0.95	0.337	1.23	Non Liquefiable Soil
6	7.50	9.50	8.50	148.33	64.97	22	0.95	0.90	1.33	1.05	26	1.24	33	95.34	0.50	1.20	40	NL	1.00	0.43	0.78	1.10	1.00	NL	0.93	0.333	NL	Non Liquefiable Soil
7	9.50	10.50	10.00	174.50	76.43	31	1.00	0.90	1.33	1.05	39	1.14	45	97.07	0.50	1.20	54	NL	1.00	0.63	0.68	1.09	1.00	NL	0.91	0.323	NL	Non Liquefiable Soil
8	10.50	12.50	11.50	200.68	87.90	18	1.00	0.90	1.33	1.05	23	1.07	24	97.07	0.50	1.20	29	0.43	1.00	0.38	0.80	1.03	1.00	0.44	0.87	0.309	1.44	Non Liquefiable Soil
9	12.50	13.50	13.00	226.85	99.36	23	1.00	0.90	1.33	1.05	29	1.00	29	88.74	0.50	1.20	35	NL	1.00	0.47	0.76	1.00	1.00	NL	0.83	0.295	NL	Non Liquefiable Soil
10	13.50	15.50	14.50	253.03	110.83	28	1.00	0.90	1.33	1.05	35	0.95	33	88.74	0.50	1.20	41	NL	1.00	0.57	0.71	0.97	1.00	NL	0.79	0.280	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	279.20	122.29	33	1.00	0.90	1.33	1.05	41	0.90	38	85.75	0.50	1.20	46	NL	1.00	0.85	0.60	0.92	1.00	NL	0.75	0.266	NL	Non Liquefiable Soil
12	16.50	18.50	17.50	305.13	133.52	26	1.00	0.90	1.33	1.05	33	0.87	28	85.75	0.50	1.20	34	NL	1.00	0.53	0.73	0.93	2.00	NL	0.71	0.252	NL	Non Liquefiable Soil
13	18.50	19.50	19.00	329.85	143.53	19	1.00	0.90	1.33	1.05	24	0.83	20	95.59	0.50	1.20	24	0.28	1.00	0.40	0.80	0.93	3.00	0.78	0.67	0.239	3.28	Non Liquefiable Soil
14	19.50	21.50	20.50	354.74	153.71	21	1.00	0.90	1.33	1.05	26	0.81	21	95.59	0.50	1.20	26	0.31	1.00	0.44	0.78	0.91	4.00	1.14	0.63	0.226	5.07	Non Liquefiable Soil
15	21.50	22.50	22.00	380.48	164.74	30	1.00	0.90	1.33	1.05	38	0.78	29	85.55	0.50	1.20	36	NL	1.00	0.61	0.69	0.86	5.00	NL	0.59	0.211	NL	Non Liquefiable Soil
16	22.50	24.50	23.50	406.22	175.77	36	1.00	0.90	1.33	1.05	45	0.75	34	85.55	0.50	1.20	41	NL	1.00	0.85	0.60	0.80	6.00	NL	0.55	0.197	NL	Non Liquefiable Soil
17	24.50	25.50	25.00	432.59	187.43	61	1.00	0.90	1.33	1.05	77	0.73	56	58.45	0.50	1.20	68	NL	1.00	0.85	0.60	0.78	7.00	NL	0.51	0.182	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	459.59	199.72	64	1.00	0.90	1.33	1.05	80	0.71	57	58.45	0.50	1.20	69	NL	1.00	0.85	0.60	0.76	8.00	NL	0.47	0.167	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	486.59	212.01	67	1.00	0.90	1.33	1.05	84	0.69	58	23.72	4.15	1.11	68	NL	1.00	0.85	0.60	0.74	9.00	NL	0.43	0.153	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	509.09	222.25	76	1.00	0.90	1.33	1.05	96	0.67	64	23.72	4.15	1.11	75	NL	1.00	0.85	0.60	0.73	10.00	NL	0.39	0.140	NL	Non Liquefiable Soil

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Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-03
Chainage	0+202
Ground Level (m)	206.5

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Inorganic silt of lowPlasticity with sand and gravel (ML)	0.00	17.25	15.78	5.97
2	Inorganic Clay of LowPlasticity with gravel (CL)	17.25	20.25	18.00	8.19
3	Inorganic silt of low compressibility with sand and gravel (ML)	20.25	23.25	18.00	8.19
4	Dense to very dense, brownish, fine-grained silty sand (SM).	23.25	30.00	18.00	8.19

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{max}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $N_1)_{60CS} > 30$)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	11.84	4.48	13	0.75	0.90	1.33	1.05	12	1.70	21	91.97	0.50	1.20	25	0.30	1.00	0.22	0.80	1.86	1.00	0.56	0.99	0.410	1.37	Non Liquefiable Soil
2	1.50	3.50	2.50	39.45	14.93	16	0.75	0.90	1.33	1.05	15	1.70	26	91.97	0.50	1.20	31	NL	1.00	0.26	0.80	1.46	1.00	NL	0.98	0.404	NL	Non Liquefiable Soil
3	3.50	4.50	4.00	63.12	23.89	19	0.85	0.90	1.33	1.05	20	1.70	35	89.42	0.50	1.20	42	NL	1.00	0.34	0.80	1.33	1.00	NL	0.97	0.399	NL	Non Liquefiable Soil
4	4.50	6.50	5.50	86.79	32.85	25	0.85	0.90	1.33	1.05	27	1.70	45	89.42	0.50	1.20	55	NL	1.00	0.44	0.78	1.28	1.00	NL	0.96	0.395	NL	Non Liquefiable Soil
5	6.50	7.50	7.00	110.46	41.81	26	0.95	0.90	1.33	1.05	31	1.55	48	91.60	0.50	1.20	58	NL	1.00	0.51	0.75	1.25	1.00	NL	0.95	0.390	NL	Non Liquefiable Soil
6	7.50	9.50	8.50	134.13	50.77	18	0.95	0.90	1.33	1.05	21	1.40	30	91.60	0.50	1.20	37	NL	1.00	0.36	0.80	1.15	1.00	NL	0.93	0.385	NL	Non Liquefiable Soil
7	9.50	10.50	10.00	157.80	59.73	23	1.00	0.90	1.33	1.05	29	1.29	37	92.57	0.50	1.20	45	NL	1.00	0.47	0.76	1.13	1.00	NL	0.91	0.374	NL	Non Liquefiable Soil
8	10.50	12.50	11.50	181.47	68.69	31	1.00	0.90	1.33	1.05	39	1.21	47	92.57	0.50	1.20	57	NL	1.00	0.63	0.68	1.13	1.00	NL	0.87	0.357	NL	Non Liquefiable Soil
9	12.50	13.50	13.00	205.14	77.65	34	1.00	0.90	1.33	1.05	43	1.13	48	91.40	0.50	1.20	59	NL	1.00	0.85	0.60	1.11	1.00	NL	0.83	0.341	NL	Non Liquefiable Soil
10	13.50	15.50	14.50	228.81	86.61	39	1.00	0.90	1.33	1.05	49	1.07	53	91.40	0.50	1.20	64	NL	1.00	0.85	0.60	1.06	1.00	NL	0.79	0.324	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	252.48	95.57	44	1.00	0.90	1.33	1.05	55	1.02	57	93.81	0.50	1.20	68	NL	1.00	0.85	0.60	1.02	1.00	NL	0.75	0.308	NL	Non Liquefiable Soil
12	16.50	18.50	17.50	276.71	105.09	11	1.00	0.90	1.33	1.05	14	0.98	13	93.81	0.50	1.20	17	0.18	1.00	0.24	0.80	0.99	2.00	0.35	0.71	0.290	1.21	Non Liquefiable Soil
13	18.50	19.50	19.00	303.71	117.38	33	1.00	0.90	1.33	1.05	41	0.92	38	82.79	0.50	1.20	46	NL	1.00	0.85	0.60	0.94	3.00	NL	0.67	0.269	NL	Non Liquefiable Soil
14	19.50	21.50	20.50	330.71	129.67	41	1.00	0.90	1.33	1.05	52	0.88	45	82.79	0.50	1.20	55	NL	1.00	0.85	0.60	0.90	4.00	NL	0.63	0.249	NL	Non Liquefiable Soil
15	21.50	22.50	22.00	357.71	141.96	48	1.00	0.90	1.33	1.05	60	0.84	51	53.36	0.50	1.20	61	NL	1.00	0.85	0.60	0.87	5.00	NL	0.59	0.231	NL	Non Liquefiable Soil
16	22.50	24.50	23.50	384.71	154.25	65	1.00	0.90	1.33	1.05	82	0.81	66	53.36	0.50	1.20	79	NL	1.00	0.85	0.60	0.84	6.00	NL	0.55	0.213	NL	Non Liquefiable Soil
17	24.50	25.50	25.00	411.71	166.54	67	1.00	0.90	1.33	1.05	84	0.77	65	31.76	4.81	1.17	81	NL	1.00	0.85	0.60	0.82	7.00	NL	0.51	0.195	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	438.71	178.83	61	1.00	0.90	1.33	1.05	77	0.75	57	31.76	4.81	1.17	72	NL	1.00	0.85	0.60	0.79	8.00	NL	0.47	0.179	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	465.71	191.12	63	1.00	0.90	1.33	1.05	79	0.72	57	23.66	4.14	1.11	67	NL	1.00	0.85	0.60	0.77	9.00	NL	0.43	0.162	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	488.21	201.36	64	1.00	0.90	1.33	1.05	80	0.70	57	23.66	4.14	1.11	67	NL	1.00	0.85	0.60	0.76	10.00	NL	0.39	0.149	NL	Non Liquefiable Soil

Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-04
Chainage	0+291
Ground Level (m)	206.67

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Inorganic silt of lowPlasticity with sand and gravel (ML)	0.00	17.25	18.45	8.64
2	Inorganic Clay of LowPlasticity with gravel (CL)	17.25	20.25	14.00	4.19
3	Inorganic silt of low compressibility with sand and gravel (ML)	20.25	22.00	15.98	6.17
4	Medium dense to dense, brownish, fine-grained silty sand with gravel (SM).	22.00	26.25	15.70	5.89
5	Dense to very dense, brownish, fine-grained silty sand with gravel (S	26.25	30.00	18.00	8.19

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{max}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $N_1)_{60CS} > 30$)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	13.84	6.48	9	0.75	0.90	1.33	1.05	8	1.70	14	94.52	0.50	1.20	18	0.19	1.00	0.16	0.80	1.73	1.00	0.33	0.99	0.331	0.99	Liquefiable Soil
2	1.50	3.50	2.50	46.13	21.61	15	0.75	0.90	1.33	1.05	14	1.70	24	94.52	0.50	1.20	29	0.43	1.00	0.24	0.80	1.36	1.00	0.58	0.98	0.327	1.78	Non Liquefiable Soil
3	3.50	4.50	4.00	73.80	34.57	17	0.85	0.90	1.33	1.05	18	1.70	31	90.00	0.50	1.20	38	NL	1.00	0.31	0.80	1.24	1.00	NL	0.97	0.323	NL	Non Liquefiable Soil
4	4.50	6.50	5.50	101.48	47.54	20	0.85	0.90	1.33	1.05	21	1.45	31	90.00	0.50	1.20	38	NL	1.00	0.36	0.80	1.16	1.00	NL	0.96	0.319	NL	Non Liquefiable Soil
5	6.50	7.50	7.00	129.15	60.50	24	0.95	0.90	1.33	1.05	29	1.29	37	95.27	0.50	1.20	45	NL	1.00	0.47	0.76	1.13	1.00	NL	0.95	0.315	NL	Non Liquefiable Soil
6	7.50	9.50	8.50	156.83	73.47	26	0.95	0.90	1.33	1.05	31	1.17	36	95.27	0.50	1.20	44	NL	1.00	0.51	0.75	1.08	1.00	NL	0.93	0.311	NL	Non Liquefiable Soil
7	9.50	10.50	10.00	184.50	86.43	42	1.00	0.90	1.33	1.05	53	1.08	57	90.10	0.50	1.20	69	NL	1.00	0.85	0.60	1.06	1.00	NL	0.91	0.302	NL	Non Liquefiable Soil
8	10.50	12.50	11.50	212.18	99.40	25	1.00	0.90	1.33	1.05	31	1.00	32	90.10	0.50	1.20	38	NL	1.00	0.51	0.74	1.00	1.00	NL	0.87	0.289	NL	Non Liquefiable Soil
9	12.50	13.50	13.00	239.85	112.36	25	1.00	0.90	1.33	1.05	31	0.94	30	98.57	0.50	1.20	36	NL	1.00	0.51	0.74	0.97	1.00	NL	0.83	0.275	NL	Non Liquefiable Soil
10	13.50	15.50	14.50	267.53	125.33	33	1.00	0.90	1.33	1.05	41	0.89	37	98.57	0.50	1.20	45	NL	1.00	0.85	0.60	0.91	1.00	NL	0.79	0.262	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	295.20	138.29	38	1.00	0.90	1.33	1.05	48	0.85	41	88.05	0.50	1.20	49	NL	1.00	0.85	0.60	0.88	1.00	NL	0.75	0.249	NL	Non Liquefiable Soil
12	16.50	18.50	17.50	321.76	150.15	16	1.00	0.90	1.33	1.05	20	0.82	16	88.05	0.50	1.20	20	0.22	1.00	0.34	0.80	0.92	2.00	0.40	0.71	0.236	1.70	Non Liquefiable Soil
13	18.50	19.50	19.00	342.76	156.44	24	1.00	0.90	1.33	1.05	30	0.80	24	83.99	0.50	1.20	29	0.43	1.00	0.49	0.75	0.90	3.00	1.16	0.67	0.228	5.10	Non Liquefiable Soil
14	19.50	21.50	20.50	364.26	163.22	51	1.00	0.90	1.33	1.05	64	0.78	50	83.99	0.50	1.20	61	NL	1.00	0.85	0.60	0.82	4.00	NL	0.63	0.218	NL	Non Liquefiable Soil
15	21.50	22.50	22.00	388.23	172.48	47	1.00	0.90	1.33	1.05	59	0.76	45	19.73	3.57	1.08	52	NL	1.00	0.85	0.60	0.80	5.00	NL	0.59	0.206	NL	Non Liquefiable Soil
16	22.50	24.50	23.50	411.78	181.32	22	1.00	0.90	1.33	1.05	28	0.74	21	19.73	3.57	1.08	26	0.31	1.00	0.46	0.77	0.87	6.00	1.60	0.55	0.194	8.29	Non Liquefiable Soil
17	24.50	25.50	25.00	435.33	190.16	44	1.00	0.90	1.33	1.05	55	0.73	40	20.02	3.62	1.08	47	NL	1.00	0.85	0.60	0.77	7.00	NL	0.51	0.181	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	459.45	199.58	57	1.00	0.90	1.33	1.05	72	0.71	51	20.02	3.62	1.08	58	NL	1.00	0.85	0.60	0.76	8.00	NL	0.47	0.168	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	486.45	211.87	57	1.00	0.90	1.33	1.05	72	0.69	49	44.30	0.50	1.20	60	NL	1.00	0.85	0.60	0.74	9.00	NL	0.43	0.153	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	508.95	222.11	66	1.00	0.90	1.33	1.05	83	0.67	56	23.66	4.14	1.11	66	NL	1.00	0.85	0.60	0.73	10.00	NL	0.39	0.140	NL	Non Liquefiable Soil

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Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-05
Chainage	0+410
Ground Level (m)	206.49

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Inorganic silt of lowPlasticity with sand and gravel (ML)	0.00	17.25	18.43	8.62
2	Inorganic Clay of LowPlasticity with gravel (CL)	17.25	20.25	14.02	4.21
3	Inorganic silt of low compressibility with sand and gravel (ML)	20.25	26.25	16.96	7.15
4	Dense to very dense, brownish, fine-grained silty sand with gravel (SM).	26.25	30.00	17.94	8.13

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{max}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $(N_1)_{60CS} > 30$)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	13.82	6.47	5	0.75	0.90	1.33	1.05	5	1.70	8	88.13	0.50	1.20	10	0.11	1.00	0.03	0.80	1.73	1.00	0.20	0.99	0.331	0.60	Liquefiable Soil
2	1.50	3.50	2.50	46.08	21.56	8	0.75	0.90	1.33	1.05	8	1.70	13	88.13	0.50	1.20	16	0.17	1.00	0.13	0.80	1.36	1.00	0.23	0.98	0.327	0.70	Liquefiable Soil
3	3.50	4.50	4.00	73.72	34.49	16	0.85	0.90	1.33	1.05	17	1.70	29	90.25	0.50	1.20	35	NL	1.00	0.29	0.80	1.24	1.00	NL	0.97	0.323	NL	Non Liquefiable Soil
4	4.50	6.50	5.50	101.37	47.43	19	0.85	0.90	1.33	1.05	20	1.45	29	90.25	0.50	1.20	36	NL	1.00	0.34	0.80	1.16	1.00	NL	0.96	0.319	NL	Non Liquefiable Soil
5	6.50	7.50	7.00	129.01	60.36	28	0.95	0.90	1.33	1.05	33	1.29	43	75.90	0.50	1.20	52	NL	1.00	0.55	0.73	1.15	1.00	NL	0.95	0.316	NL	Non Liquefiable Soil
6	7.50	9.50	8.50	156.66	73.30	30	0.95	0.90	1.33	1.05	36	1.17	42	75.90	0.50	1.20	51	NL	1.00	0.58	0.71	1.09	1.00	NL	0.93	0.312	NL	Non Liquefiable Soil
7	9.50	10.50	10.00	184.30	86.23	38	1.00	0.90	1.33	1.05	48	1.08	51	98.10	0.50	1.20	62	NL	1.00	0.85	0.60	1.06	1.00	NL	0.91	0.302	NL	Non Liquefiable Soil
8	10.50	12.50	11.50	211.95	99.17	26	1.00	0.90	1.33	1.05	33	1.00	33	98.10	0.50	1.20	40	NL	1.00	0.53	0.73	1.00	1.00	NL	0.87	0.289	NL	Non Liquefiable Soil
9	12.50	13.50	13.00	239.59	112.10	44	1.00	0.90	1.33	1.05	55	0.94	52	89.21	0.50	1.20	63	NL	1.00	0.85	0.60	0.96	1.00	NL	0.83	0.276	NL	Non Liquefiable Soil
10	13.50	15.50	14.50	267.24	125.04	43	1.00	0.90	1.33	1.05	54	0.89	48	89.21	0.50	1.20	58	NL	1.00	0.85	0.60	0.91	1.00	NL	0.79	0.262	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	294.88	137.97	40	1.00	0.90	1.33	1.05	50	0.85	43	99.35	0.50	1.20	52	NL	1.00	0.85	0.60	0.88	1.00	NL	0.75	0.249	NL	Non Liquefiable Soil
12	16.50	18.50	17.50	321.42	149.81	9	1.00	0.90	1.33	1.05	11	0.82	9	99.35	0.50	1.20	12	0.13	1.00	0.20	0.80	0.92	2.00	0.23	0.71	0.237	0.99	Liquefiable Soil
13	18.50	19.50	19.00	342.45	156.13	36	1.00	0.90	1.33	1.05	45	0.80	36	88.36	0.50	1.20	44	NL	1.00	0.85	0.60	0.84	3.00	NL	0.67	0.228	NL	Non Liquefiable Soil
14	19.50	21.50	20.50	364.22	163.18	51	1.00	0.90	1.33	1.05	64	0.78	50	88.36	0.50	1.20	61	NL	1.00	0.85	0.60	0.82	4.00	NL	0.63	0.218	NL	Non Liquefiable Soil
15	21.50	22.50	22.00	389.66	173.91	34	1.00	0.90	1.33	1.05	43	0.76	32	54.89	0.50	1.20	39	NL	1.00	0.85	0.60	0.80	5.00	NL	0.59	0.205	NL	Non Liquefiable Soil
16	22.50	24.50	23.50	415.10	184.64	41	1.00	0.90	1.33	1.05	52	0.74	38	54.89	0.50	1.20	46	NL	1.00	0.85	0.60	0.78	6.00	NL	0.55	0.192	NL	Non Liquefiable Soil
17	24.50	25.50	25.00	440.54	195.37	37	1.00	0.90	1.33	1.05	47	0.72	33	87.68	0.50	1.20	40	NL	1.00	0.85	0.60	0.76	7.00	NL	0.51	0.178	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	466.22	206.35	44	1.00	0.90	1.33	1.05	55	0.70	38	87.68	0.50	1.20	47	NL	1.00	0.85	0.60	0.75	8.00	NL	0.47	0.164	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	493.13	218.55	50	1.00	0.90	1.33	1.05	63	0.68	43	39.99	0.50	1.20	52	NL	1.00	0.85	0.60	0.73	9.00	NL	0.43	0.150	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	515.56	228.71	64	1.00	0.90	1.33	1.05	80	0.66	53	39.99	0.50	1.20	64	NL	1.00	0.85	0.60	0.72	10.00	NL	0.39	0.138	NL	Non Liquefiable Soil

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Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-06
Chainage	0+501
Ground Level (m)	207.24

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Inorganic silt of lowPlasticity with sand and gravel (ML)	0.00	25.00	16.50	6.69
2	ense to Very dense, yellowish, fine-grained silty sand (SM).	25.50	30.00	18.60	8.79

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{max}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $N_1)_{60CS} > 30$)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	12.38	5.02	6	0.75	0.90	1.33	1.05	6	1.70	10	87.30	0.50	1.20	12	0.13	1.00	0.06	0.80	1.82	1.00	0.24	0.99	0.382	0.63	Liquefiable Soil
2	1.50	3.50	2.50	41.25	16.73	12	0.75	0.90	1.33	1.05	11	1.70	19	87.30	0.50	1.20	24	0.27	1.00	0.20	0.80	1.43	1.00	0.38	0.98	0.377	1.01	Liquefiable Soil
3	3.50	4.50	4.00	66.00	26.77	14	0.85	0.90	1.33	1.05	15	1.70	25	80.20	0.50	1.20	31	NL	1.00	0.26	0.80	1.30	1.00	NL	0.97	0.373	NL	Non Liquefiable Soil
4	4.50	6.50	5.50	90.75	36.81	13	0.85	0.90	1.33	1.05	14	1.65	23	80.20	0.50	1.20	28	0.37	1.00	0.24	0.80	1.22	1.00	0.45	0.96	0.368	1.22	Non Liquefiable Soil
5	6.50	7.50	7.00	115.50	46.85	19	0.95	0.90	1.33	1.05	23	1.46	33	76.40	0.50	1.20	40	NL	1.00	0.38	0.80	1.16	1.00	NL	0.95	0.364	NL	Non Liquefiable Soil
6	7.50	9.50	8.50	140.25	56.89	24	0.95	0.90	1.33	1.05	29	1.33	38	76.40	0.50	1.20	46	NL	1.00	0.47	0.76	1.14	1.00	NL	0.93	0.360	NL	Non Liquefiable Soil
7	9.50	10.50	10.00	165.00	66.93	27	1.00	0.90	1.33	1.05	34	1.22	41	88.30	0.50	1.20	50	NL	1.00	0.55	0.72	1.12	1.00	NL	0.91	0.349	NL	Non Liquefiable Soil
8	10.50	12.50	11.50	189.75	76.97	26	1.00	0.90	1.33	1.05	33	1.14	37	88.30	0.50	1.20	45	NL	1.00	0.53	0.73	1.07	1.00	NL	0.87	0.333	NL	Non Liquefiable Soil
9	12.50	13.50	13.00	214.50	87.01	31	1.00	0.90	1.33	1.05	39	1.07	42	90.60	0.50	1.20	51	NL	1.00	0.63	0.68	1.05	1.00	NL	0.83	0.318	NL	Non Liquefiable Soil
10	13.50	15.50	14.50	239.25	97.05	37	1.00	0.90	1.33	1.05	47	1.02	47	90.60	0.50	1.20	57	NL	1.00	0.85	0.60	1.01	1.00	NL	0.79	0.303	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	264.00	107.09	51	1.00	0.90	1.33	1.05	64	0.97	62	88.50	0.50	1.20	75	NL	1.00	0.85	0.60	0.97	1.00	NL	0.75	0.287	NL	Non Liquefiable Soil
12	16.50	18.50	17.50	288.75	117.13	52	1.00	0.90	1.33	1.05	65	0.92	60	88.50	0.50	1.20	73	NL	1.00	0.85	0.60	0.94	2.00	NL	0.71	0.272	NL	Non Liquefiable Soil
13	18.50	19.50	19.00	313.50	127.17	34	1.00	0.90	1.33	1.05	43	0.89	38	86.50	0.50	1.20	46	NL	1.00	0.85	0.60	0.91	3.00	NL	0.67	0.256	NL	Non Liquefiable Soil
14	19.50	21.50	20.50	338.25	137.21	24	1.00	0.90	1.33	1.05	30	0.85	26	86.50	0.50	1.20	31	NL	1.00	0.49	0.75	0.92	4.00	NL	0.63	0.241	NL	Non Liquefiable Soil
15	21.50	22.50	22.00	363.00	147.25	33	1.00	0.90	1.33	1.05	41	0.82	34	77.50	0.50	1.20	42	NL	1.00	0.85	0.60	0.86	5.00	NL	0.59	0.226	NL	Non Liquefiable Soil
16	22.50	24.50	23.50	387.75	157.29	23	1.00	0.90	1.33	1.05	29	0.80	23	77.50	0.50	1.20	28	0.38	1.00	0.47	0.76	0.90	6.00	2.02	0.55	0.210	9.62	Non Liquefiable Soil
17	24.50	25.50	25.00	412.50	167.33	69	1.00	0.90	1.33	1.05	87	0.77	67	72.00	0.50	1.20	81	NL	1.00	0.85	0.60	0.81	7.00	NL	0.51	0.195	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	440.40	180.52	44	1.00	0.90	1.33	1.05	55	0.74	41	72.00	0.50	1.20	50	NL	1.00	0.85	0.60	0.79	8.00	NL	0.47	0.178	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	468.30	193.71	47	1.00	0.90	1.33	1.05	59	0.72	42	27.50	4.52	1.13	53	NL	1.00	0.85	0.60	0.77	9.00	NL	0.43	0.161	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	491.55	204.71	55	1.00	0.90	1.33	1.05	69	0.70	48	27.50	4.52	1.13	59	NL	1.00	0.85	0.60	0.75	10.00	NL	0.39	0.147	NL	Non Liquefiable Soil

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Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-07
Chainage	0+622
Ground Level (m)	207.65

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Inorganic Clay of intermediate plasticity with Sand (CI)	0.00	5.25	16.50	6.69
2	Inorganic silt of low compressibility with sand and gravel (ML)	5.25	8.25	17.85	8.04
3	Inorganic Clay of low plasticity with Sand and Gravel (CL)	8.25	19.00	18.00	8.19
4	Inorganic silt of low compressibility with sand and gravel (ML)	19.00	25.00	18.60	8.79
5	Medium Dense to dense, brownish, fine-grained silty sand (SM).	25.00	30.00	21.18	11.37

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{max}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $(N_1)_{60CS} > 30$)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	12.38	5.02	7	0.75	0.90	1.33	1.05	7	1.70	11	88.70	0.50	1.20	14	0.15	1.00	0.10	0.80	1.82	1.00	0.27	0.99	0.382	0.71	Liquefiable Soil
2	1.50	3.50	2.50	41.25	16.73	10	0.75	0.90	1.33	1.05	9	1.70	16	88.70	0.50	1.20	20	0.21	1.00	0.17	0.80	1.43	1.00	0.30	0.98	0.377	0.80	Liquefiable Soil
3	3.50	4.50	4.00	66.00	26.77	12	0.85	0.90	1.33	1.05	13	1.70	22	84.90	0.50	1.20	27	0.33	1.00	0.22	0.80	1.30	1.00	0.43	0.97	0.373	1.15	Liquefiable Soil
4	4.50	6.50	5.50	91.09	37.15	14	0.85	0.90	1.33	1.05	15	1.64	25	84.90	0.50	1.20	30	0.46	1.00	0.26	0.80	1.22	1.00	0.57	0.96	0.366	1.54	Non Liquefiable Soil
5	6.50	7.50	7.00	117.86	49.22	18	0.95	0.90	1.33	1.05	21	1.43	31	81.70	0.50	1.20	37	NL	1.00	0.36	0.80	1.15	1.00	NL	0.95	0.354	NL	Non Liquefiable Soil
6	7.50	9.50	8.50	144.68	61.32	23	0.95	0.90	1.33	1.05	27	1.28	35	81.70	0.50	1.20	43	NL	1.00	0.45	0.77	1.12	1.00	NL	0.93	0.344	NL	Non Liquefiable Soil
7	9.50	10.50	10.00	171.68	73.61	28	1.00	0.90	1.33	1.05	35	1.17	41	77.70	0.50	1.20	50	NL	1.00	0.57	0.71	1.09	1.00	NL	0.91	0.330	NL	Non Liquefiable Soil
8	10.50	12.50	11.50	198.68	85.90	22	1.00	0.90	1.33	1.05	28	1.08	30	77.70	0.50	1.20	36	NL	1.00	0.46	0.77	1.04	1.00	NL	0.87	0.313	NL	Non Liquefiable Soil
9	12.50	13.50	13.00	225.68	98.19	17	1.00	0.90	1.33	1.05	21	1.01	22	96.40	0.50	1.20	26	0.32	1.00	0.36	0.80	1.00	1.00	0.32	0.83	0.296	1.09	Liquefiable Soil
10	13.50	15.50	14.50	252.68	110.48	21	1.00	0.90	1.33	1.05	26	0.95	25	96.40	0.50	1.20	31	NL	1.00	0.44	0.78	0.98	1.00	NL	0.79	0.281	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	279.68	122.77	18	1.00	0.90	1.33	1.05	23	0.90	20	84.60	0.50	1.20	25	0.29	1.00	0.38	0.80	0.96	1.00	0.28	0.75	0.265	1.06	Liquefiable Soil
12	16.50	18.50	17.50	306.68	135.06	14	1.00	0.90	1.33	1.05	18	0.86	15	84.60	0.50	1.20	19	0.20	1.00	0.30	0.80	0.94	2.00	0.38	0.71	0.250	1.50	Non Liquefiable Soil
13	18.50	19.50	19.00	333.68	147.35	50	1.00	0.90	1.33	1.05	63	0.82	52	95.20	0.50	1.20	63	NL	1.00	0.85	0.60	0.86	3.00	NL	0.67	0.236	NL	Non Liquefiable Soil
14	19.50	21.50	20.50	361.58	160.54	46	1.00	0.90	1.33	1.05	58	0.79	46	95.20	0.50	1.20	55	NL	1.00	0.85	0.60	0.83	4.00	NL	0.63	0.220	NL	Non Liquefiable Soil
15	21.50	22.50	22.00	389.48	173.73	51	1.00	0.90	1.33	1.05	64	0.76	49	53.80	0.50	1.20	59	NL	1.00	0.85	0.60	0.80	5.00	NL	0.59	0.205	NL	Non Liquefiable Soil
16	22.50	24.50	23.50	417.38	186.92	38	1.00	0.90	1.33	1.05	48	0.73	35	53.80	0.50	1.20	42	NL	1.00	0.85	0.60	0.78	6.00	NL	0.55	0.190	NL	Non Liquefiable Soil
17	24.50	25.50	25.00	445.28	200.11	37	1.00	0.90	1.33	1.05	47	0.71	33	37.30	0.50	1.20	40	NL	1.00	0.85	0.60	0.76	7.00	NL	0.51	0.176	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	477.05	217.17	58	1.00	0.90	1.33	1.05	73	0.68	49	37.30	0.50	1.20	60	NL	1.00	0.85	0.60	0.73	8.00	NL	0.47	0.160	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	508.82	234.23	46	1.00	0.90	1.33	1.05	58	0.65	38	37.30	0.50	1.20	46	NL	1.00	0.85	0.60	0.71	9.00	NL	0.43	0.144	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	535.29	248.45	31	1.00	0.90	1.33	1.05	39	0.63	25	37.30	0.50	1.20	30	NL	1.00	0.63	0.68	0.75	10.00	NL	0.39	0.132	NL	Non Liquefiable Soil

Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-08
Chainage	0+701
Ground Level (m)	206.91

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Inorganic Clay of intermediate plasticity with Sand (CI)	0.00	3.75	16.90	7.09
2	Inorganic silt of low compressibility with sand and gravel (ML)	3.75	14.25	17.00	7.19
3	Inorganic Clay of low plasticity with Sand and Gravel (CL)	14.25	19.00	18.50	8.69
4	Inorganic Clay of low plasticity with Sand and Gravel (CL)	19.00	23.25	18.50	8.69
5	Inorganic silt of low compressibility with sand and gravel (ML)	23.25	30.00	19.80	9.99

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{max}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $N_{1)60CS}$ > 30)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	12.68	5.32	22	0.75	0.90	1.33	1.05	21	1.70	35	88.70	0.50	1.20	43	NL	1.00	0.35	0.80	1.80	1.00	NL	0.99	0.370	NL	Non Liquefiable Soil
2	1.50	3.50	2.50	42.25	17.73	11	0.75	0.90	1.33	1.05	10	1.70	18	88.70	0.50	1.20	22	0.24	1.00	0.19	0.80	1.41	1.00	0.33	0.98	0.365	0.92	Liquefiable Soil
3	3.50	4.50	4.00	67.63	28.40	16	0.85	0.90	1.33	1.05	17	1.70	29	86.00	0.50	1.20	35	NL	1.00	0.29	0.80	1.29	1.00	NL	0.97	0.360	NL	Non Liquefiable Soil
4	4.50	6.50	5.50	93.13	39.19	21	0.85	0.90	1.33	1.05	22	1.60	36	86.00	0.50	1.20	44	NL	1.00	0.37	0.80	1.21	1.00	NL	0.96	0.355	NL	Non Liquefiable Soil
5	6.50	7.50	7.00	118.63	49.98	14	0.95	0.90	1.33	1.05	17	1.41	24	89.30	0.50	1.20	29	0.40	1.00	0.28	0.80	1.15	1.00	0.46	0.95	0.350	1.33	Non Liquefiable Soil
6	7.50	9.50	8.50	144.13	60.77	24	0.95	0.90	1.33	1.05	29	1.28	37	89.30	0.50	1.20	45	NL	1.00	0.47	0.76	1.12	1.00	NL	0.93	0.346	NL	Non Liquefiable Soil
7	9.50	10.50	10.00	169.63	71.56	28	1.00	0.90	1.33	1.05	35	1.18	42	98.00	0.50	1.20	50	NL	1.00	0.57	0.71	1.10	1.00	NL	0.91	0.335	NL	Non Liquefiable Soil
8	10.50	12.50	11.50	195.13	82.35	26	1.00	0.90	1.33	1.05	33	1.10	36	98.00	0.50	1.20	44	NL	1.00	0.53	0.73	1.05	1.00	NL	0.87	0.320	NL	Non Liquefiable Soil
9	12.50	13.50	13.00	220.63	93.14	38	1.00	0.90	1.33	1.05	48	1.04	49	62.30	0.50	1.20	60	NL	1.00	0.85	0.60	1.03	1.00	NL	0.83	0.306	NL	Non Liquefiable Soil
10	13.50	15.50	14.50	246.50	104.30	43	1.00	0.90	1.33	1.05	54	0.98	53	62.30	0.50	1.20	64	NL	1.00	0.85	0.60	0.98	1.00	NL	0.79	0.290	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	274.25	117.34	28	1.00	0.90	1.33	1.05	35	0.92	32	87.80	0.50	1.20	39	NL	1.00	0.57	0.71	0.96	1.00	NL	0.75	0.272	NL	Non Liquefiable Soil
12	16.50	18.50	17.50	302.00	130.38	11	1.00	0.90	1.33	1.05	14	0.88	12	87.80	0.50	1.20	15	0.16	1.00	0.24	0.80	0.95	2.00	0.30	0.71	0.255	1.19	Liquefiable Soil
13	18.50	19.50	19.00	329.75	143.42	38	1.00	0.90	1.33	1.05	48	0.84	40	89.70	0.50	1.20	48	NL	1.00	0.85	0.60	0.87	3.00	NL	0.67	0.239	NL	Non Liquefiable Soil
14	19.50	21.50	20.50	357.50	156.46	18	1.00	0.90	1.33	1.05	23	0.80	18	89.70	0.50	1.20	22	0.24	1.00	0.38	0.80	0.91	4.00	0.90	0.63	0.223	4.01	Non Liquefiable Soil
15	21.50	22.50	22.00	385.25	169.50	31	1.00	0.90	1.33	1.05	39	0.77	30	81.50	0.50	1.20	36	NL	1.00	0.63	0.68	0.85	5.00	NL	0.59	0.208	NL	Non Liquefiable Soil
16	22.50	24.50	23.50	413.33	182.87	41	1.00	0.90	1.33	1.05	52	0.74	38	81.50	0.50	1.20	46	NL	1.00	0.85	0.60	0.79	6.00	NL	0.55	0.193	NL	Non Liquefiable Soil
17	24.50	25.50	25.00	443.03	197.86	43	1.00	0.90	1.33	1.05	54	0.71	38	75.10	0.50	1.20	47	NL	1.00	0.85	0.60	0.76	7.00	NL	0.51	0.177	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	472.73	212.85	65	1.00	0.90	1.33	1.05	82	0.69	56	75.10	0.50	1.20	68	NL	1.00	0.85	0.60	0.74	8.00	NL	0.47	0.162	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	502.43	227.84	60	1.00	0.90	1.33	1.05	75	0.66	50	25.30	4.32	1.12	60	NL	1.00	0.85	0.60	0.72	9.00	NL	0.43	0.147	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	527.18	240.33	56	1.00	0.90	1.33	1.05	70	0.65	45	25.30	4.32	1.12	55	NL	1.00	0.85	0.60	0.70	10.00	NL	0.39	0.134	NL	Non Liquefiable Soil

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Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-08A
Chainage	0+734
Ground Level (m)	206.58

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Stiff, Yellowish, fine grained Inorganic Clay of intermediate plasticity with Sar	0.00	3.75	15.98	6.17
2	Stiff to very stiff, Yellowish, fine grained Inorganic Clay of low plasticity with S	3.75	10.00	17.25	7.44
3	Very Stiff to Hard, brownish, fine-grained inorganic silt of low compressibility	10.00	14.25	18.40	8.59
4	Stiff to very stiff, brownish, fine grained Inorganic Clay of low plasticity with S	14.25	19.00	18.40	8.59
5	Very stiff to Hard, brownish, fine grained Inorganic Clay of low plasti	19.00	23.25	19.40	9.59
6	Hard, brownish, fine-grained inorganic silt of low compressibility with sand a	23.25	26.25	19.40	9.59
7	Very dense, brownish, fine-grained silty sand withgravel (SM)	26.25	30.00	19.40	9.59

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{mv}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $N_1)_{60CS}$ > 30)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	11.99	4.63	6	0.75	0.90	1.33	1.05	6	1.70	10	64.60	0.50	1.20	12	0.13	1.00	0.06	0.80	1.85	1.00	0.24	0.99	0.401	0.61	Liquefiable Soil
2	1.50	3.50	2.50	39.95	15.43	10	0.75	0.90	1.33	1.05	9	1.70	16	70.30	0.50	1.20	20	0.21	1.00	0.17	0.80	1.45	1.00	0.31	0.98	0.396	0.78	Liquefiable Soil
3	3.50	4.50	4.00	64.24	25.01	16	0.85	0.90	1.33	1.05	17	1.70	29	78.30	0.50	1.20	35	NL	1.00	0.29	0.80	1.32	1.00	NL	0.97	0.388	NL	Non Liquefiable Soil
4	4.50	6.50	5.50	90.11	36.18	30	0.85	0.90	1.33	1.05	32	1.66	53	79.30	0.50	1.20	64	NL	1.00	0.52	0.74	1.31	1.00	NL	0.96	0.372	NL	Non Liquefiable Soil
5	6.50	7.50	7.00	115.99	47.34	20	0.95	0.90	1.33	1.05	24	1.45	35	96.30	0.50	1.20	42	NL	1.00	0.40	0.80	1.16	1.00	NL	0.95	0.362	NL	Non Liquefiable Soil
6	7.50	9.50	8.50	141.86	58.51	13	0.95	0.90	1.33	1.05	16	1.31	20	94.40	0.50	1.20	25	0.29	1.00	0.27	0.80	1.11	1.00	0.32	0.93	0.354	0.91	Liquefiable Soil
7	9.50	10.50	10.00	167.74	69.67	20	1.00	0.90	1.33	1.05	25	1.20	30	85.40	0.50	1.20	37	NL	1.00	0.42	0.79	1.08	1.00	NL	0.91	0.341	NL	Non Liquefiable Soil
8	10.50	12.50	11.50	195.34	82.56	40	1.00	0.90	1.33	1.05	50	1.10	55	85.10	0.50	1.20	67	NL	1.00	0.85	0.60	1.08	1.00	NL	0.87	0.320	NL	Non Liquefiable Soil
9	12.50	13.50	13.00	222.94	95.45	44	1.00	0.90	1.33	1.05	55	1.02	57	85.10	0.50	1.20	68	NL	1.00	0.85	0.60	1.02	1.00	NL	0.83	0.301	NL	Non Liquefiable Soil
10	13.50	15.50	14.50	250.54	108.34	46	1.00	0.90	1.33	1.05	58	0.96	56	97.20	0.50	1.20	67	NL	1.00	0.85	0.60	0.97	1.00	NL	0.79	0.284	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	278.14	121.23	54	1.00	0.90	1.33	1.05	68	0.91	62	93.70	0.50	1.20	74	NL	1.00	0.85	0.60	0.93	1.00	NL	0.75	0.267	NL	Non Liquefiable Soil
12	16.50	18.50	17.50	305.74	134.12	59	1.00	0.90	1.33	1.05	74	0.86	64	88.00	0.50	1.20	77	NL	1.00	0.85	0.60	0.89	2.00	NL	0.71	0.251	NL	Non Liquefiable Soil
13	18.50	19.50	19.00	333.34	147.01	60	1.00	0.90	1.33	1.05	75	0.82	62	83.70	0.50	1.20	75	NL	1.00	0.85	0.60	0.86	3.00	NL	0.67	0.236	NL	Non Liquefiable Soil
14	19.50	21.50	20.50	362.44	161.40	56	1.00	0.90	1.33	1.05	70	0.79	55	79.60	0.50	1.20	67	NL	1.00	0.85	0.60	0.83	4.00	NL	0.63	0.220	NL	Non Liquefiable Soil
15	21.50	22.50	22.00	391.54	175.79	63	1.00	0.90	1.33	1.05	79	0.75	60	69.60	0.50	1.20	72	NL	1.00	0.85	0.60	0.80	5.00	NL	0.59	0.204	NL	Non Liquefiable Soil
16	22.50	24.50	23.50	420.64	190.18	64	1.00	0.90	1.33	1.05	80	0.73	58	88.80	0.50	1.20	70	NL	1.00	0.85	0.60	0.77	6.00	NL	0.55	0.189	NL	Non Liquefiable Soil
17	24.50	25.50	25.00	449.74	204.57	68	1.00	0.90	1.33	1.05	85	0.70	60	58.30	0.50	1.20	72	NL	1.00	0.85	0.60	0.75	7.00	NL	0.51	0.174	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	478.84	218.96	100	1.00	0.90	1.33	1.05	126	0.68	85	33.80	4.92	1.19	106	NL	1.00	0.85	0.60	0.73	8.00	NL	0.47	0.159	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	507.94	233.35	100	1.00	0.90	1.33	1.05	126	0.65	82	42.60	0.50	1.20	99	NL	1.00	0.85	0.60	0.71	9.00	NL	0.43	0.145	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	532.19	245.34	100	1.00	0.90	1.33	1.05	126	0.64	80	36.80	0.50	1.20	97	NL	1.00	0.85	0.60	0.70	10.00	NL	0.39	0.133	NL	Non Liquefiable Soil

Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-08B
Chainage	0+847
Ground Level (m)	206.91

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Stiff, Yellowish, fine grained Inorganic Clay of intermediate plasticity with Sar	0.00	4.00	16.50	6.69
2	Stiff to very stiff, Yellowish, fine grained Inorganic Clay of low plasticity with S	4.00	10.00	17.00	7.19
3	Very Stiff to Hard, brownish, fine-grained inorganic silt of low compressibility	10.00	14.25	21.50	11.69
4	Stiff to hard, brownish, fine-grained inorganic silt of low compressibility with	14.25	26.25	20.20	10.39
5	Very dense, brownish, fine-grained silty sand withgravel (SM)	26.25	30.00	21.00	11.19

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{max}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $(N_1)_{60CS} > 30$)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	12.38	5.02	8	0.75	0.90	1.33	1.05	8	1.70	13	79.90	0.50	1.20	16	0.17	1.00	0.13	0.80	1.82	1.00	0.31	0.99	0.382	0.80	Liquefiable Soil
2	1.50	3.50	2.50	41.25	16.73	11	0.75	0.90	1.33	1.05	10	1.70	18	89.30	0.50	1.20	22	0.24	1.00	0.19	0.80	1.43	1.00	0.34	0.98	0.377	0.90	Liquefiable Soil
3	3.50	4.50	4.00	66.00	26.77	13	0.85	0.90	1.33	1.05	14	1.70	24	89.60	0.50	1.20	29	0.40	1.00	0.24	0.80	1.30	1.00	0.52	0.97	0.373	1.40	Non Liquefiable Soil
4	4.50	6.50	5.50	91.50	37.56	22	0.85	0.90	1.33	1.05	24	1.63	38	81.40	0.50	1.20	47	NL	1.00	0.39	0.80	1.22	1.00	NL	0.96	0.364	NL	Non Liquefiable Soil
5	6.50	7.50	7.00	117.00	48.35	24	0.95	0.90	1.33	1.05	29	1.44	41	41.90	0.50	1.20	50	NL	1.00	0.47	0.76	1.19	1.00	NL	0.95	0.357	NL	Non Liquefiable Soil
6	7.50	9.50	8.50	142.50	59.14	11	0.95	0.90	1.33	1.05	13	1.30	17	90.10	0.50	1.20	21	0.23	1.00	0.23	0.80	1.11	1.00	0.25	0.93	0.351	0.72	Liquefiable Soil
7	9.50	10.50	10.00	168.00	69.93	14	1.00	0.90	1.33	1.05	18	1.20	21	98.30	0.50	1.20	26	0.31	1.00	0.30	0.80	1.07	1.00	0.33	0.91	0.340	0.97	Liquefiable Soil
8	10.50	12.50	11.50	200.25	87.47	20	1.00	0.90	1.33	1.05	25	1.07	27	90.70	0.50	1.20	33	NL	1.00	0.42	0.79	1.03	1.00	NL	0.87	0.310	NL	Non Liquefiable Soil
9	12.50	13.50	13.00	232.50	105.01	23	1.00	0.90	1.33	1.05	29	0.98	28	94.80	0.50	1.20	34	NL	1.00	0.47	0.76	0.99	1.00	NL	0.83	0.286	NL	Non Liquefiable Soil
10	13.50	15.50	14.50	264.43	122.23	29	1.00	0.90	1.33	1.05	36	0.90	33	83.10	0.50	1.20	40	NL	1.00	0.59	0.70	0.94	1.00	NL	0.79	0.266	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	294.73	137.82	33	1.00	0.90	1.33	1.05	41	0.85	35	96.60	0.50	1.20	43	NL	1.00	0.85	0.60	0.88	1.00	NL	0.75	0.249	NL	Non Liquefiable Soil
12	16.50	18.50	17.50	325.03	153.41	39	1.00	0.90	1.33	1.05	49	0.81	40	90.50	0.50	1.20	48	NL	1.00	0.85	0.60	0.84	2.00	NL	0.71	0.234	NL	Non Liquefiable Soil
13	18.50	19.50	19.00	355.33	169.00	44	1.00	0.90	1.33	1.05	55	0.77	43	78.40	0.50	1.20	52	NL	1.00	0.85	0.60	0.81	3.00	NL	0.67	0.219	NL	Non Liquefiable Soil
14	19.50	21.50	20.50	385.63	184.59	45	1.00	0.90	1.33	1.05	57	0.74	42	92.70	0.50	1.20	50	NL	1.00	0.85	0.60	0.78	4.00	NL	0.63	0.204	NL	Non Liquefiable Soil
15	21.50	22.50	22.00	415.93	200.18	50	1.00	0.90	1.33	1.05	63	0.71	44	95.30	0.50	1.20	54	NL	1.00	0.85	0.60	0.76	5.00	NL	0.59	0.190	NL	Non Liquefiable Soil
16	22.50	24.50	23.50	446.23	215.77	51	1.00	0.90	1.33	1.05	64	0.68	44	91.30	0.50	1.20	53	NL	1.00	0.85	0.60	0.74	6.00	NL	0.55	0.176	NL	Non Liquefiable Soil
17	24.50	25.50	25.00	476.53	231.36	55	1.00	0.90	1.33	1.05	69	0.66	45	92.10	0.50	1.20	55	NL	1.00	0.85	0.60	0.71	7.00	NL	0.51	0.163	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	507.03	247.15	75	1.00	0.90	1.33	1.05	94	0.64	60	33.50	4.91	1.18	76	NL	1.00	0.85	0.60	0.70	8.00	NL	0.47	0.149	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	538.53	263.94	81	1.00	0.90	1.33	1.05	102	0.62	63	71.40	0.50	1.20	76	NL	1.00	0.85	0.60	0.68	9.00	NL	0.43	0.136	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	564.78	277.93	54	1.00	0.90	1.33	1.05	68	0.60	41	31.00	4.77	1.16	52	NL	1.00	0.85	0.60	0.66	10.00	NL	0.39	0.125	NL	Non Liquefiable Soil

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Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-09
Chainage	0+802
Ground Level (m)	206.45

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Inorganic Clay of intermediate plasticity with Sand (CI)	0.00	3.75	15.80	5.99
2	Inorganic silt of low compressibility with sand and gravel (ML)	3.75	16.00	14.90	5.09
3	Inorganic Clay of low plasticity with Sand and Gravel (CL)	16.00	19.00	15.50	5.69
4	Inorganic Clay of low plasticity with Sand and Gravel (CL)	19.00	22.00	17.20	7.39
5	Inorganic Clay of low plasticity with Sand (CL)	22.00	24.50	16.50	6.69
6	Dense to very dense, brownish, fine-grained silty sand withgravel (SI	24.50	30.00	19.22	9.41

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{max}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $(N_1)_{60CS} > 30$)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	11.85	4.50	9	0.75	0.90	1.33	1.05	8	1.70	14	86.90	0.50	1.20	18	0.19	1.00	0.16	0.80	1.86	1.00	0.35	0.99	0.409	0.86	Liquefiable Soil
2	1.50	3.50	2.50	39.50	14.98	14	0.75	0.90	1.33	1.05	13	1.70	22	86.90	0.50	1.20	27	0.35	1.00	0.23	0.80	1.46	1.00	0.51	0.98	0.403	1.27	Non Liquefiable Soil
3	3.50	4.50	4.00	62.98	23.75	11	0.85	0.90	1.33	1.05	12	1.70	20	34.50	4.95	1.19	29	0.40	1.00	0.21	0.80	1.33	1.00	0.53	0.97	0.401	1.33	Non Liquefiable Soil
4	4.50	6.50	5.50	85.33	31.39	15	0.85	0.90	1.33	1.05	16	1.70	27	34.50	4.95	1.19	37	NL	1.00	0.27	0.80	1.26	1.00	NL	0.96	0.406	NL	Non Liquefiable Soil
5	6.50	7.50	7.00	107.68	39.03	11	0.95	0.90	1.33	1.05	13	1.60	21	62.50	0.50	1.20	26	0.31	1.00	0.23	0.80	1.21	1.00	0.37	0.95	0.407	0.91	Liquefiable Soil
6	7.50	9.50	8.50	130.03	46.67	19	0.95	0.90	1.33	1.05	23	1.46	33	62.50	0.50	1.20	40	NL	1.00	0.38	0.80	1.16	1.00	NL	0.93	0.406	NL	Non Liquefiable Soil
7	9.50	10.50	10.00	152.38	54.31	37	1.00	0.90	1.33	1.05	47	1.36	63	81.60	0.50	1.20	76	NL	1.00	0.85	0.60	1.28	1.00	NL	0.91	0.397	NL	Non Liquefiable Soil
8	10.50	12.50	11.50	174.73	61.95	17	1.00	0.90	1.33	1.05	21	1.27	27	81.60	0.50	1.20	33	NL	1.00	0.36	0.80	1.10	1.00	NL	0.87	0.381	NL	Non Liquefiable Soil
9	12.50	13.50	13.00	197.08	69.59	21	1.00	0.90	1.33	1.05	26	1.20	32	86.00	0.50	1.20	38	NL	1.00	0.44	0.78	1.08	1.00	NL	0.83	0.365	NL	Non Liquefiable Soil
10	13.50	15.50	14.50	219.43	77.23	22	1.00	0.90	1.33	1.05	28	1.14	31	86.00	0.50	1.20	38	NL	1.00	0.46	0.77	1.06	1.00	NL	0.79	0.349	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	241.78	84.87	18	1.00	0.90	1.33	1.05	23	1.09	25	77.30	0.50	1.20	30	0.47	1.00	0.38	0.80	1.03	1.00	0.48	0.75	0.332	1.45	Non Liquefiable Soil
12	16.50	18.50	17.50	265.03	93.41	14	1.00	0.90	1.33	1.05	18	1.03	18	77.30	0.50	1.20	22	0.25	1.00	0.30	0.80	1.01	2.00	0.50	0.71	0.313	1.60	Non Liquefiable Soil
13	18.50	19.50	19.00	288.28	101.95	35	1.00	0.90	1.33	1.05	44	0.99	44	94.50	0.50	1.20	53	NL	1.00	0.85	0.60	0.99	3.00	NL	0.67	0.294	NL	Non Liquefiable Soil
14	19.50	21.50	20.50	314.08	113.04	19	1.00	0.90	1.33	1.05	24	0.94	22	94.50	0.50	1.20	27	0.35	1.00	0.40	0.80	0.98	4.00	1.37	0.63	0.272	5.05	Non Liquefiable Soil
15	21.50	22.50	22.00	339.88	124.13	14	1.00	0.90	1.33	1.05	18	0.90	16	89.50	0.50	1.20	19	0.21	1.00	0.30	0.80	0.96	5.00	1.00	0.59	0.251	3.99	Non Liquefiable Soil
16	22.50	24.50	23.50	364.63	134.17	43	1.00	0.90	1.33	1.05	54	0.86	47	89.50	0.50	1.20	56	NL	1.00	0.85	0.60	0.89	6.00	NL	0.55	0.232	NL	Non Liquefiable Soil
17	24.50	25.50	25.00	389.38	144.21	53	1.00	0.90	1.33	1.05	67	0.83	55	36.80	0.50	1.20	67	NL	1.00	0.85	0.60	0.86	7.00	NL	0.51	0.213	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	414.13	154.25	42	1.00	0.90	1.33	1.05	53	0.81	43	36.80	0.50	1.20	52	NL	1.00	0.85	0.60	0.84	8.00	NL	0.47	0.195	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	438.88	164.29	46	1.00	0.90	1.33	1.05	58	0.78	45	26.20	4.41	1.12	55	NL	1.00	0.85	0.60	0.82	9.00	NL	0.43	0.178	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	459.50	172.66	61	1.00	0.90	1.33	1.05	77	0.76	58	26.20	4.41	1.12	70	NL	1.00	0.85	0.60	0.80	10.00	NL	0.39	0.163	NL	Non Liquefiable Soil

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Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-10
Chainage	0+907
Ground Level (m)	207.15

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Inorganic Clay of intermediate plasticity with Sand (CI)	0.00	5.25	14.50	4.69
2	Inorganic silt of low compressibility with sand and gravel (ML)	5.25	24.25	17.35	7.54
3	Inorganic Clay of low plasticity with Sand and Gravel (CL)	24.25	30.00	19.50	9.69

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{max}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $N_1)_{60CS} > 30$)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	10.88	3.52	6	0.75	0.90	1.33	1.05	6	1.70	10	94.70	0.50	1.20	12	0.13	1.00	0.06	0.80	1.95	1.00	0.26	0.99	0.479	0.54	Liquefiable Soil
2	1.50	3.50	2.50	36.25	11.73	9	0.75	0.90	1.33	1.05	8	1.70	14	94.70	0.50	1.20	18	0.19	1.00	0.16	0.80	1.54	1.00	0.29	0.98	0.473	0.62	Liquefiable Soil
3	3.50	4.50	4.00	58.00	18.77	12	0.85	0.90	1.33	1.05	13	1.70	22	79.32	0.50	1.20	27	0.33	1.00	0.22	0.80	1.40	1.00	0.46	0.97	0.467	0.98	Liquefiable Soil
4	4.50	6.50	5.50	80.46	26.53	17	0.85	0.90	1.33	1.05	18	1.70	31	79.32	0.50	1.20	38	NL	1.00	0.31	0.80	1.30	1.00	NL	0.96	0.453	NL	Non Liquefiable Soil
5	6.50	7.50	7.00	106.49	37.84	15	0.95	0.90	1.33	1.05	18	1.63	29	71.32	0.50	1.20	35	NL	1.00	0.30	0.80	1.21	1.00	NL	0.95	0.415	NL	Non Liquefiable Soil
6	7.50	9.50	8.50	132.51	49.16	16	0.95	0.90	1.33	1.05	19	1.43	27	71.32	0.50	1.20	33	NL	1.00	0.32	0.80	1.15	1.00	NL	0.93	0.393	NL	Non Liquefiable Soil
7	9.50	10.50	10.00	158.54	60.47	28	1.00	0.90	1.33	1.05	35	1.29	45	99.30	0.50	1.20	55	NL	1.00	0.57	0.71	1.16	1.00	NL	0.91	0.371	NL	Non Liquefiable Soil
8	10.50	12.50	11.50	184.56	71.79	16	1.00	0.90	1.33	1.05	20	1.18	24	99.30	0.50	1.20	29	0.41	1.00	0.34	0.80	1.07	1.00	0.44	0.87	0.348	1.26	Non Liquefiable Soil
9	12.50	13.50	13.00	210.59	83.10	20	1.00	0.90	1.33	1.05	25	1.10	28	91.00	0.50	1.20	34	NL	1.00	0.42	0.79	1.04	1.00	NL	0.83	0.327	NL	Non Liquefiable Soil
10	13.50	15.50	14.50	236.61	94.42	20	1.00	0.90	1.33	1.05	25	1.03	26	91.00	0.50	1.20	32	NL	1.00	0.42	0.79	1.01	1.00	NL	0.79	0.308	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	262.64	105.73	67	1.00	0.90	1.33	1.05	84	0.97	82	98.00	0.50	1.20	99	NL	1.00	0.85	0.60	0.98	1.00	NL	0.75	0.289	NL	Non Liquefiable Soil
12	16.50	18.50	17.50	288.66	117.05	12	1.00	0.90	1.33	1.05	15	0.92	14	98.00	0.50	1.20	17	0.18	1.00	0.26	0.80	0.97	2.00	0.36	0.71	0.272	1.31	Non Liquefiable Soil
13	18.50	19.50	19.00	314.69	128.36	22	1.00	0.90	1.33	1.05	28	0.88	24	94.70	0.50	1.20	30	0.45	1.00	0.46	0.77	0.94	3.00	1.28	0.67	0.255	5.04	Non Liquefiable Soil
14	19.50	21.50	20.50	340.71	139.68	18	1.00	0.90	1.33	1.05	23	0.85	19	94.70	0.50	1.20	23	0.26	1.00	0.38	0.80	0.94	4.00	0.99	0.63	0.238	4.15	Non Liquefiable Soil
15	21.50	22.50	22.00	366.74	150.99	22	1.00	0.90	1.33	1.05	28	0.81	23	90.70	0.50	1.20	28	0.35	1.00	0.46	0.77	0.91	5.00	1.61	0.59	0.222	7.23	Non Liquefiable Soil
16	22.50	24.50	23.50	392.76	162.31	28	1.00	0.90	1.33	1.05	35	0.78	28	90.70	0.50	1.20	34	NL	1.00	0.57	0.71	0.87	6.00	NL	0.55	0.206	NL	Non Liquefiable Soil
17	24.50	25.50	25.00	420.40	175.23	38	1.00	0.90	1.33	1.05	48	0.76	36	40.90	0.50	1.20	44	NL	1.00	0.85	0.60	0.80	7.00	NL	0.51	0.190	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	449.65	189.77	54	1.00	0.90	1.33	1.05	68	0.73	49	40.90	0.50	1.20	60	NL	1.00	0.85	0.60	0.77	8.00	NL	0.47	0.172	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	478.90	204.31	48	1.00	0.90	1.33	1.05	60	0.70	42	30.90	4.76	1.16	54	NL	1.00	0.85	0.60	0.75	9.00	NL	0.43	0.156	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	503.28	216.43	53	1.00	0.90	1.33	1.05	67	0.68	45	30.90	4.76	1.16	57	NL	1.00	0.85	0.60	0.73	10.00	NL	0.39	0.143	NL	Non Liquefiable Soil

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Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-11
Chainage	1+004
Ground Level (m)	207.09

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Inorganic Clay of low plasticity with sand and gravel (CL)	0.00	16.00	18.00	8.19
2	Inorganic Clay of low plasticity with sand and gravel (CL)	16.00	24.25	18.50	8.69
3	Inorganic Clay of low plasticity with Sand and Gravel (CL)	24.25	30.00	20.50	10.69

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{max}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $N_1)_{60CS} > 30$)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	13.50	6.15	12	0.75	0.90	1.33	1.05	11	1.70	19	96.00	0.50	1.20	24	0.27	1.00	0.20	0.80	1.75	1.00	0.46	0.99	0.341	1.36	Non Liquefiable Soil
2	1.50	3.50	2.50	45.00	20.48	13	0.75	0.90	1.33	1.05	12	1.70	21	96.00	0.50	1.20	25	0.30	1.00	0.22	0.80	1.37	1.00	0.41	0.98	0.336	1.23	Non Liquefiable Soil
3	3.50	4.50	4.00	72.00	32.77	16	0.85	0.90	1.33	1.05	17	1.70	29	75.30	0.50	1.20	35	NL	1.00	0.29	0.80	1.25	1.00	NL	0.97	0.332	NL	Non Liquefiable Soil
4	4.50	6.50	5.50	99.00	45.06	14	0.85	0.90	1.33	1.05	15	1.49	22	75.30	0.50	1.20	27	0.35	1.00	0.26	0.80	1.17	1.00	0.40	0.96	0.328	1.23	Non Liquefiable Soil
5	6.50	7.50	7.00	126.00	57.35	16	0.95	0.90	1.33	1.05	19	1.32	25	94.20	0.50	1.20	31	NL	1.00	0.32	0.80	1.12	1.00	NL	0.95	0.324	NL	Non Liquefiable Soil
6	7.50	9.50	8.50	153.00	69.64	27	0.95	0.90	1.33	1.05	32	1.20	39	94.20	0.50	1.20	47	NL	1.00	0.53	0.74	1.10	1.00	NL	0.93	0.320	NL	Non Liquefiable Soil
7	9.50	10.50	10.00	180.00	81.93	31	1.00	0.90	1.33	1.05	39	1.10	43	91.60	0.50	1.20	52	NL	1.00	0.63	0.68	1.07	1.00	NL	0.91	0.311	NL	Non Liquefiable Soil
8	10.50	12.50	11.50	207.00	94.22	14	1.00	0.90	1.33	1.05	18	1.03	18	91.60	0.50	1.20	22	0.25	1.00	0.30	0.80	1.01	1.00	0.25	0.87	0.297	0.84	Liquefiable Soil
9	12.50	13.50	13.00	234.00	106.51	18	1.00	0.90	1.33	1.05	23	0.97	22	77.10	0.50	1.20	27	0.33	1.00	0.38	0.80	0.99	1.00	0.33	0.83	0.283	1.16	Liquefiable Soil
10	13.50	15.50	14.50	261.00	118.80	21	1.00	0.90	1.33	1.05	26	0.92	24	77.10	0.50	1.20	30	0.44	1.00	0.44	0.78	0.96	1.00	0.42	0.79	0.270	1.57	Non Liquefiable Soil
11	15.50	16.50	16.00	288.00	131.09	36	1.00	0.90	1.33	1.05	45	0.87	40	91.80	0.50	1.20	48	NL	1.00	0.85	0.60	0.90	1.00	NL	0.75	0.256	NL	Non Liquefiable Soil
12	16.50	18.50	17.50	315.75	144.13	23	1.00	0.90	1.33	1.05	29	0.83	24	91.80	0.50	1.20	29	0.43	1.00	0.47	0.76	0.92	2.00	0.79	0.71	0.242	3.27	Non Liquefiable Soil
13	18.50	19.50	19.00	343.50	157.17	26	1.00	0.90	1.33	1.05	33	0.80	26	79.20	0.50	1.20	32	NL	1.00	0.53	0.73	0.89	3.00	NL	0.67	0.227	NL	Non Liquefiable Soil
14	19.50	21.50	20.50	371.25	170.21	25	1.00	0.90	1.33	1.05	31	0.77	24	79.20	0.50	1.20	29	0.43	1.00	0.51	0.74	0.87	4.00	1.50	0.63	0.213	7.04	Non Liquefiable Soil
15	21.50	22.50	22.00	399.00	183.25	49	1.00	0.90	1.33	1.05	62	0.74	45	83.40	0.50	1.20	55	NL	1.00	0.85	0.60	0.78	5.00	NL	0.59	0.199	NL	Non Liquefiable Soil
16	22.50	24.50	23.50	426.75	196.29	53	1.00	0.90	1.33	1.05	67	0.71	48	83.40	0.50	1.20	58	NL	1.00	0.85	0.60	0.76	6.00	NL	0.55	0.185	NL	Non Liquefiable Soil
17	24.50	25.50	25.00	456.00	210.83	45	1.00	0.90	1.33	1.05	57	0.69	39	93.30	0.50	1.20	47	NL	1.00	0.85	0.60	0.74	7.00	NL	0.51	0.171	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	486.75	226.87	41	1.00	0.90	1.33	1.05	52	0.66	34	93.30	0.50	1.20	42	NL	1.00	0.85	0.60	0.72	8.00	NL	0.47	0.156	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	517.50	242.91	58	1.00	0.90	1.33	1.05	73	0.64	47	20.40	3.68	1.08	54	NL	1.00	0.85	0.60	0.70	9.00	NL	0.43	0.142	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	543.13	256.28	54	1.00	0.90	1.33	1.05	68	0.62	42	20.40	3.68	1.08	50	NL	1.00	0.85	0.60	0.69	10.00	NL	0.39	0.130	NL	Non Liquefiable Soil

B.2. Zone 2: CH: 1+004 km to 1+925 km (BH-12 to BH-21)

Based on the geotechnical investigation and analysis, the table below provides a summary of liquefiable soil layers, including the computed factor of safety values for liquefaction assessment.

Borehole ID	Top of Layer	Bottom of Layer	N_{SPT}	N_{60}	$(N1)_{60}$	$(N1)_{60cs}$	CRR	CSR	FS_{liq}	Liquefaction Potential
BH-12	1.50	3.50	13	12	21	25	0.42	0.35	1.19	Liquefiable Soil
BH-12	3.50	4.50	9	10	16	20	0.28	0.35	0.79	Liquefiable Soil
BH-13	0.00	1.50	8	8	13	16	0.32	0.43	0.75	Liquefiable Soil
BH-14	0.00	1.50	10	9	16	20	0.39	0.39	0.99	Liquefiable Soil
BH-14	7.50	9.50	14	17	22	27	0.38	0.36	1.06	Liquefiable Soil
BH-14	9.50	10.50	13	16	20	24	0.30	0.35	0.87	Liquefiable Soil
BH-15	0.00	1.50	9	8	14	18	0.33	0.33	0.99	Liquefiable Soil
BH-15	15.50	16.50	14	18	18	22	0.24	0.30	0.79	Liquefiable Soil
BH-16	0.00	1.50	7	7	11	14	0.27	0.39	0.70	Liquefiable Soil
BH-16	1.50	3.50	13	12	21	25	0.43	0.38	1.13	Liquefiable Soil
BH-16	3.50	4.50	12	13	22	27	0.43	0.38	1.13	Liquefiable Soil
BH-16	15.50	16.50	17	21	21	25	0.29	0.29	1.02	Liquefiable Soil
BH-17	0.00	1.50	6	6	10	12	0.25	0.41	0.59	Liquefiable Soil
BH-17	1.50	3.50	7	7	11	14	0.22	0.41	0.54	Liquefiable Soil
BH-17	3.50	4.50	5	5	9	11	0.17	0.40	0.42	Liquefiable Soil
BH-17	4.50	6.50	11	12	20	24	0.35	0.40	0.89	Liquefiable Soil
BH-17	7.50	9.50	12	14	20	25	0.33	0.39	0.85	Liquefiable Soil
BH-21	0.00	1.50	6	6	10	12	0.24	0.37	0.64	Liquefiable Soil
BH-21	1.50	3.50	11	10	18	22	0.33	0.36	0.92	Liquefiable Soil

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Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-12
Chainage	1+092
Ground Level (m)	206.76

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Stiff to hard, yellow to brownish, fine grained Inorganic Clay of low plasticity	0.00	17.25	17.30	7.49
2	Stiff to Very Stiff, yellow to brownish, fine-grained inorganic silt of low compr	17.25	24.25	16.80	6.99
3	Dense, brownish, fine-grained silty sand with gravel (SM)	24.25	30.00	18.24	8.43

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{max}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $N_1)_{60CS} > 30$)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	12.98	5.62	22	0.75	0.90	1.33	1.05	21	1.70	35	95.99	0.50	1.20	43	NL	1.00	0.35	0.80	1.78	1.00	NL	0.99	0.358	NL	Non Liquefiable Soil
2	1.50	3.50	2.50	43.25	18.73	13	0.75	0.90	1.33	1.05	12	1.70	21	99.20	0.50	1.20	25	0.30	1.00	0.22	0.80	1.40	1.00	0.42	0.98	0.353	1.19	Liquefiable Soil
3	3.50	4.50	4.00	69.20	29.97	9	0.85	0.90	1.33	1.05	10	1.70	16	96.47	0.50	1.20	20	0.22	1.00	0.17	0.80	1.27	1.00	0.28	0.97	0.349	0.79	Liquefiable Soil
4	4.50	6.50	5.50	95.15	41.21	24	0.85	0.90	1.33	1.05	26	1.56	40	93.96	0.50	1.20	48	NL	1.00	0.42	0.79	1.21	1.00	NL	0.96	0.345	NL	Non Liquefiable Soil
5	6.50	7.50	7.00	121.10	52.45	19	0.95	0.90	1.33	1.05	23	1.38	31	94.04	0.50	1.20	38	NL	1.00	0.38	0.80	1.14	1.00	NL	0.95	0.341	NL	Non Liquefiable Soil
6	7.50	9.50	8.50	147.05	63.69	22	0.95	0.90	1.33	1.05	26	1.25	33	49.43	0.50	1.20	40	NL	1.00	0.43	0.78	1.10	1.00	NL	0.93	0.337	NL	Non Liquefiable Soil
7	9.50	10.50	10.00	173.00	74.93	27	1.00	0.90	1.33	1.05	34	1.16	39	92.80	0.50	1.20	48	NL	1.00	0.55	0.72	1.08	1.00	NL	0.91	0.327	NL	Non Liquefiable Soil
8	10.50	12.50	11.50	198.95	86.17	24	1.00	0.90	1.33	1.05	30	1.08	32	98.94	0.50	1.20	39	NL	1.00	0.49	0.75	1.04	1.00	NL	0.87	0.312	NL	Non Liquefiable Soil
9	12.50	13.50	13.00	224.90	97.41	28	1.00	0.90	1.33	1.05	35	1.01	36	96.03	0.50	1.20	43	NL	1.00	0.57	0.71	1.01	1.00	NL	0.83	0.298	NL	Non Liquefiable Soil
10	13.50	15.50	14.50	250.85	108.65	32	1.00	0.90	1.33	1.05	40	0.96	39	94.19	0.50	1.20	47	NL	1.00	0.85	0.60	0.97	1.00	NL	0.79	0.283	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	276.80	119.89	27	1.00	0.90	1.33	1.05	34	0.91	31	97.11	0.50	1.20	38	NL	1.00	0.55	0.72	0.95	1.00	NL	0.75	0.269	NL	Non Liquefiable Soil
12	16.50	18.50	17.50	302.63	131.01	22	1.00	0.90	1.33	1.05	28	0.87	24	97.11	0.50	1.20	29	0.44	1.00	0.46	0.77	0.94	2.00	0.82	0.71	0.255	3.22	Non Liquefiable Soil
13	18.50	19.50	19.00	327.83	141.50	14	1.00	0.90	1.33	1.05	18	0.84	15	95.55	0.50	1.20	18	0.19	1.00	0.30	0.80	0.93	3.00	0.54	0.67	0.241	2.26	Non Liquefiable Soil
14	19.50	21.50	20.50	353.03	151.99	19	1.00	0.90	1.33	1.05	24	0.81	19	95.45	0.50	1.20	24	0.27	1.00	0.40	0.80	0.92	4.00	0.99	0.63	0.227	4.36	Non Liquefiable Soil
15	21.50	22.50	22.00	378.23	162.48	24	1.00	0.90	1.33	1.05	30	0.78	24	77.37	0.50	1.20	29	0.41	1.00	0.49	0.75	0.89	5.00	1.80	0.59	0.213	8.44	Non Liquefiable Soil
16	22.50	24.50	23.50	403.43	172.97	26	1.00	0.90	1.33	1.05	33	0.76	25	97.30	0.50	1.20	30	NL	1.00	0.53	0.73	0.86	6.00	NL	0.55	0.199	NL	Non Liquefiable Soil
17	24.50	25.50	25.00	429.71	184.54	29	1.00	0.90	1.33	1.05	36	0.74	27	85.21	0.50	1.20	33	NL	1.00	0.59	0.70	0.83	7.00	NL	0.51	0.184	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	457.07	197.19	51	1.00	0.90	1.33	1.05	64	0.71	46	52.48	0.50	1.20	55	NL	1.00	0.85	0.60	0.76	8.00	NL	0.47	0.169	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	484.43	209.84	47	1.00	0.90	1.33	1.05	59	0.69	41	31.15	4.78	1.16	52	NL	1.00	0.85	0.60	0.74	9.00	NL	0.43	0.154	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	507.23	220.38	41	1.00	0.90	1.33	1.05	52	0.67	35	31.15	4.78	1.16	45	NL	1.00	0.85	0.60	0.73	10.00	NL	0.39	0.141	NL	Non Liquefiable Soil

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Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-13
Chainage	1+214
Ground Level (m)	206.32

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Stiff to Very Stiff, yellow to brownish, fine grained Inorganic Clay of low p	0.00	3.75	15.40	5.59
2	Stiff to Very Stiff, yellow to brownish, fine grained inorganic silt of low co	3.75	11.25	16.80	6.99
3	Very Stiff to Hard, yellow to brownish, fine grained Inorganic Clay of low	11.25	19.00	16.50	6.69
4	Hard, Greyey, fine grained inorganic silt of low compressibility with sand	19.00	25.00	19.40	9.59
5	Very dense, greyey, fine-grained silty sand (SM)	25.00	30.00	21.20	11.39

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{max}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $(N_1)_{60CS} > 30$)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (C_N)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	11.55	4.20	8	0.75	0.90	1.33	1.05	8	1.70	13	96.68	0.50	1.20	16	0.17	1.00	0.13	0.80	1.89	1.00	0.32	0.99	0.427	0.75	Liquefiable Soil
2	1.50	3.50	2.50	38.50	13.98	14	0.75	0.90	1.33	1.05	13	1.70	22	96.51	0.50	1.20	27	0.35	1.00	0.23	0.80	1.48	1.00	0.52	0.98	0.421	1.23	Non Liquefiable Soil
3	3.50	4.50	4.00	61.95	22.72	24	0.85	0.90	1.33	1.05	26	1.70	44	81.46	0.50	1.20	53	NL	1.00	0.42	0.79	1.37	1.00	NL	0.97	0.412	NL	Non Liquefiable Soil
4	4.50	6.50	5.50	87.15	33.21	20	0.85	0.90	1.33	1.05	21	1.70	36	58.66	0.50	1.20	44	NL	1.00	0.36	0.80	1.25	1.00	NL	0.96	0.392	NL	Non Liquefiable Soil
5	6.50	7.50	7.00	112.35	43.70	25	0.95	0.90	1.33	1.05	30	1.51	45	93.23	0.50	1.20	55	NL	1.00	0.49	0.76	1.22	1.00	NL	0.95	0.380	NL	Non Liquefiable Soil
6	7.50	9.50	8.50	137.55	54.19	28	0.95	0.90	1.33	1.05	33	1.36	45	89.96	0.50	1.20	55	NL	1.00	0.55	0.73	1.18	1.00	NL	0.93	0.370	NL	Non Liquefiable Soil
7	9.50	10.50	10.00	162.75	64.68	16	1.00	0.90	1.33	1.05	20	1.24	25	97.96	0.50	1.20	31	NL	1.00	0.34	0.80	1.09	1.00	NL	0.91	0.356	NL	Non Liquefiable Soil
8	10.50	12.50	11.50	187.88	75.10	28	1.00	0.90	1.33	1.05	35	1.15	41	94.44	0.50	1.20	49	NL	1.00	0.57	0.71	1.09	1.00	NL	0.87	0.338	NL	Non Liquefiable Soil
9	12.50	13.50	13.00	212.63	85.14	41	1.00	0.90	1.33	1.05	52	1.08	56	63.57	0.50	1.20	68	NL	1.00	0.85	0.60	1.07	1.00	NL	0.83	0.322	NL	Non Liquefiable Soil
10	13.50	15.50	14.50	237.38	95.18	38	1.00	0.90	1.33	1.05	48	1.03	49	95.66	0.50	1.20	59	NL	1.00	0.85	0.60	1.02	1.00	NL	0.79	0.306	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	262.13	105.22	24	1.00	0.90	1.33	1.05	30	0.97	29	93.77	0.50	1.20	36	NL	1.00	0.49	0.75	0.99	1.00	NL	0.75	0.290	NL	Non Liquefiable Soil
12	16.50	18.50	17.50	286.88	115.26	29	1.00	0.90	1.33	1.05	36	0.93	34	60.94	0.50	1.20	41	NL	1.00	0.59	0.70	0.96	2.00	NL	0.71	0.274	NL	Non Liquefiable Soil
13	18.50	19.50	19.00	311.63	125.30	33	1.00	0.90	1.33	1.05	41	0.89	37	92.44	0.50	1.20	45	NL	1.00	0.85	0.60	0.91	3.00	NL	0.67	0.259	NL	Non Liquefiable Soil
14	19.50	21.50	20.50	340.73	139.69	49	1.00	0.90	1.33	1.05	62	0.85	52	94.03	0.50	1.20	63	NL	1.00	0.85	0.60	0.87	4.00	NL	0.63	0.238	NL	Non Liquefiable Soil
15	21.50	22.50	22.00	369.83	154.08	49	1.00	0.90	1.33	1.05	62	0.81	50	95.22	0.50	1.20	60	NL	1.00	0.85	0.60	0.84	5.00	NL	0.59	0.220	NL	Non Liquefiable Soil
16	22.50	24.50	23.50	398.93	168.47	53	1.00	0.90	1.33	1.05	67	0.77	51	94.63	0.50	1.20	62	NL	1.00	0.85	0.60	0.81	6.00	NL	0.55	0.202	NL	Non Liquefiable Soil
17	24.50	25.50	25.00	428.03	182.86	55	1.00	0.90	1.33	1.05	69	0.74	51	32.35	4.85	1.17	65	NL	1.00	0.85	0.60	0.79	7.00	NL	0.51	0.185	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	459.83	199.95	61	1.00	0.90	1.33	1.05	77	0.71	54	80.28	0.50	1.20	66	NL	1.00	0.85	0.60	0.76	8.00	NL	0.47	0.167	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	491.63	217.04	64	1.00	0.90	1.33	1.05	80	0.68	55	26.33	4.42	1.13	66	NL	1.00	0.85	0.60	0.73	9.00	NL	0.43	0.151	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	518.13	231.28	73	1.00	0.90	1.33	1.05	92	0.66	60	25.88	4.38	1.12	72	NL	1.00	0.85	0.60	0.72	10.00	NL	0.39	0.137	NL	Non Liquefiable Soil

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Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-14
Chainage	1+293
Ground Level (m)	206.13

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Very Stiff, yellow to brownish, fine grained inorganic silt of low compressibili	0.00	5.25	16.20	6.39
2	Very Stiff, brownish, fine grained Inorganic Clay of low plasticity with silt and	5.25	8.25	17.00	7.19
3	Stiff, brownish, fine grained inorganic silt of low compressibility with sand (M	8.25	11.25	17.00	7.19
4	Very Stiff to Hard, yellow to brownish, fine grained Inorganic Clay of low plas	11.25	24.25	18.90	9.09
5	Dense to very dense, brownish to greyey, fine-grained silty sand (SM)	24.25	30.00	18.90	9.09

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{max}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $N_1)_{60CS} > 30$)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	12.15	4.80	10	0.75	0.90	1.33	1.05	9	1.70	16	47.51	0.50	1.20	20	0.21	1.00	0.17	0.80	1.84	1.00	0.39	0.99	0.393	0.99	Liquefiable Soil
2	1.50	3.50	2.50	40.50	15.98	16	0.75	0.90	1.33	1.05	15	1.70	26	47.51	0.50	1.20	31	NL	1.00	0.26	0.80	1.44	1.00	NL	0.98	0.388	NL	Non Liquefiable Soil
3	3.50	4.50	4.00	64.80	25.57	14	0.85	0.90	1.33	1.05	15	1.70	25	75.79	0.50	1.20	31	NL	1.00	0.26	0.80	1.31	1.00	NL	0.97	0.383	NL	Non Liquefiable Soil
4	4.50	6.50	5.50	89.30	35.36	20	0.85	0.90	1.33	1.05	21	1.68	36	62.86	0.50	1.20	44	NL	1.00	0.36	0.80	1.23	1.00	NL	0.96	0.377	NL	Non Liquefiable Soil
5	6.50	7.50	7.00	114.80	46.15	19	0.95	0.90	1.33	1.05	23	1.47	33	91.56	0.50	1.20	41	NL	1.00	0.38	0.80	1.17	1.00	NL	0.95	0.367	NL	Non Liquefiable Soil
6	7.50	9.50	8.50	140.30	56.94	14	0.95	0.90	1.33	1.05	17	1.33	22	96.46	0.50	1.20	27	0.34	1.00	0.28	0.80	1.12	1.00	0.38	0.93	0.359	1.06	Liquefiable Soil
7	9.50	10.50	10.00	165.80	67.73	13	1.00	0.90	1.33	1.05	16	1.22	20	96.67	0.50	1.20	24	0.28	1.00	0.28	0.80	1.08	1.00	0.30	0.91	0.346	0.87	Liquefiable Soil
8	10.50	12.50	11.50	191.78	79.00	19	1.00	0.90	1.33	1.05	24	1.13	27	98.64	0.50	1.20	33	NL	1.00	0.40	0.80	1.05	1.00	NL	0.87	0.328	NL	Non Liquefiable Soil
9	12.50	13.50	13.00	220.13	92.64	22	1.00	0.90	1.33	1.05	28	1.04	29	97.94	0.50	1.20	35	NL	1.00	0.46	0.77	1.02	1.00	NL	0.83	0.307	NL	Non Liquefiable Soil
10	13.50	15.50	14.50	248.48	106.28	34	1.00	0.90	1.33	1.05	43	0.97	41	87.31	0.50	1.20	50	NL	1.00	0.85	0.60	0.98	1.00	NL	0.79	0.287	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	276.83	119.92	34	1.00	0.90	1.33	1.05	43	0.91	39	96.29	0.50	1.20	47	NL	1.00	0.85	0.60	0.93	1.00	NL	0.75	0.269	NL	Non Liquefiable Soil
12	16.50	18.50	17.50	305.18	133.56	24	1.00	0.90	1.33	1.05	30	0.87	26	98.76	0.50	1.20	32	NL	1.00	0.49	0.75	0.93	2.00	NL	0.71	0.252	NL	Non Liquefiable Soil
13	18.50	19.50	19.00	333.53	147.20	44	1.00	0.90	1.33	1.05	55	0.82	46	93.55	0.50	1.20	55	NL	1.00	0.85	0.60	0.86	3.00	NL	0.67	0.236	NL	Non Liquefiable Soil
14	19.50	21.50	20.50	361.88	160.84	48	1.00	0.90	1.33	1.05	60	0.79	48	92.14	0.50	1.20	58	NL	1.00	0.85	0.60	0.83	4.00	NL	0.63	0.220	NL	Non Liquefiable Soil
15	21.50	22.50	22.00	390.23	174.48	40	1.00	0.90	1.33	1.05	50	0.76	38	95.43	0.50	1.20	46	NL	1.00	0.85	0.60	0.80	5.00	NL	0.59	0.205	NL	Non Liquefiable Soil
16	22.50	24.50	23.50	418.58	188.12	39	1.00	0.90	1.33	1.05	49	0.73	36	95.07	0.50	1.20	43	NL	1.00	0.85	0.60	0.78	6.00	NL	0.55	0.190	NL	Non Liquefiable Soil
17	24.50	25.50	25.00	446.93	201.76	59	1.00	0.90	1.33	1.05	74	0.70	52	94.85	0.50	1.20	63	NL	1.00	0.85	0.60	0.76	7.00	NL	0.51	0.175	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	475.28	215.40	81	1.00	0.90	1.33	1.05	102	0.68	69	40.41	0.50	1.20	84	NL	1.00	0.85	0.60	0.74	8.00	NL	0.47	0.161	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	503.63	229.04	89	1.00	0.90	1.33	1.05	112	0.66	74	64.41	0.50	1.20	89	NL	1.00	0.85	0.60	0.72	9.00	NL	0.43	0.146	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	527.25	240.41	97	1.00	0.90	1.33	1.05	122	0.64	79	55.27	0.50	1.20	95	NL	1.00	0.85	0.60	0.70	10.00	NL	0.39	0.134	NL	Non Liquefiable Soil

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Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-15
Chainage	1+392
Ground Level (m)	206.64

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Stiff, yellow to brownish, fine grained inorganic silt of low compressibility wit	0.00	3.75	18.45	8.64
2	Stiff to very stiff, brownish, fine grained Inorganic Clay of low plasticity with g	3.75	7.00	14.00	4.19
3	Stiff to hard, brownish, fine grained inorganic silt of low compressibility with	7.00	13.00	15.98	6.17
4	Hard, yellow to brownish, fine grained Inorganic Clay of low plasticity with sil	13.00	23.25	15.70	5.89
5	Hard, brownish, fine grained inorganic silt of low compressibility wit	23.25	30.00	18.00	8.19

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{max}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $N_1)_{60CS} > 30$)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	13.84	6.48	9	0.75	0.90	1.33	1.05	8	1.70	14	90.42	0.50	1.20	18	0.19	1.00	0.16	0.80	1.73	1.00	0.33	0.99	0.331	0.99	Liquefiable Soil
2	1.50	3.50	2.50	46.13	21.61	14	0.75	0.90	1.33	1.05	13	1.70	22	81.82	0.50	1.20	27	0.35	1.00	0.23	0.80	1.36	1.00	0.48	0.98	0.327	1.46	Non Liquefiable Soil
3	3.50	4.50	4.00	72.69	33.46	16	0.85	0.90	1.33	1.05	17	1.70	29	79.51	0.50	1.20	35	NL	1.00	0.29	0.80	1.24	1.00	NL	0.97	0.329	NL	Non Liquefiable Soil
4	4.50	6.50	5.50	93.69	39.75	20	0.85	0.90	1.33	1.05	21	1.59	34	97.70	0.50	1.20	41	NL	1.00	0.36	0.80	1.20	1.00	NL	0.96	0.352	NL	Non Liquefiable Soil
5	6.50	7.50	7.00	114.69	46.04	20	0.95	0.90	1.33	1.05	24	1.47	35	80.28	0.50	1.20	43	NL	1.00	0.40	0.80	1.17	1.00	NL	0.95	0.368	NL	Non Liquefiable Soil
6	7.50	9.50	8.50	138.66	55.30	18	0.95	0.90	1.33	1.05	21	1.34	29	97.10	0.50	1.20	35	NL	1.00	0.36	0.80	1.13	1.00	NL	0.93	0.366	NL	Non Liquefiable Soil
7	9.50	10.50	10.00	162.63	64.56	16	1.00	0.90	1.33	1.05	20	1.24	25	97.90	0.50	1.20	31	NL	1.00	0.34	0.80	1.09	1.00	NL	0.91	0.356	NL	Non Liquefiable Soil
8	10.50	12.50	11.50	186.60	73.82	31	1.00	0.90	1.33	1.05	39	1.16	45	95.66	0.50	1.20	55	NL	1.00	0.63	0.68	1.10	1.00	NL	0.87	0.342	NL	Non Liquefiable Soil
9	12.50	13.50	13.00	210.57	83.08	37	1.00	0.90	1.33	1.05	47	1.10	51	95.75	0.50	1.20	62	NL	1.00	0.85	0.60	1.08	1.00	NL	0.83	0.327	NL	Non Liquefiable Soil
10	13.50	15.50	14.50	234.12	91.92	41	1.00	0.90	1.33	1.05	52	1.04	54	86.88	0.50	1.20	65	NL	1.00	0.85	0.60	1.03	1.00	NL	0.79	0.313	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	257.67	100.76	14	1.00	0.90	1.33	1.05	18	1.00	18	91.57	0.50	1.20	22	0.24	1.00	0.30	0.80	1.00	1.00	0.24	0.75	0.298	0.79	Liquefiable Soil
12	16.50	18.50	17.50	281.22	109.60	27	1.00	0.90	1.33	1.05	34	0.96	32	97.93	0.50	1.20	39	NL	1.00	0.55	0.72	0.97	2.00	NL	0.71	0.283	NL	Non Liquefiable Soil
13	18.50	19.50	19.00	304.77	118.44	25	1.00	0.90	1.33	1.05	31	0.92	29	99.26	0.50	1.20	35	NL	1.00	0.51	0.74	0.96	3.00	NL	0.67	0.268	NL	Non Liquefiable Soil
14	19.50	21.50	20.50	328.32	127.28	32	1.00	0.90	1.33	1.05	40	0.89	36	87.19	0.50	1.20	43	NL	1.00	0.85	0.60	0.91	4.00	NL	0.63	0.252	NL	Non Liquefiable Soil
15	21.50	22.50	22.00	351.87	136.12	42	1.00	0.90	1.33	1.05	53	0.86	45	91.57	0.50	1.20	55	NL	1.00	0.85	0.60	0.88	5.00	NL	0.59	0.237	NL	Non Liquefiable Soil
16	22.50	24.50	23.50	375.99	145.54	48	1.00	0.90	1.33	1.05	60	0.83	50	57.04	0.50	1.20	61	NL	1.00	0.85	0.60	0.86	6.00	NL	0.55	0.220	NL	Non Liquefiable Soil
17	24.50	25.50	25.00	402.99	157.83	57	1.00	0.90	1.33	1.05	72	0.80	57	57.04	0.50	1.20	69	NL	1.00	0.85	0.60	0.83	7.00	NL	0.51	0.202	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	429.99	170.12	76	1.00	0.90	1.33	1.05	96	0.77	73	64.23	0.50	1.20	88	NL	1.00	0.85	0.60	0.81	8.00	NL	0.47	0.184	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	456.99	182.41	91	1.00	0.90	1.33	1.05	114	0.74	85	62.89	0.50	1.20	102	NL	1.00	0.85	0.60	0.79	9.00	NL	0.43	0.167	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	479.49	192.65	71	1.00	0.90	1.33	1.05	89	0.72	64	61.77	0.50	1.20	78	NL	1.00	0.85	0.60	0.77	10.00	NL	0.39	0.153	NL	Non Liquefiable Soil

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Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-16
Chainage	1+487
Ground Level (m)	205.19

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Medium stiff, brownish, fine grained inorganic silt of low compressibility with	0.00	7.00	16.30	6.49
2	Medium dense, brownish to greyey, fine-grained silty sand (SM)	7.00	10.00	16.30	6.49
3	Very stiff, brownish, fine grained inorganic silt of low compressibility with sar	10.00	13.00	16.30	6.49
4	Stiff to very stiff, brownish, fine grained Inorganic Clay of low plasticity with g	13.00	23.25	17.20	7.39
5	Dense, greyey, fine-grained silty sand with gravel (SM)	23.25	30.00	19.00	9.19

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{max}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $N_1)_{60CS} > 30$)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	12.23	4.87	7	0.75	0.90	1.33	1.05	7	1.70	11	95.66	0.50	1.20	14	0.15	1.00	0.10	0.80	1.83	1.00	0.27	0.99	0.389	0.70	Liquefiable Soil
2	1.50	3.50	2.50	40.75	16.23	13	0.75	0.90	1.33	1.05	12	1.70	21	92.45	0.50	1.20	25	0.30	1.00	0.22	0.80	1.44	1.00	0.43	0.98	0.384	1.13	Liquefiable Soil
3	3.50	4.50	4.00	65.20	25.97	12	0.85	0.90	1.33	1.05	13	1.70	22	89.45	0.50	1.20	27	0.33	1.00	0.22	0.80	1.31	1.00	0.43	0.97	0.380	1.13	Liquefiable Soil
4	4.50	6.50	5.50	89.65	35.71	21	0.85	0.90	1.33	1.05	22	1.67	38	76.80	0.50	1.20	46	NL	1.00	0.37	0.80	1.23	1.00	NL	0.96	0.375	NL	Non Liquefiable Soil
5	6.50	7.50	7.00	114.10	45.45	28	0.95	0.90	1.33	1.05	33	1.48	50	62.97	0.50	1.20	60	NL	1.00	0.55	0.73	1.24	1.00	NL	0.95	0.371	NL	Non Liquefiable Soil
6	7.50	9.50	8.50	138.55	55.19	30	0.95	0.90	1.33	1.05	36	1.35	48	47.26	0.50	1.20	58	NL	1.00	0.58	0.71	1.19	1.00	NL	0.93	0.366	NL	Non Liquefiable Soil
7	9.50	10.50	10.00	163.00	64.93	17	1.00	0.90	1.33	1.05	21	1.24	27	96.44	0.50	1.20	32	NL	1.00	0.36	0.80	1.09	1.00	NL	0.91	0.355	NL	Non Liquefiable Soil
8	10.50	12.50	11.50	187.45	74.67	22	1.00	0.90	1.33	1.05	28	1.16	32	71.13	0.50	1.20	39	NL	1.00	0.46	0.77	1.07	1.00	NL	0.87	0.339	NL	Non Liquefiable Soil
9	12.50	13.50	13.00	211.90	84.41	23	1.00	0.90	1.33	1.05	29	1.09	31	92.98	0.50	1.20	38	NL	1.00	0.47	0.76	1.04	1.00	NL	0.83	0.324	NL	Non Liquefiable Soil
10	13.50	15.50	14.50	237.70	95.50	37	1.00	0.90	1.33	1.05	47	1.02	48	85.14	0.50	1.20	58	NL	1.00	0.85	0.60	1.02	1.00	NL	0.79	0.306	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	263.50	106.59	17	1.00	0.90	1.33	1.05	21	0.97	21	73.79	0.50	1.20	25	0.30	1.00	0.36	0.80	0.99	1.00	0.29	0.75	0.288	1.02	Liquefiable Soil
12	16.50	18.50	17.50	289.30	117.68	23	1.00	0.90	1.33	1.05	29	0.92	27	54.79	0.50	1.20	32	NL	1.00	0.47	0.76	0.96	2.00	NL	0.71	0.271	NL	Non Liquefiable Soil
13	18.50	19.50	19.00	315.10	128.77	19	1.00	0.90	1.33	1.05	24	0.88	21	89.59	0.50	1.20	26	0.31	1.00	0.40	0.80	0.95	3.00	0.88	0.67	0.254	3.45	Non Liquefiable Soil
14	19.50	21.50	20.50	340.90	139.86	18	1.00	0.90	1.33	1.05	23	0.85	19	85.60	0.50	1.20	23	0.26	1.00	0.38	0.80	0.94	4.00	0.99	0.63	0.238	4.15	Non Liquefiable Soil
15	21.50	22.50	22.00	366.70	150.95	14	1.00	0.90	1.33	1.05	18	0.81	14	69.31	0.50	1.20	18	0.19	1.00	0.30	0.80	0.92	5.00	0.87	0.59	0.222	3.90	Non Liquefiable Soil
16	22.50	24.50	23.50	392.95	162.49	36	1.00	0.90	1.33	1.05	45	0.78	35	54.92	0.50	1.20	43	NL	1.00	0.85	0.60	0.82	6.00	NL	0.55	0.206	NL	Non Liquefiable Soil
17	24.50	25.50	25.00	421.45	176.28	34	1.00	0.90	1.33	1.05	43	0.75	32	28.58	4.61	1.14	41	NL	1.00	0.85	0.60	0.80	7.00	NL	0.51	0.189	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	449.95	190.07	30	1.00	0.90	1.33	1.05	38	0.73	27	43.30	0.50	1.20	33	NL	1.00	0.61	0.69	0.82	8.00	NL	0.47	0.172	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	478.45	203.86	39	1.00	0.90	1.33	1.05	49	0.70	34	33.04	4.88	1.18	45	NL	1.00	0.85	0.60	0.75	9.00	NL	0.43	0.156	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	502.20	215.36	44	1.00	0.90	1.33	1.05	55	0.68	38	29.79	4.69	1.15	48	NL	1.00	0.85	0.60	0.74	10.00	NL	0.39	0.143	NL	Non Liquefiable Soil

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Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-17
Chainage	1+587
Ground Level (m)	205.36

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Medium stiff, yellow to brownish, fine grained Inorganic Clay of Intermediate	0.00	5.25	15.70	5.89
2	Stiff to very stiff, brownish, fine grained inorganic silt of low compressibility v	5.25	11.25	15.70	5.89
3	Stiff to very stiff, brownish to grayey, fine grained Inorganic Clay of low plasti	11.25	23.25	17.65	7.84
4	Dense to very dense, greyey, fine-grained silty sand (SM)	23.25	30.00	19.70	9.89

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{max}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $N_1)_{60CS} > 30$)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	11.78	4.42	6	0.75	0.90	1.33	1.05	6	1.70	10	89.18	0.50	1.20	12	0.13	1.00	0.06	0.80	1.87	1.00	0.25	0.99	0.413	0.59	Liquefiable Soil
2	1.50	3.50	2.50	39.25	14.73	7	0.75	0.90	1.33	1.05	7	1.70	11	85.31	0.50	1.20	14	0.15	1.00	0.10	0.80	1.47	1.00	0.22	0.98	0.408	0.54	Liquefiable Soil
3	3.50	4.50	4.00	62.80	23.57	5	0.85	0.90	1.33	1.05	5	1.70	9	95.71	0.50	1.20	11	0.13	1.00	0.05	0.80	1.34	1.00	0.17	0.97	0.403	0.42	Liquefiable Soil
4	4.50	6.50	5.50	86.35	32.41	11	0.85	0.90	1.33	1.05	12	1.70	20	74.09	0.50	1.20	24	0.28	1.00	0.21	0.80	1.25	1.00	0.35	0.96	0.398	0.89	Liquefiable Soil
5	6.50	7.50	7.00	109.90	41.25	14	0.95	0.90	1.33	1.05	17	1.56	26	74.09	0.50	1.20	32	NL	1.00	0.28	0.80	1.19	1.00	NL	0.95	0.393	NL	Non Liquefiable Soil
6	7.50	9.50	8.50	133.45	50.09	12	0.95	0.90	1.33	1.05	14	1.41	20	79.80	0.50	1.20	25	0.29	1.00	0.25	0.80	1.15	1.00	0.33	0.93	0.389	0.85	Liquefiable Soil
7	9.50	10.50	10.00	157.00	58.93	22	1.00	0.90	1.33	1.05	28	1.30	36	53.08	0.50	1.20	44	NL	1.00	0.46	0.77	1.13	1.00	NL	0.91	0.377	NL	Non Liquefiable Soil
8	10.50	12.50	11.50	181.04	68.26	22	1.00	0.90	1.33	1.05	28	1.21	33	58.64	0.50	1.20	41	NL	1.00	0.46	0.77	1.09	1.00	NL	0.87	0.359	NL	Non Liquefiable Soil
9	12.50	13.50	13.00	207.51	80.03	21	1.00	0.90	1.33	1.05	26	1.12	30	81.73	0.50	1.20	36	NL	1.00	0.44	0.78	1.05	1.00	NL	0.83	0.334	NL	Non Liquefiable Soil
10	13.50	15.50	14.50	233.99	91.79	28	1.00	0.90	1.33	1.05	35	1.04	37	78.01	0.50	1.20	45	NL	1.00	0.57	0.71	1.02	1.00	NL	0.79	0.313	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	260.46	103.56	30	1.00	0.90	1.33	1.05	38	0.98	37	90.99	0.50	1.20	45	NL	1.00	0.61	0.69	0.99	1.00	NL	0.75	0.293	NL	Non Liquefiable Soil
12	16.50	18.50	17.50	286.94	115.32	14	1.00	0.90	1.33	1.05	18	0.93	16	64.19	0.50	1.20	20	0.22	1.00	0.30	0.80	0.97	2.00	0.42	0.71	0.274	1.54	Non Liquefiable Soil
13	18.50	19.50	19.00	313.41	127.09	21	1.00	0.90	1.33	1.05	26	0.89	23	85.69	0.50	1.20	29	0.39	1.00	0.44	0.78	0.95	3.00	1.12	0.67	0.256	4.35	Non Liquefiable Soil
14	19.50	21.50	20.50	339.89	138.85	22	1.00	0.90	1.33	1.05	28	0.85	23	69.66	0.50	1.20	29	0.39	1.00	0.46	0.77	0.93	4.00	1.47	0.63	0.239	6.12	Non Liquefiable Soil
15	21.50	22.50	22.00	366.36	150.62	29	1.00	0.90	1.33	1.05	36	0.81	30	71.37	0.50	1.20	36	NL	1.00	0.59	0.70	0.89	5.00	NL	0.59	0.223	NL	Non Liquefiable Soil
16	22.50	24.50	23.50	393.35	162.89	63	1.00	0.90	1.33	1.05	79	0.78	62	80.79	0.50	1.20	75	NL	1.00	0.85	0.60	0.82	6.00	NL	0.55	0.206	NL	Non Liquefiable Soil
17	24.50	25.50	25.00	422.90	177.73	57	1.00	0.90	1.33	1.05	72	0.75	54	71.93	0.50	1.20	65	NL	1.00	0.85	0.60	0.79	7.00	NL	0.51	0.188	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	452.45	192.57	46	1.00	0.90	1.33	1.05	58	0.72	42	46.82	0.50	1.20	50	NL	1.00	0.85	0.60	0.77	8.00	NL	0.47	0.171	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	482.00	207.41	50	1.00	0.90	1.33	1.05	63	0.69	44	49.25	0.50	1.20	53	NL	1.00	0.85	0.60	0.75	9.00	NL	0.43	0.155	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	506.63	219.78	38	1.00	0.90	1.33	1.05	48	0.67	32	40.20	0.50	1.20	39	NL	1.00	0.85	0.60	0.73	10.00	NL	0.39	0.141	NL	Non Liquefiable Soil

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Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-20
Chainage	1+869
Ground Level (m)	206.25

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Very stiff to Hard, brownish, fine grained Inorganic Clay of Intermediate plast	0.00	3.75	17.65	7.84
2	Very stiff to Hard, brownish, fine grained inorganic silt of low compressibility	3.75	8.25	17.65	7.84
3	Hard, brownish, fine grained Inorganic Clay of Intermediate plasticity with gr	8.25	12.25	17.65	7.84
4	Hard, brownish, fine grained inorganic silt of low compressibility with sand (M	12.25	14.25	17.65	7.84
5	Very stiff to Hard, brownish to grayey, fine grained Inorganic Clay of low plas	14.25	17.25	19.20	9.39
6	Hard, brownish, fine grained inorganic silt of low compressibility with sand a	17.25	23.25	18.15	8.34
7	Very dense, greyey, fine-grained silty sand with gravel (SM)	23.25	30.00	20.6	10.79

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{max}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $N_1)_{60CS} > 30$)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	13.24	5.88	20	0.75	0.90	1.33	1.05	19	1.70	32	80.06	0.50	1.20	39	NL	1.00	0.32	0.80	1.76	1.00	NL	0.99	0.349	NL	Non Liquefiable Soil
2	1.50	3.50	2.50	44.13	19.61	43	0.75	0.90	1.33	1.05	41	1.70	69	75.97	0.50	1.20	83	NL	1.00	0.85	0.60	1.92	1.00	NL	0.98	0.344	NL	Non Liquefiable Soil
3	3.50	4.50	4.00	70.60	31.37	40	0.85	0.90	1.33	1.05	43	1.70	73	71.57	0.50	1.20	88	NL	1.00	0.85	0.60	1.59	1.00	NL	0.97	0.340	NL	Non Liquefiable Soil
4	4.50	6.50	5.50	97.08	43.14	69	0.85	0.90	1.33	1.05	74	1.52	112	67.22	0.50	1.20	135	NL	1.00	0.85	0.60	1.40	1.00	NL	0.96	0.336	NL	Non Liquefiable Soil
5	6.50	7.50	7.00	123.55	54.90	45	0.95	0.90	1.33	1.05	54	1.35	73	66.27	0.50	1.20	88	NL	1.00	0.85	0.60	1.27	1.00	NL	0.95	0.332	NL	Non Liquefiable Soil
6	7.50	9.50	8.50	150.03	66.67	44	0.95	0.90	1.33	1.05	53	1.22	64	91.90	0.50	1.20	78	NL	1.00	0.85	0.60	1.18	1.00	NL	0.93	0.328	NL	Non Liquefiable Soil
7	9.50	10.50	10.00	176.50	78.43	42	1.00	0.90	1.33	1.05	53	1.13	60	65.62	0.50	1.20	72	NL	1.00	0.85	0.60	1.10	1.00	NL	0.91	0.318	NL	Non Liquefiable Soil
8	10.50	12.50	11.50	202.98	90.20	49	1.00	0.90	1.33	1.05	62	1.05	65	54.14	0.50	1.20	78	NL	1.00	0.85	0.60	1.04	1.00	NL	0.87	0.304	NL	Non Liquefiable Soil
9	12.50	13.50	13.00	229.45	101.96	100	1.00	0.90	1.33	1.05	126	0.99	124	95.57	0.50	1.20	150	NL	1.00	0.85	0.60	0.99	1.00	NL	0.83	0.290	NL	Non Liquefiable Soil
10	13.50	15.50	14.50	256.31	114.12	100	1.00	0.90	1.33	1.05	126	0.94	118	82.62	0.50	1.20	142	NL	1.00	0.85	0.60	0.95	1.00	NL	0.79	0.276	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	285.11	128.21	30	1.00	0.90	1.33	1.05	38	0.88	33	91.24	0.50	1.20	40	NL	1.00	0.61	0.69	0.93	1.00	NL	0.75	0.259	NL	Non Liquefiable Soil
12	16.50	18.50	17.50	313.91	142.30	100	1.00	0.90	1.33	1.05	126	0.84	105	88.60	0.50	1.20	127	NL	1.00	0.85	0.60	0.87	2.00	NL	0.71	0.243	NL	Non Liquefiable Soil
13	18.50	19.50	19.00	342.71	156.39	100	1.00	0.90	1.33	1.05	126	0.80	101	88.20	0.50	1.20	121	NL	1.00	0.85	0.60	0.84	3.00	NL	0.67	0.228	NL	Non Liquefiable Soil
14	19.50	21.50	20.50	371.51	170.48	100	1.00	0.90	1.33	1.05	126	0.77	96	83.17	0.50	1.20	116	NL	1.00	0.85	0.60	0.81	4.00	NL	0.63	0.213	NL	Non Liquefiable Soil
15	21.50	22.50	22.00	400.31	184.57	100	1.00	0.90	1.33	1.05	126	0.74	93	86.89	0.50	1.20	112	NL	1.00	0.85	0.60	0.78	5.00	NL	0.59	0.198	NL	Non Liquefiable Soil
16	22.50	24.50	23.50	429.11	198.66	100	1.00	0.90	1.33	1.05	126	0.71	89	31.29	4.79	1.17	109	NL	1.00	0.85	0.60	0.76	6.00	NL	0.55	0.184	NL	Non Liquefiable Soil
17	24.50	25.50	25.00	457.91	212.75	100	1.00	0.90	1.33	1.05	126	0.69	86	28.26	4.58	1.14	103	NL	1.00	0.85	0.60	0.74	7.00	NL	0.51	0.170	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	486.71	226.84	100	1.00	0.90	1.33	1.05	126	0.66	83	53.37	0.50	1.20	101	NL	1.00	0.85	0.60	0.72	8.00	NL	0.47	0.156	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	515.51	240.93	100	1.00	0.90	1.33	1.05	126	0.64	81	48.38	0.50	1.20	98	NL	1.00	0.85	0.60	0.70	9.00	NL	0.43	0.142	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	539.51	252.67	100	1.00	0.90	1.33	1.05	126	0.63	79	32.33	4.85	1.17	98	NL	1.00	0.85	0.60	0.69	10.00	NL	0.39	0.131	NL	Non Liquefiable Soil

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Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-21
Chainage	1+925
Ground Level (m)	206.16

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Medium stiff to stiff, yellowish, fine grained Inorganic Clay of Intermediate pl	0.00	5.25	16.90	7.09
2	Very stiff to Hard, dark brownish, fine grained inorganic silt of low compressi	5.25	14.25	17.00	7.19
3	Hard, yellow to brownish, fine grained Inorganic Clay of low plasticity with sa	14.25	23.25	18.50	8.69
4	Hard, greyey, fine grained inorganic silt of low compressibility with sand (ML	23.25	27.25	18.50	8.69
5	Very dense, greyey, fine-grained silty sand (SM)	27.25	30.00	19.80	9.99

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{max}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $N_1)_{60CS} > 30$)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	12.68	5.32	6	0.75	0.90	1.33	1.05	6	1.70	10	95.70	0.50	1.20	12	0.13	1.00	0.06	0.80	1.80	1.00	0.24	0.99	0.370	0.64	Liquefiable Soil
2	1.50	3.50	2.50	42.25	17.73	11	0.75	0.90	1.33	1.05	10	1.70	18	97.62	0.50	1.20	22	0.24	1.00	0.19	0.80	1.41	1.00	0.33	0.98	0.365	0.92	Liquefiable Soil
3	3.50	4.50	4.00	67.60	28.37	14	0.85	0.90	1.33	1.05	15	1.70	25	88.17	0.50	1.20	31	NL	1.00	0.26	0.80	1.29	1.00	NL	0.97	0.360	NL	Non Liquefiable Soil
4	4.50	6.50	5.50	92.98	39.04	23	0.85	0.90	1.33	1.05	25	1.60	39	93.62	0.50	1.20	48	NL	1.00	0.41	0.80	1.21	1.00	NL	0.96	0.356	NL	Non Liquefiable Soil
5	6.50	7.50	7.00	118.48	49.83	25	0.95	0.90	1.33	1.05	30	1.42	42	84.64	0.50	1.20	51	NL	1.00	0.49	0.76	1.19	1.00	NL	0.95	0.351	NL	Non Liquefiable Soil
6	7.50	9.50	8.50	143.98	60.62	30	0.95	0.90	1.33	1.05	36	1.28	46	89.08	0.50	1.20	56	NL	1.00	0.58	0.71	1.16	1.00	NL	0.93	0.346	NL	Non Liquefiable Soil
7	9.50	10.50	10.00	169.48	71.41	31	1.00	0.90	1.33	1.05	39	1.18	46	94.01	0.50	1.20	56	NL	1.00	0.63	0.68	1.11	1.00	NL	0.91	0.336	NL	Non Liquefiable Soil
8	10.50	12.50	11.50	194.98	82.20	46	1.00	0.90	1.33	1.05	58	1.10	64	84.69	0.50	1.20	77	NL	1.00	0.85	0.60	1.08	1.00	NL	0.87	0.321	NL	Non Liquefiable Soil
9	12.50	13.50	13.00	220.48	92.99	53	1.00	0.90	1.33	1.05	67	1.04	69	97.00	0.50	1.20	83	NL	1.00	0.85	0.60	1.03	1.00	NL	0.83	0.306	NL	Non Liquefiable Soil
10	13.50	15.50	14.50	246.35	104.15	66	1.00	0.90	1.33	1.05	83	0.98	81	93.92	0.50	1.20	98	NL	1.00	0.85	0.60	0.98	1.00	NL	0.79	0.290	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	274.10	117.19	50	1.00	0.90	1.33	1.05	63	0.92	58	93.64	0.50	1.20	70	NL	1.00	0.85	0.60	0.94	1.00	NL	0.75	0.272	NL	Non Liquefiable Soil
12	16.50	18.50	17.50	301.85	130.23	33	1.00	0.90	1.33	1.05	41	0.88	36	48.61	0.50	1.20	44	NL	1.00	0.85	0.60	0.90	2.00	NL	0.71	0.256	NL	Non Liquefiable Soil
13	18.50	19.50	19.00	329.60	143.27	37	1.00	0.90	1.33	1.05	47	0.84	39	71.21	0.50	1.20	47	NL	1.00	0.85	0.60	0.87	3.00	NL	0.67	0.239	NL	Non Liquefiable Soil
14	19.50	21.50	20.50	357.35	156.31	32	1.00	0.90	1.33	1.05	40	0.80	32	46.65	0.50	1.20	39	NL	1.00	0.85	0.60	0.84	4.00	NL	0.63	0.223	NL	Non Liquefiable Soil
15	21.50	22.50	22.00	385.10	169.35	38	1.00	0.90	1.33	1.05	48	0.77	37	54.24	0.50	1.20	45	NL	1.00	0.85	0.60	0.81	5.00	NL	0.59	0.208	NL	Non Liquefiable Soil
16	22.50	24.50	23.50	412.85	182.39	51	1.00	0.90	1.33	1.05	64	0.74	47	84.07	0.50	1.20	57	NL	1.00	0.85	0.60	0.79	6.00	NL	0.55	0.193	NL	Non Liquefiable Soil
17	24.50	25.50	25.00	440.60	195.43	58	1.00	0.90	1.33	1.05	73	0.72	52	61.94	0.50	1.20	63	NL	1.00	0.85	0.60	0.76	7.00	NL	0.51	0.178	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	468.35	208.47	65	1.00	0.90	1.33	1.05	82	0.69	57	56.47	0.50	1.20	68	NL	1.00	0.85	0.60	0.75	8.00	NL	0.47	0.163	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	497.08	222.49	71	1.00	0.90	1.33	1.05	89	0.67	60	37.69	0.50	1.20	72	NL	1.00	0.85	0.60	0.73	9.00	NL	0.43	0.149	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	521.83	234.98	100	1.00	0.90	1.33	1.05	126	0.65	82	28.76	4.62	1.14	98	NL	1.00	0.85	0.60	0.71	10.00	NL	0.39	0.136	NL	Non Liquefiable Soil

B.3. Zone 3: CH: 1+925 km to 2+586 km (BH-22 to BH-27)

Based on the geotechnical investigation and analysis, the table below provides a summary of liquefiable soil layers, including the computed factor of safety values for liquefaction assessment.

Borehole ID	Top of Layer	Bottom of Layer	N_{SPT}	N_{60}	$(N1)_{60}$	$(N1)_{60cs}$	CRR	CSR	FS_{liq}	Liquefaction Potential
BH-22	0.00	1.50	9	8	14	18	0.35	0.41	0.86	Liquefiable Soil
BH-22	1.50	3.50	9	8	14	18	0.28	0.41	0.68	Liquefiable Soil
BH-22	9.50	10.50	10	13	16	19	0.22	0.36	0.63	Liquefiable Soil
BH-22	10.50	12.50	12	15	17	21	0.25	0.34	0.73	Liquefiable Soil
BH-24	0.00	1.50	11	10	18	22	0.43	0.38	1.13	Liquefiable Soil
BH-25	0.00	1.50	11	10	18	22	0.44	0.40	1.09	Liquefiable Soil
BH-25	1.50	3.50	10	9	16	20	0.31	0.40	0.78	Liquefiable Soil
BH-26	15.50	16.50	19	24	22	27	0.31	0.27	1.17	Liquefiable Soil

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Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-22
Chainage	2+036
Ground Level (m)	207.06

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Stiff, yellowish, fine grained Inorganic Clay of Intermediate plasticity with gra	0.00	4.00	15.70	5.89
2	Very stiff, brownish, fine grained inorganic silt of low compressibility with sar	4.00	14.25	16.70	6.89
3	Very stiff to Hard, brownish, fine grained inorganic silt of low compressibility	14.25	28.00	17.50	7.69
4	Very dense, brownish to greyed, fine-grained silty sand (SM)	28.00	30.00	20.20	10.39

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{mx}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $N_1)_{60CS}$ > 30)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	11.78	4.42	9	0.75	0.90	1.33	1.05	8	1.70	14	93.58	0.50	1.20	18	0.19	1.00	0.16	0.80	1.87	1.00	0.35	0.99	0.413	0.86	Liquefiable Soil
2	1.50	3.50	2.50	39.25	14.73	9	0.75	0.90	1.33	1.05	8	1.70	14	92.31	0.50	1.20	18	0.19	1.00	0.16	0.80	1.47	1.00	0.28	0.98	0.408	0.68	Liquefiable Soil
3	3.50	4.50	4.00	62.80	23.57	16	0.85	0.90	1.33	1.05	17	1.70	29	85.18	0.50	1.20	35	NL	1.00	0.29	0.80	1.34	1.00	NL	0.97	0.403	NL	Non Liquefiable Soil
4	4.50	6.50	5.50	87.85	33.91	21	0.85	0.90	1.33	1.05	22	1.70	38	65.54	0.50	1.20	46	NL	1.00	0.37	0.80	1.24	1.00	NL	0.96	0.387	NL	Non Liquefiable Soil
5	6.50	7.50	7.00	112.90	44.25	25	0.95	0.90	1.33	1.05	30	1.50	45	88.51	0.50	1.20	54	NL	1.00	0.49	0.76	1.22	1.00	NL	0.95	0.377	NL	Non Liquefiable Soil
6	7.50	9.50	8.50	137.95	54.59	19	0.95	0.90	1.33	1.05	23	1.35	31	88.23	0.50	1.20	37	NL	1.00	0.38	0.80	1.13	1.00	NL	0.93	0.369	NL	Non Liquefiable Soil
7	9.50	10.50	10.00	163.00	64.93	10	1.00	0.90	1.33	1.05	13	1.24	16	94.90	0.50	1.20	19	0.21	1.00	0.22	0.80	1.09	1.00	0.22	0.91	0.355	0.63	Liquefiable Soil
8	10.50	12.50	11.50	188.05	75.27	12	1.00	0.90	1.33	1.05	15	1.15	17	95.74	0.50	1.20	21	0.23	1.00	0.26	0.80	1.06	1.00	0.25	0.87	0.338	0.73	Liquefiable Soil
9	12.50	13.50	13.00	213.10	85.61	17	1.00	0.90	1.33	1.05	21	1.08	23	85.59	0.50	1.20	28	0.38	1.00	0.36	0.80	1.03	1.00	0.39	0.83	0.321	1.21	Non Liquefiable Soil
10	13.50	15.50	14.50	238.35	96.15	31	1.00	0.90	1.33	1.05	39	1.02	40	93.67	0.50	1.20	48	NL	1.00	0.63	0.68	1.01	1.00	NL	0.79	0.304	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	264.60	107.69	31	1.00	0.90	1.33	1.05	39	0.96	38	88.45	0.50	1.20	46	NL	1.00	0.63	0.68	0.98	1.00	NL	0.75	0.286	NL	Non Liquefiable Soil
12	16.50	18.50	17.50	290.85	119.23	27	1.00	0.90	1.33	1.05	34	0.92	31	63.94	0.50	1.20	38	NL	1.00	0.55	0.72	0.95	2.00	NL	0.71	0.269	NL	Non Liquefiable Soil
13	18.50	19.50	19.00	317.10	130.77	36	1.00	0.90	1.33	1.05	45	0.87	40	67.78	0.50	1.20	48	NL	1.00	0.85	0.60	0.90	3.00	NL	0.67	0.252	NL	Non Liquefiable Soil
14	19.50	21.50	20.50	343.35	142.31	67	1.00	0.90	1.33	1.05	84	0.84	71	76.73	0.50	1.20	85	NL	1.00	0.85	0.60	0.87	4.00	NL	0.63	0.236	NL	Non Liquefiable Soil
15	21.50	22.50	22.00	369.60	153.85	34	1.00	0.90	1.33	1.05	43	0.81	34	80.94	0.50	1.20	42	NL	1.00	0.85	0.60	0.84	5.00	NL	0.59	0.220	NL	Non Liquefiable Soil
16	22.50	24.50	23.50	395.85	165.39	41	1.00	0.90	1.33	1.05	52	0.78	40	69.08	0.50	1.20	49	NL	1.00	0.85	0.60	0.82	6.00	NL	0.55	0.204	NL	Non Liquefiable Soil
17	24.50	25.50	25.00	422.10	176.93	45	1.00	0.90	1.33	1.05	57	0.75	43	81.68	0.50	1.20	52	NL	1.00	0.85	0.60	0.80	7.00	NL	0.51	0.188	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	448.35	188.47	56	1.00	0.90	1.33	1.05	70	0.73	51	69.26	0.50	1.20	62	NL	1.00	0.85	0.60	0.78	8.00	NL	0.47	0.173	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	474.60	200.01	62	1.00	0.90	1.33	1.05	78	0.71	55	36.68	0.50	1.20	67	NL	1.00	0.85	0.60	0.76	9.00	NL	0.43	0.158	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	499.85	213.01	74	1.00	0.90	1.33	1.05	93	0.69	64	38.23	0.50	1.20	77	NL	1.00	0.85	0.60	0.74	10.00	NL	0.39	0.144	NL	Non Liquefiable Soil

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Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-23
Chainage	2+116
Ground Level (m)	205.26

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Very stiff, brownish, fine grained inorganic silt of low compressibility with sar	0.00	4.00	17.55	7.74
2	Very stiff to Hard, brownish, fine grained inorganic silt of low compressibility	4.00	20.25	17.90	8.09
3	Very dense, greyed, fine-grained silty sand with gravel (SM)	20.25	30.00	19.85	10.04
4					
5					

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{mx}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $N_1)_{60CS}$ > 30)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	13.16	5.81	24	0.75	0.90	1.33	1.05	23	1.70	38	73.43	0.50	1.20	47	NL	1.00	0.38	0.80	1.77	1.00	NL	0.99	0.352	NL	Non Liquefiable Soil
2	1.50	3.50	2.50	43.88	19.36	29	0.75	0.90	1.33	1.05	27	1.70	46	66.43	0.50	1.20	56	NL	1.00	0.45	0.77	1.45	1.00	NL	0.98	0.347	NL	Non Liquefiable Soil
3	3.50	4.50	4.00	70.20	30.97	33	0.85	0.90	1.33	1.05	35	1.70	60	46.35	0.50	1.20	72	NL	1.00	0.58	0.71	1.40	1.00	NL	0.97	0.343	NL	Non Liquefiable Soil
4	4.50	6.50	5.50	97.05	43.11	38	0.85	0.90	1.33	1.05	41	1.52	62	48.22	0.50	1.20	75	NL	1.00	0.85	0.60	1.40	1.00	NL	0.96	0.336	NL	Non Liquefiable Soil
5	6.50	7.50	7.00	123.90	55.25	43	0.95	0.90	1.33	1.05	51	1.35	69	40.03	0.50	1.20	83	NL	1.00	0.85	0.60	1.27	1.00	NL	0.95	0.331	NL	Non Liquefiable Soil
6	7.50	9.50	8.50	150.75	67.39	55	0.95	0.90	1.33	1.05	66	1.22	80	63.18	0.50	1.20	96	NL	1.00	0.85	0.60	1.17	1.00	NL	0.93	0.326	NL	Non Liquefiable Soil
7	9.50	10.50	10.00	177.60	79.53	70	1.00	0.90	1.33	1.05	88	1.12	99	96.07	0.50	1.20	119	NL	1.00	0.85	0.60	1.10	1.00	NL	0.91	0.316	NL	Non Liquefiable Soil
8	10.50	12.50	11.50	204.45	91.67	74	1.00	0.90	1.33	1.05	93	1.04	97	88.38	0.50	1.20	117	NL	1.00	0.85	0.60	1.04	1.00	NL	0.87	0.302	NL	Non Liquefiable Soil
9	12.50	13.50	13.00	231.30	103.81	74	1.00	0.90	1.33	1.05	93	0.98	91	62.44	0.50	1.20	110	NL	1.00	0.85	0.60	0.99	1.00	NL	0.83	0.287	NL	Non Liquefiable Soil
10	13.50	15.50	14.50	258.15	115.95	72	1.00	0.90	1.33	1.05	90	0.93	84	68.01	0.50	1.20	101	NL	1.00	0.85	0.60	0.94	1.00	NL	0.79	0.273	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	285.00	128.09	81	1.00	0.90	1.33	1.05	102	0.88	90	86.38	0.50	1.20	108	NL	1.00	0.85	0.60	0.91	1.00	NL	0.75	0.259	NL	Non Liquefiable Soil
12	16.50	18.50	17.50	311.85	140.23	84	1.00	0.90	1.33	1.05	106	0.84	89	87.02	0.50	1.20	107	NL	1.00	0.85	0.60	0.87	2.00	NL	0.71	0.245	NL	Non Liquefiable Soil
13	18.50	19.50	19.00	338.70	152.37	87	1.00	0.90	1.33	1.05	109	0.81	89	79.27	0.50	1.20	107	NL	1.00	0.85	0.60	0.84	3.00	NL	0.67	0.231	NL	Non Liquefiable Soil
14	19.50	21.50	20.50	366.04	165.00	100	1.00	0.90	1.33	1.05	126	0.78	98	25.76	4.37	1.12	114	NL	1.00	0.85	0.60	0.82	4.00	NL	0.63	0.217	NL	Non Liquefiable Soil
15	21.50	22.50	22.00	395.81	180.07	100	1.00	0.90	1.33	1.05	126	0.75	94	57.92	0.50	1.20	113	NL	1.00	0.85	0.60	0.79	5.00	NL	0.59	0.201	NL	Non Liquefiable Soil
16	22.50	24.50	23.50	425.59	195.13	100	1.00	0.90	1.33	1.05	126	0.72	90	44.91	0.50	1.20	108	NL	1.00	0.85	0.60	0.77	6.00	NL	0.55	0.186	NL	Non Liquefiable Soil
17	24.50	25.50	25.00	455.36	210.20	100	1.00	0.90	1.33	1.05	126	0.69	87	44.73	0.50	1.20	105	NL	1.00	0.85	0.60	0.74	7.00	NL	0.51	0.171	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	485.14	225.26	100	1.00	0.90	1.33	1.05	126	0.67	84	39.88	0.50	1.20	101	NL	1.00	0.85	0.60	0.72	8.00	NL	0.47	0.157	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	514.91	240.33	100	1.00	0.90	1.33	1.05	126	0.65	81	73.38	0.50	1.20	98	NL	1.00	0.85	0.60	0.70	9.00	NL	0.43	0.143	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	539.73	252.88	100	1.00	0.90	1.33	1.05	126	0.63	79	71.27	0.50	1.20	95	NL	1.00	0.85	0.60	0.69	10.00	NL	0.39	0.131	NL	Non Liquefiable Soil

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Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-23A
Chainage	2+257
Ground Level (m)	206.28

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Stiff, brownish, fine-grained inorganic silt of low compressibility with sand (M	0.00	3.25	16.40	6.59
2	Very stiff, greyed, fine grained inorganic silt of low compressibility with sand	3.25	18.25	17.00	7.19
3	Very stiff to hard, brownish, fine-grained inorganic silt of low compressibility	18.25	25.00	18.80	8.99
4	Dense to very dense, brownish, fine-grained silty sand with gravel (SM)	25.00	30.00	18.80	8.99
5					

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{mx}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $N_1)_{60CS}$ > 30)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	12.30	4.95	13	0.75	0.90	1.33	1.05	12	1.70	21	71.42	0.50	1.20	25	0.30	1.00	0.22	0.80	1.82	1.00	0.55	0.99	0.386	1.43	Non Liquefiable Soil
2	1.50	3.50	2.50	41.00	16.48	18	0.75	0.90	1.33	1.05	17	1.70	29	77.00	0.50	1.20	35	NL	1.00	0.29	0.80	1.43	1.00	NL	0.98	0.381	NL	Non Liquefiable Soil
3	3.50	4.50	4.00	66.05	26.82	22	0.85	0.90	1.33	1.05	24	1.70	40	77.00	0.50	1.20	48	NL	1.00	0.39	0.80	1.30	1.00	NL	0.97	0.372	NL	Non Liquefiable Soil
4	4.50	6.50	5.50	91.55	37.61	19	0.85	0.90	1.33	1.05	20	1.63	33	35.55	0.50	1.20	40	NL	1.00	0.34	0.80	1.22	1.00	NL	0.96	0.364	NL	Non Liquefiable Soil
5	6.50	7.50	7.00	117.05	48.40	22	0.95	0.90	1.33	1.05	26	1.44	38	65.60	0.50	1.20	46	NL	1.00	0.43	0.78	1.17	1.00	NL	0.95	0.357	NL	Non Liquefiable Soil
6	7.50	9.50	8.50	142.55	59.19	17	0.95	0.90	1.33	1.05	20	1.30	26	57.34	0.50	1.20	32	NL	1.00	0.34	0.80	1.11	1.00	NL	0.93	0.351	NL	Non Liquefiable Soil
7	9.50	10.50	10.00	168.05	69.98	22	1.00	0.90	1.33	1.05	28	1.20	33	58.38	0.50	1.20	40	NL	1.00	0.46	0.77	1.08	1.00	NL	0.91	0.340	NL	Non Liquefiable Soil
8	10.50	12.50	11.50	193.55	80.77	24	1.00	0.90	1.33	1.05	30	1.11	34	66.46	0.50	1.20	41	NL	1.00	0.49	0.75	1.05	1.00	NL	0.87	0.324	NL	Non Liquefiable Soil
9	12.50	13.50	13.00	219.05	91.56	28	1.00	0.90	1.33	1.05	35	1.05	37	68.83	0.50	1.20	45	NL	1.00	0.57	0.71	1.03	1.00	NL	0.83	0.309	NL	Non Liquefiable Soil
10	13.50	15.50	14.50	244.55	102.35	29	1.00	0.90	1.33	1.05	36	0.99	36	33.59	4.91	1.18	48	NL	1.00	0.59	0.70	0.99	1.00	NL	0.79	0.293	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	270.05	113.14	28	1.00	0.90	1.33	1.05	35	0.94	33	53.14	0.50	1.20	40	NL	1.00	0.57	0.71	0.97	1.00	NL	0.75	0.278	NL	Non Liquefiable Soil
12	16.50	18.50	17.50	295.55	123.93	37	1.00	0.90	1.33	1.05	47	0.90	42	60.58	0.50	1.20	51	NL	1.00	0.85	0.60	0.92	2.00	NL	0.71	0.263	NL	Non Liquefiable Soil
13	18.50	19.50	19.00	322.40	136.07	35	1.00	0.90	1.33	1.05	44	0.86	38	60.58	0.50	1.20	46	NL	1.00	0.85	0.60	0.88	3.00	NL	0.67	0.246	NL	Non Liquefiable Soil
14	19.50	21.50	20.50	350.60	149.56	40	1.00	0.90	1.33	1.05	50	0.82	41	54.32	0.50	1.20	50	NL	1.00	0.85	0.60	0.85	4.00	NL	0.63	0.229	NL	Non Liquefiable Soil
15	21.50	22.50	22.00	378.80	163.05	48	1.00	0.90	1.33	1.05	60	0.78	47	66.76	0.50	1.20	57	NL	1.00	0.85	0.60	0.82	5.00	NL	0.59	0.213	NL	Non Liquefiable Soil
16	22.50	24.50	23.50	407.00	176.54	29	1.00	0.90	1.33	1.05	36	0.75	27	54.30	0.50	1.20	33	NL	1.00	0.59	0.70	0.84	6.00	NL	0.55	0.197	NL	Non Liquefiable Soil
17	24.50	25.50	25.00	435.20	190.03	41	1.00	0.90	1.33	1.05	52	0.73	37	57.98	0.50	1.20	45	NL	1.00	0.85	0.60	0.77	7.00	NL	0.51	0.181	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	463.40	203.52	60	1.00	0.90	1.33	1.05	75	0.70	53	48.72	0.50	1.20	64	NL	1.00	0.85	0.60	0.75	8.00	NL	0.47	0.166	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	491.60	217.01	77	1.00	0.90	1.33	1.05	97	0.68	66	68.64	0.50	1.20	79	NL	1.00	0.85	0.60	0.73	9.00	NL	0.43	0.151	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	515.10	228.26	100	1.00	0.90	1.33	1.05	126	0.66	83	77.07	0.50	1.20	100	NL	1.00	0.85	0.60	0.72	10.00	NL	0.39	0.138	NL	Non Liquefiable Soil

Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-23B
Chainage	2+190
Ground Level (m)	206.94

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Very stiff, Yellowish, fine-grained inorganic silt of low compressibility with sa	0.00	4.00	16.50	6.69
2	Hard, yellow to brownish, fine-grained inorganic silt of low compressibility w	4.00	15.25	18.70	8.89
3	Hard, greyed to brownish, fine-grained inorganic silt of low compressibility w	15.25	30.00	20.00	10.19
4					
5					

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{mx}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $N_1)_{60CS}$ > 30)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	12.38	5.02	30	0.75	0.90	1.33	1.05	28	1.70	48	71.42	0.50	1.20	58	NL	1.00	0.46	0.77	2.00	1.00	NL	0.99	0.382	NL	Non Liquefiable Soil
2	1.50	3.50	2.50	41.25	16.73	33	0.75	0.90	1.33	1.05	31	1.70	53	71.42	0.50	1.20	64	NL	1.00	0.51	0.75	1.58	1.00	NL	0.98	0.377	NL	Non Liquefiable Soil
3	3.50	4.50	4.00	66.00	26.77	42	0.85	0.90	1.33	1.05	45	1.70	76	77.00	0.50	1.20	92	NL	1.00	0.85	0.60	1.69	1.00	NL	0.97	0.373	NL	Non Liquefiable Soil
4	4.50	6.50	5.50	94.05	40.11	41	0.85	0.90	1.33	1.05	44	1.58	69	35.55	0.50	1.20	83	NL	1.00	0.85	0.60	1.44	1.00	NL	0.96	0.350	NL	Non Liquefiable Soil
5	6.50	7.50	7.00	122.10	53.45	46	0.95	0.90	1.33	1.05	55	1.37	75	65.60	0.50	1.20	91	NL	1.00	0.85	0.60	1.28	1.00	NL	0.95	0.337	NL	Non Liquefiable Soil
6	7.50	9.50	8.50	150.15	66.79	65	0.95	0.90	1.33	1.05	78	1.22	95	57.34	0.50	1.20	114	NL	1.00	0.85	0.60	1.18	1.00	NL	0.93	0.328	NL	Non Liquefiable Soil
7	9.50	10.50	10.00	178.20	80.13	100	1.00	0.90	1.33	1.05	126	1.12	140	58.38	0.50	1.20	169	NL	1.00	0.85	0.60	1.09	1.00	NL	0.91	0.315	NL	Non Liquefiable Soil
8	10.50	12.50	11.50	206.25	93.47	60	1.00	0.90	1.33	1.05	75	1.03	78	66.46	0.50	1.20	94	NL	1.00	0.85	0.60	1.03	1.00	NL	0.87	0.298	NL	Non Liquefiable Soil
9	12.50	13.50	13.00	234.30	106.81	70	1.00	0.90	1.33	1.05	88	0.97	85	68.83	0.50	1.20	103	NL	1.00	0.85	0.60	0.97	1.00	NL	0.83	0.283	NL	Non Liquefiable Soil
10	13.50	15.50	14.50	262.35	120.15	100	1.00	0.90	1.33	1.05	126	0.91	115	33.59	4.91	1.18	141	NL	1.00	0.85	0.60	0.93	1.00	NL	0.79	0.268	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	291.38	134.47	100	1.00	0.90	1.33	1.05	126	0.86	108	53.14	0.50	1.20	131	NL	1.00	0.85	0.60	0.89	1.00	NL	0.75	0.252	NL	Non Liquefiable Soil
12	16.50	18.50	17.50	321.38	149.76	100	1.00	0.90	1.33	1.05	126	0.82	103	60.58	0.50	1.20	124	NL	1.00	0.85	0.60	0.85	2.00	NL	0.71	0.237	NL	Non Liquefiable Soil
13	18.50	19.50	19.00	351.38	165.05	100	1.00	0.90	1.33	1.05	126	0.78	98	54.32	0.50	1.20	118	NL	1.00	0.85	0.60	0.82	3.00	NL	0.67	0.221	NL	Non Liquefiable Soil
14	19.50	21.50	20.50	381.38	180.34	100	1.00	0.90	1.33	1.05	126	0.74	94	54.32	0.50	1.20	113	NL	1.00	0.85	0.60	0.79	4.00	NL	0.63	0.207	NL	Non Liquefiable Soil
15	21.50	22.50	22.00	411.38	195.63	100	1.00	0.90	1.33	1.05	126	0.71	90	66.76	0.50	1.20	108	NL	1.00	0.85	0.60	0.76	5.00	NL	0.59	0.192	NL	Non Liquefiable Soil
16	22.50	24.50	23.50	441.38	210.92	100	1.00	0.90	1.33	1.05	126	0.69	87	54.30	0.50	1.20	104	NL	1.00	0.85	0.60	0.74	6.00	NL	0.55	0.178	NL	Non Liquefiable Soil
17	24.50	25.50	25.00	471.38	226.21	100	1.00	0.90	1.33	1.05	126	0.66	84	57.98	0.50	1.20	101	NL	1.00	0.85	0.60	0.72	7.00	NL	0.51	0.165	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	501.38	241.50	100	1.00	0.90	1.33	1.05	126	0.64	81	48.72	0.50	1.20	98	NL	1.00	0.85	0.60	0.70	8.00	NL	0.47	0.151	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	531.38	256.79	100	1.00	0.90	1.33	1.05	126	0.62	78	68.64	0.50	1.20	95	NL	1.00	0.85	0.60	0.69	9.00	NL	0.43	0.138	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	556.38	269.53	100	1.00	0.90	1.33	1.05	126	0.61	77	77.07	0.50	1.20	92	NL	1.00	0.85	0.60	0.67	10.00	NL	0.39	0.127	NL	Non Liquefiable Soil

Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-24
Chainage	2+338
Ground Level (m)	206.45

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Very stiff, Brownish, fine grained inorganic silt of low compressibility with sar	0.00	4.00	16.50	6.69
2	Hard, Brownish, fine grained inorganic silt of low compressibility with sand ar	4.00	8.25	17.00	7.19
3	Very dense, brownish, fine-grained silty sand with gravels (SM)	8.25	16.00	17.00	7.19
4	Hard, Brownish, fine grained inorganic silt of low compressibility with sand ar	16.00	23.25	18.60	8.79
5	Very dense, greyed, fine-grained silty sand with gravels (SM)	23.25	30.00	19.00	9.19

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{mx}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $N_1)_{60CS}$ > 30)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	12.38	5.02	11	0.75	0.90	1.33	1.05	10	1.70	18	89.14	0.50	1.20	22	0.24	1.00	0.19	0.80	1.82	1.00	0.43	0.99	0.382	1.13	Liquefiable Soil
2	1.50	3.50	2.50	41.25	16.73	28	0.75	0.90	1.33	1.05	26	1.70	45	80.37	0.50	1.20	54	NL	1.00	0.44	0.78	1.48	1.00	NL	0.98	0.377	NL	Non Liquefiable Soil
3	3.50	4.50	4.00	66.00	26.77	33	0.85	0.90	1.33	1.05	35	1.70	60	79.38	0.50	1.20	72	NL	1.00	0.58	0.71	1.46	1.00	NL	0.97	0.373	NL	Non Liquefiable Soil
4	4.50	6.50	5.50	91.50	37.56	55	0.85	0.90	1.33	1.05	59	1.63	96	68.66	0.50	1.20	116	NL	1.00	0.85	0.60	1.48	1.00	NL	0.96	0.364	NL	Non Liquefiable Soil
5	6.50	7.50	7.00	117.00	48.35	32	0.95	0.90	1.33	1.05	38	1.44	55	65.65	0.50	1.20	66	NL	1.00	0.62	0.69	1.25	1.00	NL	0.95	0.357	NL	Non Liquefiable Soil
6	7.50	9.50	8.50	142.50	59.14	78	0.95	0.90	1.33	1.05	93	1.30	121	22.65	4.01	1.10	137	NL	1.00	0.85	0.60	1.23	1.00	NL	0.93	0.351	NL	Non Liquefiable Soil
7	9.50	10.50	10.00	168.00	69.93	82	1.00	0.90	1.33	1.05	103	1.20	123	58.11	0.50	1.20	148	NL	1.00	0.85	0.60	1.15	1.00	NL	0.91	0.340	NL	Non Liquefiable Soil
8	10.50	12.50	11.50	193.50	80.72	100	1.00	0.90	1.33	1.05	126	1.11	140	24.60	4.25	1.11	160	NL	1.00	0.85	0.60	1.09	1.00	NL	0.87	0.324	NL	Non Liquefiable Soil
9	12.50	13.50	13.00	219.00	91.51	100	1.00	0.90	1.33	1.05	126	1.05	131	46.36	0.50	1.20	158	NL	1.00	0.85	0.60	1.04	1.00	NL	0.83	0.309	NL	Non Liquefiable Soil
10	13.50	15.50	14.50	244.50	102.30	45	1.00	0.90	1.33	1.05	57	0.99	56	37.03	0.50	1.20	68	NL	1.00	0.85	0.60	0.99	1.00	NL	0.79	0.293	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	270.00	113.09	48	1.00	0.90	1.33	1.05	60	0.94	57	84.43	0.50	1.20	69	NL	1.00	0.85	0.60	0.95	1.00	NL	0.75	0.278	NL	Non Liquefiable Soil
12	16.50	18.50	17.50	297.90	126.28	59	1.00	0.90	1.33	1.05	74	0.89	66	91.24	0.50	1.20	80	NL	1.00	0.85	0.60	0.91	2.00	NL	0.71	0.260	NL	Non Liquefiable Soil
13	18.50	19.50	19.00	325.80	139.47	100	1.00	0.90	1.33	1.05	126	0.85	106	91.00	0.50	1.20	128	NL	1.00	0.85	0.60	0.88	3.00	NL	0.67	0.243	NL	Non Liquefiable Soil
14	19.50	21.50	20.50	353.70	152.66	100	1.00	0.90	1.33	1.05	126	0.81	102	29.98	4.70	1.15	122	NL	1.00	0.85	0.60	0.84	4.00	NL	0.63	0.226	NL	Non Liquefiable Soil
15	21.50	22.50	22.00	381.60	165.85	100	1.00	0.90	1.33	1.05	126	0.78	98	63.38	0.50	1.20	118	NL	1.00	0.85	0.60	0.82	5.00	NL	0.59	0.211	NL	Non Liquefiable Soil
16	22.50	24.50	23.50	409.60	179.14	100	1.00	0.90	1.33	1.05	126	0.75	94	53.14	0.50	1.20	113	NL	1.00	0.85	0.60	0.79	6.00	NL	0.55	0.195	NL	Non Liquefiable Soil
17	24.50	25.50	25.00	438.10	192.93	100	1.00	0.90	1.33	1.05	126	0.72	90	66.88	0.50	1.20	109	NL	1.00	0.85	0.60	0.77	7.00	NL	0.51	0.179	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	466.60	206.72	100	1.00	0.90	1.33	1.05	126	0.70	87	25.52	4.34	1.12	102	NL	1.00	0.85	0.60	0.75	8.00	NL	0.47	0.164	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	495.10	220.51	100	1.00	0.90	1.33	1.05	126	0.67	85	32.06	4.83	1.17	104	NL	1.00	0.85	0.60	0.73	9.00	NL	0.43	0.149	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	518.85	232.01	100	1.00	0.90	1.33	1.05	126	0.66	83	29.20	4.65	1.15	99	NL	1.00	0.85	0.60	0.71	10.00	NL	0.39	0.137	NL	Non Liquefiable Soil

Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-25
Chainage	2+404
Ground Level (m)	206

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Stiff to very stiff, Brownish, fine-grained inorganic silt of low compressibility v	0.00	8.25	16.00	6.19
2	Medium dense, brownish, fine-grained silty sand with gravels (SM)	8.25	16.00	16.50	6.69
3	Very stiff, Greyed, fine-grained inorganic silt of low compressibility with sand	16.00	22.00	17.30	7.49
4	Hard, Greyed, fine-grained inorganic silt of low compressibility with sand and	22.00	27.25	18.70	8.89
5	Very dense, greyed, fine-grained silty sand with gravels (SM)	27.25	30.00	18.70	8.89

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{mx}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $N_1)_{60CS}$ > 30)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	12.00	4.65	11	0.75	0.90	1.33	1.05	10	1.70	18	68.38	0.50	1.20	22	0.24	1.00	0.19	0.80	1.85	1.00	0.44	0.99	0.401	1.09	Liquefiable Soil
2	1.50	3.50	2.50	40.00	15.48	10	0.75	0.90	1.33	1.05	9	1.70	16	80.61	0.50	1.20	20	0.21	1.00	0.17	0.80	1.45	1.00	0.31	0.98	0.395	0.78	Liquefiable Soil
3	3.50	4.50	4.00	64.00	24.77	14	0.85	0.90	1.33	1.05	15	1.70	25	45.90	0.50	1.20	31	NL	1.00	0.26	0.80	1.32	1.00	NL	0.97	0.391	NL	Non Liquefiable Soil
4	4.50	6.50	5.50	88.00	34.06	18	0.85	0.90	1.33	1.05	19	1.70	33	45.90	0.50	1.20	40	NL	1.00	0.32	0.80	1.24	1.00	NL	0.96	0.386	NL	Non Liquefiable Soil
5	6.50	7.50	7.00	112.00	43.35	21	0.95	0.90	1.33	1.05	25	1.52	38	74.16	0.50	1.20	46	NL	1.00	0.41	0.79	1.19	1.00	NL	0.95	0.381	NL	Non Liquefiable Soil
6	7.50	9.50	8.50	136.13	52.77	30	0.95	0.90	1.33	1.05	36	1.38	49	74.16	0.50	1.20	60	NL	1.00	0.58	0.71	1.21	1.00	NL	0.93	0.376	NL	Non Liquefiable Soil
7	9.50	10.50	10.00	160.88	62.81	23	1.00	0.90	1.33	1.05	29	1.26	36	51.17	0.50	1.20	44	NL	1.00	0.47	0.76	1.12	1.00	NL	0.91	0.362	NL	Non Liquefiable Soil
8	10.50	12.50	11.50	185.63	72.85	29	1.00	0.90	1.33	1.05	36	1.17	43	50.60	0.50	1.20	52	NL	1.00	0.59	0.70	1.10	1.00	NL	0.87	0.345	NL	Non Liquefiable Soil
9	12.50	13.50	13.00	210.38	82.89	33	1.00	0.90	1.33	1.05	41	1.10	46	49.87	0.50	1.20	55	NL	1.00	0.85	0.60	1.08	1.00	NL	0.83	0.327	NL	Non Liquefiable Soil
10	13.50	15.50	14.50	235.13	92.93	29	1.00	0.90	1.33	1.05	36	1.04	38	43.40	0.50	1.20	46	NL	1.00	0.59	0.70	1.02	1.00	NL	0.79	0.311	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	259.88	102.97	20	1.00	0.90	1.33	1.05	25	0.99	25	50.24	0.50	1.20	30	NL	1.00	0.42	0.79	0.99	1.00	NL	0.75	0.294	NL	Non Liquefiable Soil
12	16.50	18.50	17.50	285.83	114.21	17	1.00	0.90	1.33	1.05	21	0.94	20	69.49	0.50	1.20	24	0.28	1.00	0.36	0.80	0.97	2.00	0.55	0.71	0.276	1.99	Non Liquefiable Soil
13	18.50	19.50	19.00	311.78	125.45	24	1.00	0.90	1.33	1.05	30	0.89	27	75.51	0.50	1.20	33	NL	1.00	0.49	0.75	0.95	3.00	NL	0.67	0.258	NL	Non Liquefiable Soil
14	19.50	21.50	20.50	337.73	136.69	28	1.00	0.90	1.33	1.05	35	0.86	30	50.53	0.50	1.20	37	NL	1.00	0.57	0.71	0.91	4.00	NL	0.63	0.242	NL	Non Liquefiable Soil
15	21.50	22.50	22.00	363.68	147.93	33	1.00	0.90	1.33	1.05	41	0.82	34	72.75	0.50	1.20	41	NL	1.00	0.85	0.60	0.86	5.00	NL	0.59	0.225	NL	Non Liquefiable Soil
16	22.50	24.50	23.50	391.73	161.27	38	1.00	0.90	1.33	1.05	48	0.79	38	83.91	0.50	1.20	46	NL	1.00	0.85	0.60	0.83	6.00	NL	0.55	0.207	NL	Non Liquefiable Soil
17	24.50	25.50	25.00	419.78	174.61	46	1.00	0.90	1.33	1.05	58	0.76	44	73.89	0.50	1.20	53	NL	1.00	0.85	0.60	0.80	7.00	NL	0.51	0.190	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	447.83	187.95	57	1.00	0.90	1.33	1.05	72	0.73	52	78.83	0.50	1.20	63	NL	1.00	0.85	0.60	0.78	8.00	NL	0.47	0.173	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	475.88	201.29	62	1.00	0.90	1.33	1.05	78	0.70	55	80.88	0.50	1.20	66	NL	1.00	0.85	0.60	0.76	9.00	NL	0.43	0.157	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	499.25	212.41	69	1.00	0.90	1.33	1.05	87	0.69	60	29.20	4.65	1.15	73	NL	1.00	0.85	0.60	0.74	10.00	NL	0.39	0.144	NL	Non Liquefiable Soil

GOMA ENGINEERING AND CONSULTANCY
Quality we put forward

Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-26
Chainage	2+532
Ground Level (m)	206.04

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Stiff, yellowish, fine grained Inorganic Clay of Intermediate plasticity with Silt	0.00	5.25	16.50	6.69
2	Very stiff, yellow to Brownish, fine grained inorganic silt of low compressibili	5.25	23.25	17.80	7.99
3	Dense, greyed to brownish, fine-grained silty sand with gravels (SM)	23.25	28.00	18.00	8.19
4	Very dense, greyed, fine-grained silty sand (SM)	28.00	30.00	18.00	8.19
5					
6					
7					

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{mx}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $N_1)_{60CS}$ > 30)

Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils	
Sampler with Liner	No
Hammer Used: Dount hammer with trip/auto	Trip
Hammer Type Correction (C_{HT})	1.33
Borehole Diameter (mm)	150
Borehole Diameter Correction (C_{BD})	1.05
Hammer weight or hight of fall (C_{HW})	1.00
Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	12.38	5.02	12	0.75	0.90	1.33	1.05	11	1.70	19	92.13	0.50	1.20	24	0.27	1.00	0.20	0.80	1.82	1.00	0.48	0.99	0.382	1.27	Non Liquefiable Soil
2	1.50	3.50	2.50	41.25	16.73	15	0.75	0.90	1.33	1.05	14	1.70	24	86.09	0.50	1.20	29	0.43	1.00	0.24	0.80	1.43	1.00	0.61	0.98	0.377	1.62	Non Liquefiable Soil
3	3.50	4.50	4.00	66.00	26.77	13	0.85	0.90	1.33	1.05	14	1.70	24	89.33	0.50	1.20	29	0.40	1.00	0.24	0.80	1.30	1.00	0.52	0.97	0.373	1.40	Non Liquefiable Soil
4	4.50	6.50	5.50	91.08	37.14	20	0.85	0.90	1.33	1.05	21	1.64	35	82.37	0.50	1.20	43	NL	1.00	0.36	0.80	1.22	1.00	NL	0.96	0.366	NL	Non Liquefiable Soil
5	6.50	7.50	7.00	117.78	49.13	24	0.95	0.90	1.33	1.05	29	1.43	41	62.50	0.50	1.20	50	NL	1.00	0.47	0.76	1.18	1.00	NL	0.95	0.354	NL	Non Liquefiable Soil
6	7.50	9.50	8.50	144.48	61.12	28	0.95	0.90	1.33	1.05	33	1.28	43	71.89	0.50	1.20	52	NL	1.00	0.55	0.73	1.14	1.00	NL	0.93	0.345	NL	Non Liquefiable Soil
7	9.50	10.50	10.00	171.18	73.11	24	1.00	0.90	1.33	1.05	30	1.17	35	67.65	0.50	1.20	43	NL	1.00	0.49	0.75	1.08	1.00	NL	0.91	0.331	NL	Non Liquefiable Soil
8	10.50	12.50	11.50	197.88	85.10	20	1.00	0.90	1.33	1.05	25	1.08	27	61.95	0.50	1.20	33	NL	1.00	0.42	0.79	1.03	1.00	NL	0.87	0.314	NL	Non Liquefiable Soil
9	12.50	13.50	13.00	224.58	97.09	18	1.00	0.90	1.33	1.05	23	1.01	23	55.70	0.50	1.20	28	0.37	1.00	0.38	0.80	1.01	1.00	0.37	0.83	0.298	1.25	Non Liquefiable Soil
10	13.50	15.50	14.50	251.28	109.08	27	1.00	0.90	1.33	1.05	34	0.96	32	59.50	0.50	1.20	39	NL	1.00	0.55	0.72	0.98	1.00	NL	0.79	0.283	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	277.98	121.07	19	1.00	0.90	1.33	1.05	24	0.91	22	73.79	0.50	1.20	27	0.33	1.00	0.40	0.80	0.96	1.00	0.31	0.75	0.267	1.17	Liquefiable Soil
12	16.50	18.50	17.50	304.68	133.06	21	1.00	0.90	1.33	1.05	26	0.87	23	92.22	0.50	1.20	28	0.37	1.00	0.44	0.78	0.94	2.00	0.69	0.71	0.252	2.74	Non Liquefiable Soil
13	18.50	19.50	19.00	331.38	145.05	25	1.00	0.90	1.33	1.05	31	0.83	26	78.39	0.50	1.20	32	NL	1.00	0.51	0.74	0.91	3.00	NL	0.67	0.238	NL	Non Liquefiable Soil
14	19.50	21.50	20.50	358.08	157.04	18	1.00	0.90	1.33	1.05	23	0.80	18	54.22	0.50	1.20	22	0.24	1.00	0.38	0.80	0.91	4.00	0.89	0.63	0.223	4.01	Non Liquefiable Soil
15	21.50	22.50	22.00	384.78	169.03	33	1.00	0.90	1.33	1.05	41	0.77	32	56.66	0.50	1.20	39	NL	1.00	0.85	0.60	0.81	5.00	NL	0.59	0.208	NL	Non Liquefiable Soil
16	22.50	24.50	23.50	411.53	181.07	34	1.00	0.90	1.33	1.05	43	0.74	32	45.02	0.50	1.20	39	NL	1.00	0.85	0.60	0.79	6.00	NL	0.55	0.194	NL	Non Liquefiable Soil
17	24.50	25.50	25.00	438.53	193.36	45	1.00	0.90	1.33	1.05	57	0.72	41	81.67	0.50	1.20	49	NL	1.00	0.85	0.60	0.77	7.00	NL	0.51	0.179	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	465.53	205.65	55	1.00	0.90	1.33	1.05	69	0.70	48	56.27	0.50	1.20	58	NL	1.00	0.85	0.60	0.75	8.00	NL	0.47	0.165	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	492.53	217.94	72	1.00	0.90	1.33	1.05	90	0.68	61	34.75	4.97	1.19	78	NL	1.00	0.85	0.60	0.73	9.00	NL	0.43	0.150	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	515.03	228.18	78	1.00	0.90	1.33	1.05	98	0.66	65	48.75	0.50	1.20	78	NL	1.00	0.85	0.60	0.72	10.00	NL	0.39	0.138	NL	Non Liquefiable Soil

Liquefaction Susceptibility Assessment (Based on SPT N Value)

Analysis in accordance with IS 1893 (Part 1):2016 ANNEX F (Clause 3.12 & 6.3.5.3)

Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km)
Stretch:	Depot Station to Boraki MMTH (0+000 to 2+600km)

Site Details	
Borehole No.	BH-27
Chainage	2+586
Ground Level (m)	205.97

Density Profile

Sr No.	Layer Discription	from	to	Bulk (kn/m³)	Submerged (kn/m³)
1	Very stiff to hard, yellow, fine grained inorganic silt of low compressibility wit	0.00	5.25	15.60	5.79
2	Hard, brownish, fine-grained inorganic silt of low compressibility with gravel	5.25	11.25	15.60	5.79
3	Very stiff, yellow to brownish, fine-grained inorganic silt of low compressibili	11.25	16.00	18.00	8.19
4	Hard, brownish, fine-grained inorganic silt of low compressibility with clay an	16.00	19.00	18.00	8.19
5	Very stiff, brownish, fine grained inorganic silt of low compressibility with sa	19.00	21.25	19.00	9.19
6	Very dense, greyed, fine-grained silty sand (SM)	21.25	30.00	19.00	9.19

Earthquake Factor	
Seismic Zone	IV
Earthquake Magnitude	7.5
PGA (g) or (a_{mx}/g)	0.24
Factor of Safety (FS)	1.2

NL:Not Liquefiable (if $N_1)_{60CS}$ > 30)

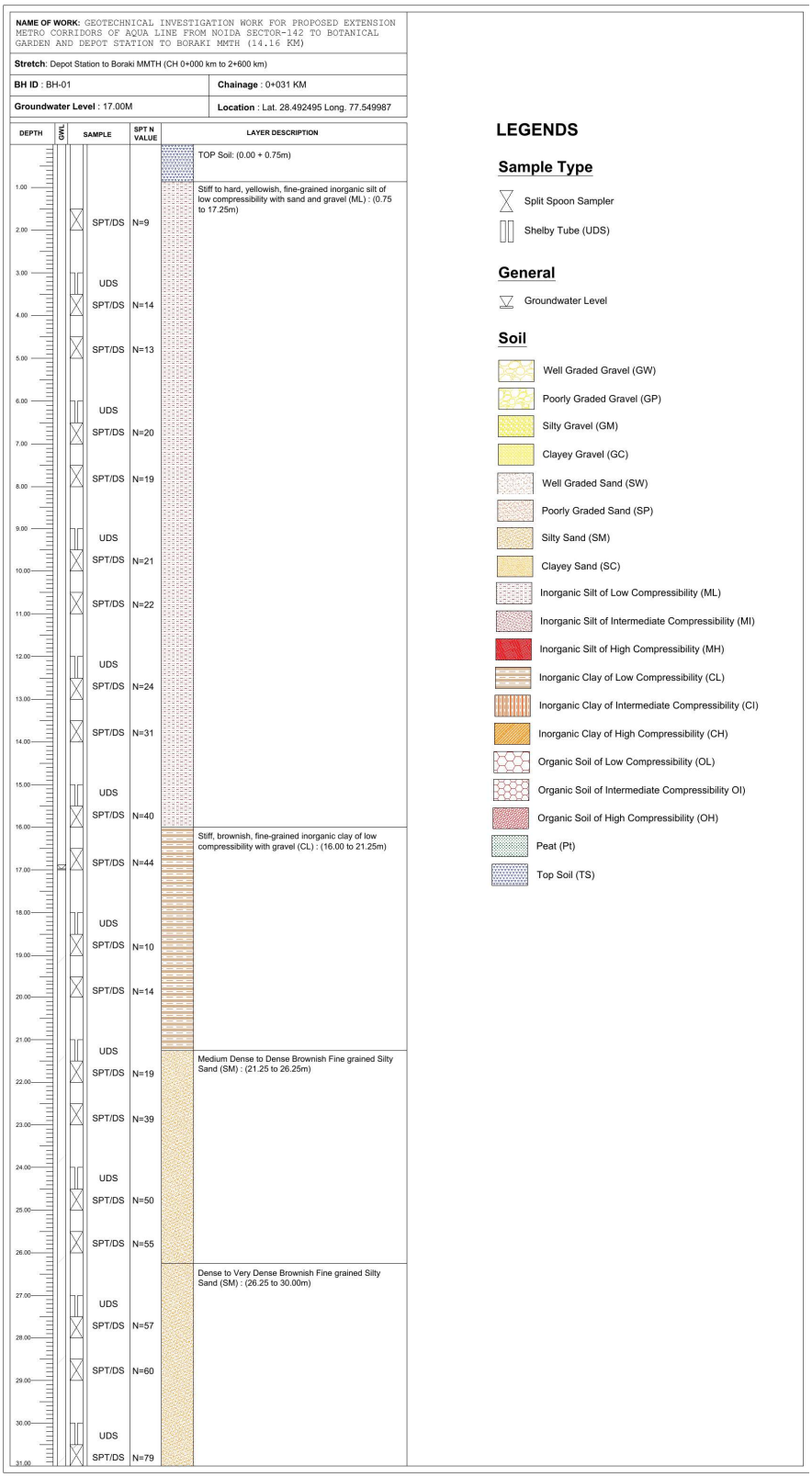
Groundwater Details	
Existing Ground Level, EGL(m)	-
GW Depth (m)	0
Design GW Depth (m)	0
Design GW Level (m)	0

Boring Datils		
	Sampler with Liner	No
Hammer Used	Dount hammer with trip/auto	Trip
	Hammer Type Correction (C_{HT})	1.33
	Borehole Diameter (mm)	150
	Borehole Diameter Correction (C_{BD})	1.05
	Hammer weight or hight of fall (C_{HW})	1.00
	Sampler Correction (C_{SS})	0.90

Layer	Top of Layer	Bottom of Layer	Depth to middle of layer	Total Overburden Pressure at Middle of Layer	Effective Stress at Middle of Layer	NSPT	Correction for rod Length (CRL)	Sampler Correction (CSS)	Hammer Type Correction (CHT)	Borehole Diameter Correction (CBD)	N60	Overburden Correction Factor (CN)	$(N_1)_{60}$	Fines Content	α	β	$(N_1)_{60CS}$	CRR 7.5	Magnitude Scaling Factor (MSF)	Relative Density (D_r)	Factor (f)	Overburden Correction Factor (k_σ)	Sloping Ground Correction Factor (k_α)	CRR	Stress Reduction Factor (rd)	CSR	Computed SF against Liquefaction	Liquefaction
No.	(m)	(m)	(m)	(kn/m²)	(kn/m²)	-	-	-	-	-	-	-	-	%	-	-	-	-	-	-	-	-	-	-	-	-	-
1	0.00	1.50	0.75	11.70	4.35	48	0.75	0.90	1.33	1.05	45	1.70	77	97.21	0.50	1.20	93	NL	1.00	0.85	0.60	3.51	1.00	NL	0.99	0.418	NL	Non Liquefiable Soil
2	1.50	3.50	2.50	39.00	14.48	40	0.75	0.90	1.33	1.05	38	1.70	64	55.47	0.50	1.20	77	NL	1.00	0.61	0.69	1.81	1.00	NL	0.98	0.412	NL	Non Liquefiable Soil
3	3.50	4.50	4.00	62.40	23.17	21	0.85	0.90	1.33	1.05	22	1.70	38	95.06	0.50	1.20	46	NL	1.00	0.37	0.80	1.34	1.00	NL	0.97	0.407	NL	Non Liquefiable Soil
4	4.50	6.50	5.50	85.80	31.86	42	0.85	0.90	1.33	1.05	45	1.70	76	73.09	0.50	1.20	92	NL	1.00	0.85	0.60	1.58	1.00	NL	0.96	0.402	NL	Non Liquefiable Soil
5	6.50	7.50	7.00	109.20	40.55	47	0.95	0.90	1.33	1.05	56	1.57	88	90.12	0.50	1.20	106	NL	1.00	0.85	0.60	1.43	1.00	NL	0.95	0.398	NL	Non Liquefiable Soil
6	7.50	9.50	8.50	132.60	49.24	32	0.95	0.90	1.33	1.05	38	1.43	54	86.71	0.50	1.20	66	NL	1.00	0.62	0.69	1.25	1.00	NL	0.93	0.393	NL	Non Liquefiable Soil
7	9.50	10.50	10.00	156.00	57.93	38	1.00	0.90	1.33	1.05	48	1.31	63	55.20	0.50	1.20	76	NL	1.00	0.85	0.60	1.24	1.00	NL	0.91	0.381	NL	Non Liquefiable Soil
8	10.50	12.50	11.50	180.00	67.22	31	1.00	0.90	1.33	1.05	39	1.22	48	54.14	0.50	1.20	58	NL	1.00	0.63	0.68	1.13	1.00	NL	0.87	0.362	NL	Non Liquefiable Soil
9	12.50	13.50	13.00	207.00	79.51	22	1.00	0.90	1.33	1.05	28	1.12	31	66.60	0.50	1.20	38	NL	1.00	0.46	0.77	1.05	1.00	NL	0.83	0.336	NL	Non Liquefiable Soil
10	13.50	15.50	14.50	234.00	91.80	27	1.00	0.90	1.33	1.05	34	1.04	35	92.82	0.50	1.20	43	NL	1.00	0.55	0.72	1.02	1.00	NL	0.79	0.313	NL	Non Liquefiable Soil
11	15.50	16.50	16.00	261.00	104.09	44	1.00	0.90	1.33	1.05	55	0.98	54	85.35	0.50	1.20	66	NL	1.00	0.85	0.60	0.98	1.00	NL	0.75	0.292	NL	Non Liquefiable Soil
12	16.50	18.50	17.50	288.00	116.38	44	1.00	0.90	1.33	1.05	55	0.93	51	94.81	0.50	1.20	62	NL	1.00	0.85	0.60	0.94	2.00	NL	0.71	0.273	NL	Non Liquefiable Soil
13	18.50	19.50	19.00	315.00	128.67	21	1.00	0.90	1.33	1.05	26	0.88	23	86.69	0.50	1.20	28	0.39	1.00	0.44	0.78	0.95	3.00	1.09	0.67	0.255	4.30	Non Liquefiable Soil
14	19.50	21.50	20.50	343.50	142.46	74	1.00	0.90	1.33	1.05	93	0.84	78	86.69	0.50	1.20	94	NL	1.00	0.85	0.60	0.87	4.00	NL	0.63	0.236	NL	Non Liquefiable Soil
15	21.50	22.50	22.00	372.00	156.25	100	1.00	0.90	1.33	1.05	126	0.80	101	42.61	0.50	1.20	121	NL	1.00	0.85	0.60	0.84	5.00	NL	0.59	0.218	NL	Non Liquefiable Soil
16	22.50	24.50	23.50	400.50	170.04	100	1.00	0.90	1.33	1.05	126	0.77	96	29.76	4.69	1.15	116	NL	1.00	0.85	0.60	0.81	6.00	NL	0.55	0.201	NL	Non Liquefiable Soil
17	24.50	25.50	25.00	429.00	183.83	100	1.00	0.90	1.33	1.05	126	0.74	93	57.21	0.50	1.20	112	NL	1.00	0.85	0.60	0.78	7.00	NL	0.51	0.184	NL	Non Liquefiable Soil
18	25.50	27.50	26.50	457.50	197.62	100	1.00	0.90	1.33	1.05	126	0.71	89	61.70	0.50	1.20	108	NL	1.00	0.85	0.60	0.76	8.00	NL	0.47	0.168	NL	Non Liquefiable Soil
19	27.50	28.50	28.00	486.00	211.41	100	1.00	0.90	1.33	1.05	126	0.69	86	45.14	0.50	1.20	104	NL	1.00	0.85	0.60	0.74	9.00	NL	0.43	0.153	NL	Non Liquefiable Soil
20	28.50	30.00	29.25	509.75	222.91	59	1.00	0.90	1.33	1.05	74	0.67	50	52.74	0.50	1.20	60	NL	1.00	0.85	0.60	0.73	10.00	NL	0.39	0.140	NL	Non Liquefiable Soil

Appendix C Borelog & Test Results

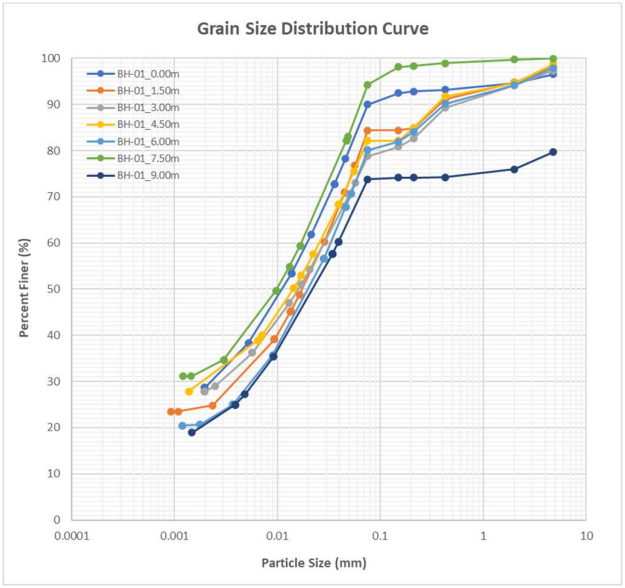
C.1. Zone 1: CH: 0+000 km to 1+004 km (BH-01 to BH-11)

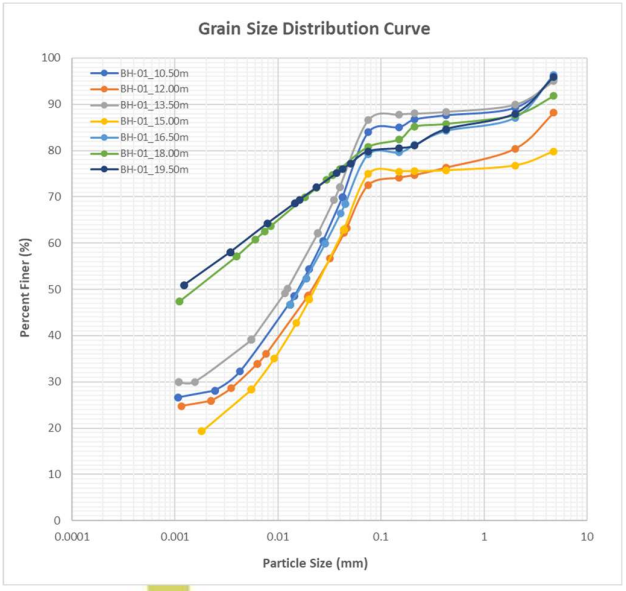


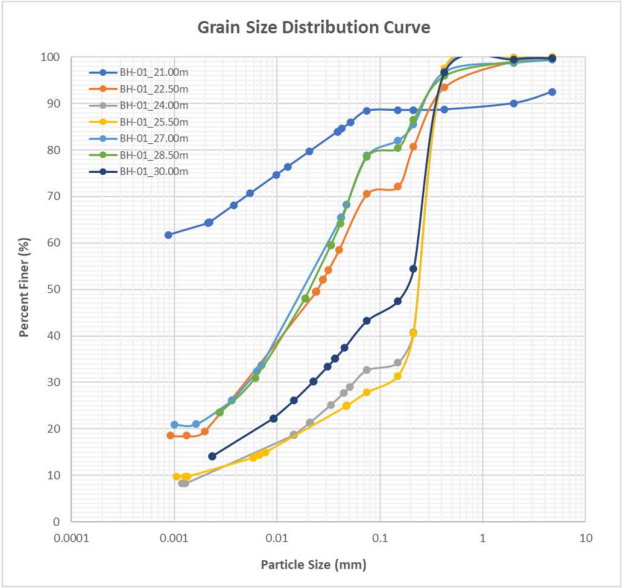
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-01	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	0+031	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	17-10-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	207.05	**End Date:**	17-10-2025
Project Code:	158_R0_DEST TO BOMM_0+000 km TO 2+586 km	**Water table Level [m]:**	17.00	**Location:**	**Lat:** 28°29'31.93", **Long:** 77°32'59.21"

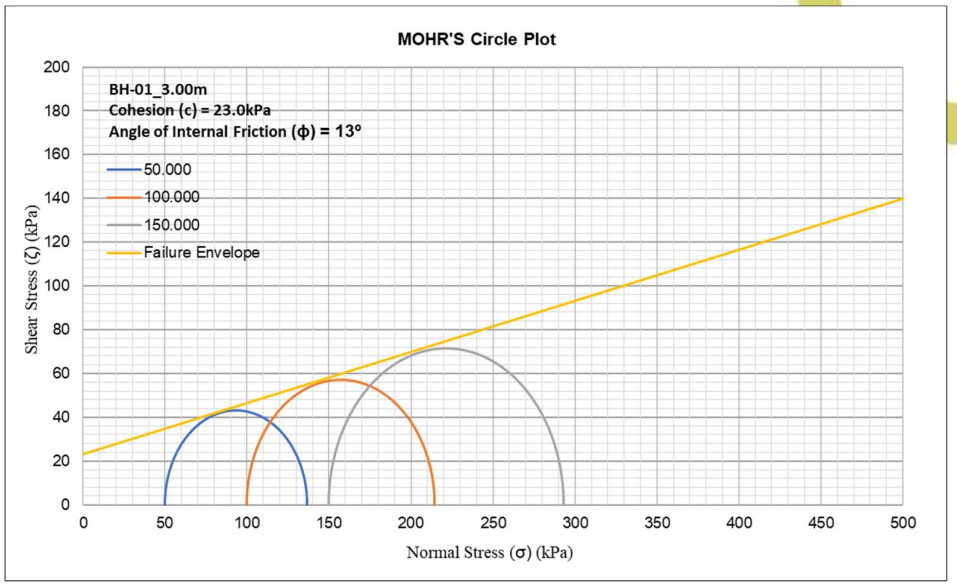
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	3.4	6.6	61.4	28.6	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Stiff to Very Stiff, yellowish, fine-grained inorganic silt of lowPlasticity with sand (ML)	2	3	6	9	13	1.9	13.7	65.7	18.7	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							2.7	18.5	57.2	21.6	28	NP	NP	21.56	2.04	1.68	2.67	F	0.1	23	UU	23	13	0.033	0.099	0.544
3.50	SPT/DS		4	6	8	14	15	-																			
4.50	SPT/DS		3	5	8	13	13	1.3	16.6	64.3	17.8	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							2.1	17.8	56.7	23.4	26	NP	NP	19.12	1.68	1.41	2.65	F	0.28	25	UU	45	24	-	-	-
6.50	SPT/DS		4	8	12	20	19	-																			
7.50	SPT/DS		5	8	11	19	17	0.1	5.7	67.8	26.5	30	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS	Very stiff to hard, yellowish, fine-grained inorganic silt of lowPlasticity with sand and gravel (ML)						20.3	5.9	47.4	26.4	NP	NP	NP	15.18	1.51	1.31	2.52	-	-	-	-	-	-	-	-	-
9.50	SPT/DS		7	11	10	21	18	-																			
10.50	SPT/DS		6	9	13	22	18	4.5	11.6	60.8	23.2	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							11.9	15.6	47.3	25.3	NP	NP	NP	16.2	1.65	1.42	2.50	F	0.07	24	-	-	-	-	-	-
12.50	SPT/DS		7	11	13	24	18	-																			
13.50	SPT/DS		8	14	17	31	22	5.0	8.4	56.1	30.5	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS							20.2	4.8	48.7	26.3	NP	NP	NP	19.11	1.80	1.51	2.53	F	0.11	26	-	-	-	-	-	-
15.50	SPT/DS		10	17	23	40	26	-																			
16.50	SPT/DS		12	19	25	44	28	3.6	17.2	50.4	28.8	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS	Stiff, Browinish, fine grained Inorganic Clay of LowPlasticity with gravel (CL)						8.2	11.0	32.2	48.6	27	17	10	21.2	1.89	1.56	2.49	F	0.13	24	-	-	-	-	-	-
18.50	SPT/DS		4	4	6	10	6	-																			
19.50	SPT/DS		6	7	7	14	8	4.1	16.1	31.1	48.8	30	18	12	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	UDS							7.5	4.1	31.9	56.5	28	17	12	-	-	-	2.57	F	0.18	19	-	-	-	-	-	-
21.50	SPT/DS		8	9	10	19	11	-																			
22.50	SPT/DS	Medium-dense to dense, brownish, fine-grained silty sand (SM)	6	17	22	39	19	0.3	29.2	48.7	21.8	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	UDS							0.1	67.3	21.1	11.6	28	NP	NP	22.33	2.26	1.85	2.67	F	0.0	30	-	-	-	-	-	-
24.50	SPT/DS		10	22	28	50	21	-																			
25.50	SPT/DS	Dense to very dense, brownish, fine-grained silty sand (SM).	12	24	31	55	22	0.0	72.2	16.9	11.0	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	UDS							0.6	20.6	55.9	23.0	25	NP	NP	21.96	1.58	1.30	2.58	F	0.0	31	-	-	-	-	-	-
27.50	SPT/DS		11	25	32	57	22	-																			
28.50	SPT/DS		12	27	33	60	23	0.2	21.3	55.1	23.4	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	UDS							0.2	56.6	27.6	15.6	26	NP	NP	18.08	-	-	2.48	F	0.0	33	-	-	-	-	-	-
30.50	SPT/DS		18	35	44	79	26	-																			

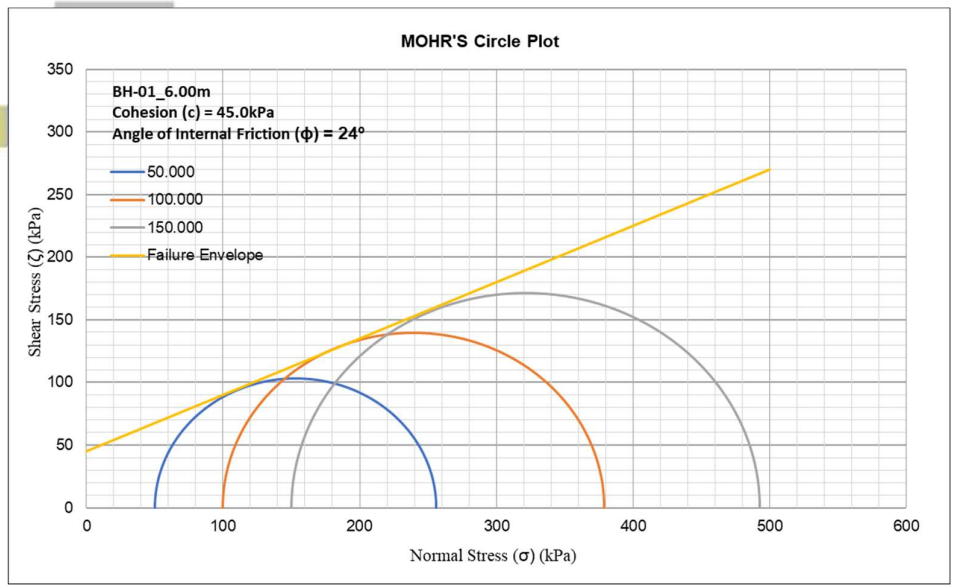
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

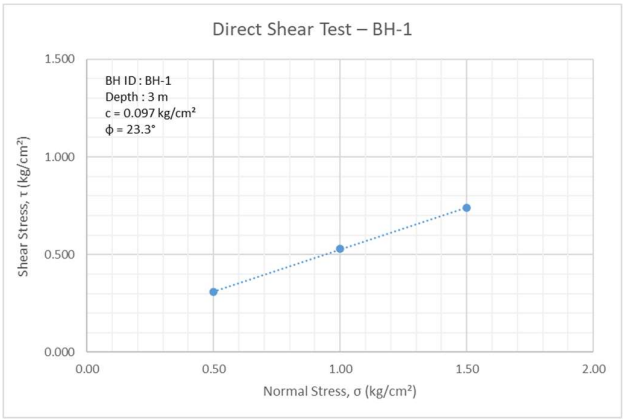

Grain Size Distribution Curve
BH-01_0.00m
BH-01_1.50m
BH-01_3.00m
BH-01_4.50m
BH-01_6.00m
BH-01_7.50m
BH-01_9.00m
Percent Finer (%)
Particle Size (mm)

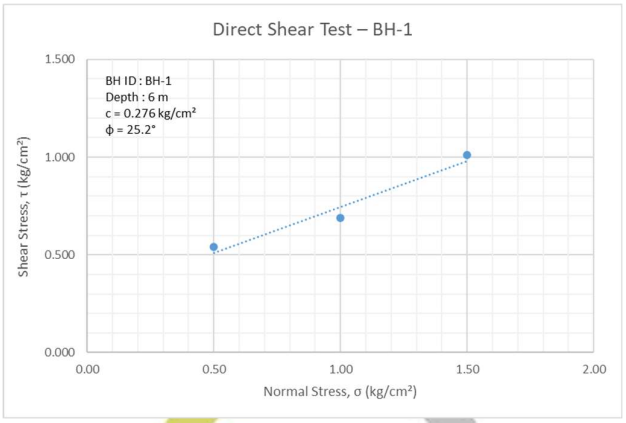

Grain Size Distribution Curve
BH-01_10.50m
BH-01_12.00m
BH-01_13.50m
BH-01_15.00m
BH-01_16.50m
BH-01_18.00m
BH-01_19.50m
Percent Finer (%)
Particle Size (mm)

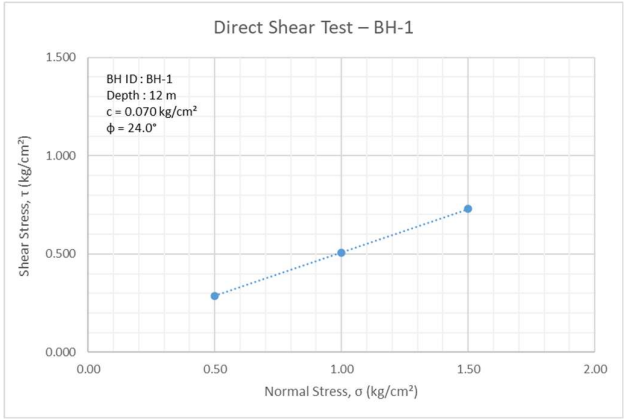

Grain Size Distribution Curve
BH-01_21.00m
BH-01_22.50m
BH-01_24.00m
BH-01_25.50m
BH-01_27.00m
BH-01_28.50m
BH-01_30.00m
Percent Finer (%)
Particle Size (mm)

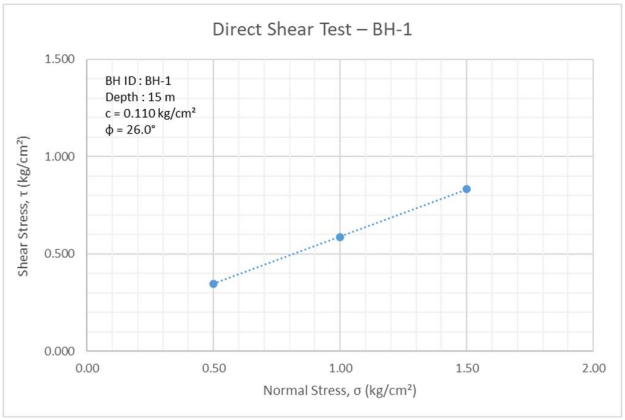

MOHR'S Circle Plot
BH-01_3.00m
Cohesion (c) = 23.0kPa
Angle of Internal Friction (ϕ) = 13°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

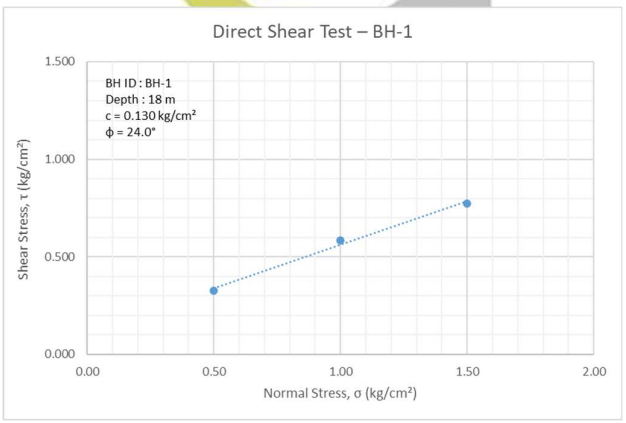

MOHR'S Circle Plot
BH-01_6.00m
Cohesion (c) = 45.0kPa
Angle of Internal Friction (ϕ) = 24°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

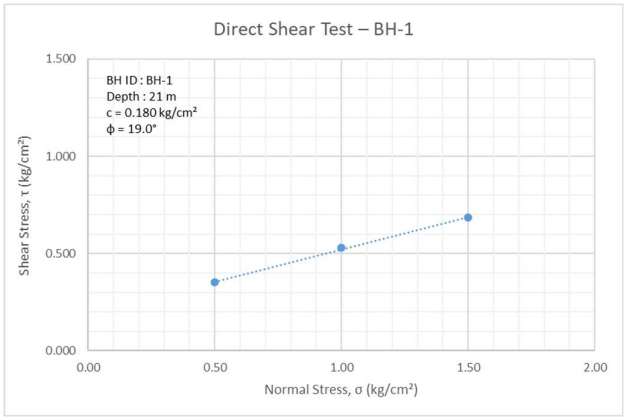

Direct Shear Test – BH-1
BH ID : BH-1
Depth : 3 m
c = 0.097 kg/cm²
ϕ = 23.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

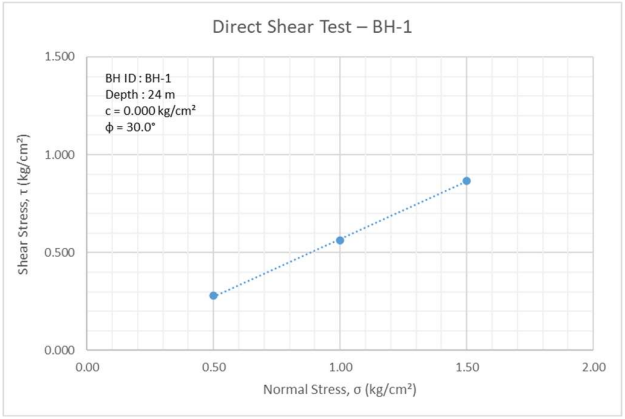

Direct Shear Test – BH-1
BH ID : BH-1
Depth : 6 m
c = 0.276 kg/cm²
ϕ = 25.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

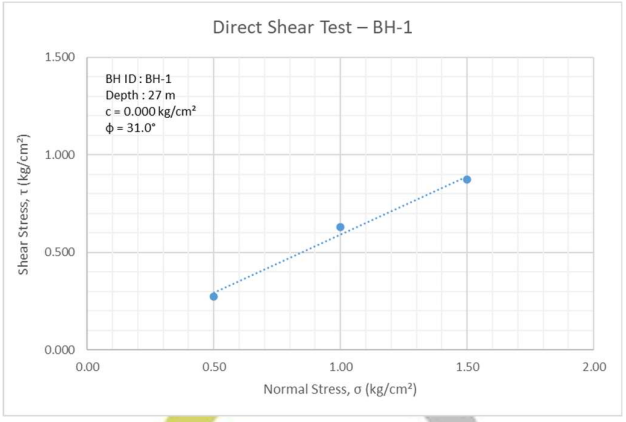

Direct Shear Test – BH-1
BH ID : BH-1
Depth : 12 m
c = 0.070 kg/cm²
ϕ = 24.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-1
BH ID : BH-1
Depth : 15 m
c = 0.110 kg/cm²
ϕ = 26.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-1
BH ID : BH-1
Depth : 18 m
c = 0.130 kg/cm²
ϕ = 24.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-1
BH ID : BH-1
Depth : 21 m
c = 0.180 kg/cm²
ϕ = 19.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-1
BH ID : BH-1
Depth : 24 m
c = 0.000 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-1
BH ID : BH-1
Depth : 27 m
c = 0.000 kg/cm²
ϕ = 31.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Depot Station to Boraki MMTH (CH 0+000 km to 2+600 km)

BH ID : BH-02 | **Chainage** : 0+124 KM

Groundwater Level : 17.50M | **Location** : Lat. 28.493103 Long. 77.550361

DEPTH	GWL	SAMPLE	SPT N VALUE	LAYER DESCRIPTION
0.00				TOP Soil: (0.00 + 0.75m)
1.00				Stiff to hard, brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML) : (0.75 to 17.25 m)
2.00		SPT/DS	N=11	
3.00		UDS		
4.00		SPT/DS	N=15	
5.00		SPT/DS	N=12	
6.00		UDS		
7.00		SPT/DS	N=19	
8.00		SPT/DS	N=14	
9.00		UDS		
10.00		SPT/DS	N=22	
11.00		SPT/DS	N=31	
12.00		UDS		
13.00		SPT/DS	N=18	
14.00		SPT/DS	N=23	
15.00		UDS		
16.00		SPT/DS	N=28	
17.00		SPT/DS	N=33	
18.00		UDS	N=26	Very Stiff, Browinish, fine grained Inorganic Clay of Low Compressibility (CL) : (17.25 to 20.25 m)
19.00		SPT/DS		
20.00		SPT/DS	N=19	
21.00		UDS		Very stiff, yellowish, fine-grained inorganic silt of low compressibility with sand and gravel (ML) : (20.25 to 24.25 m)
22.00		SPT/DS	N=21	
23.00		SPT/DS	N=30	
24.00		UDS		
25.00		SPT/DS	N=36	Hard, yellowish, fine-grained inorganic silt of low compressibility with sand and gravel (ML) or Very dense, yellowish, fine-grained silty sand (SM). : (24.25 to 30 m)
26.00		SPT/DS	N=61	
27.00		UDS		
28.00		SPT/DS	N=64	
29.00		SPT/DS	N=67	
30.00		UDS		
31.00		SPT/DS	N=76	

LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

Soil

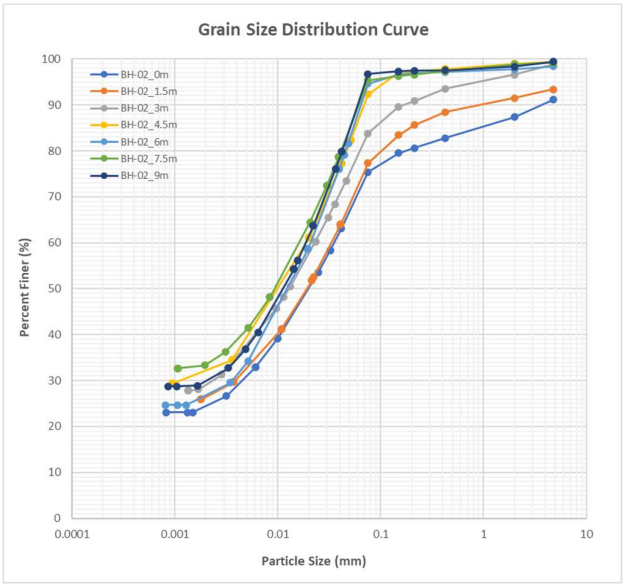
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

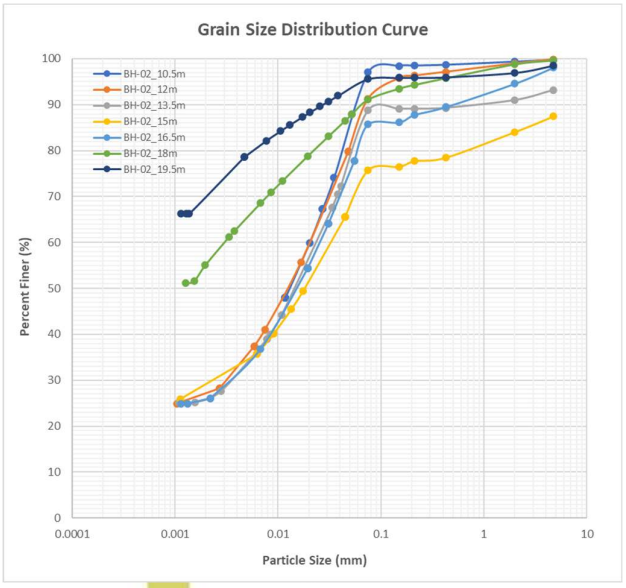
GOMA ENGINEERING AND CONSULTANCY
Quality we put forward

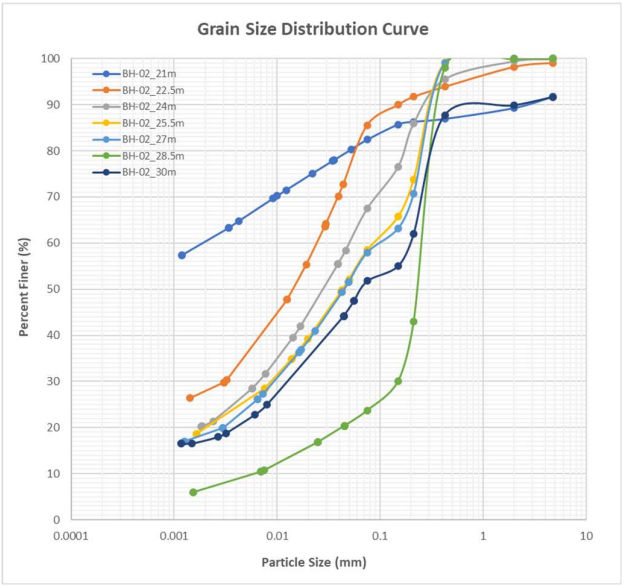
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-02	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	0+124	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	17-10-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	206.73	**End Date:**	17-10-2025
Project Code:	158_R0_DEST TO BOMM_0+000 km TO 2+586 km	**Water table Level [m]:**	17.50	**Location:**	**Lat:** 28°29'33.72", **Long:** 77°33'2.28"

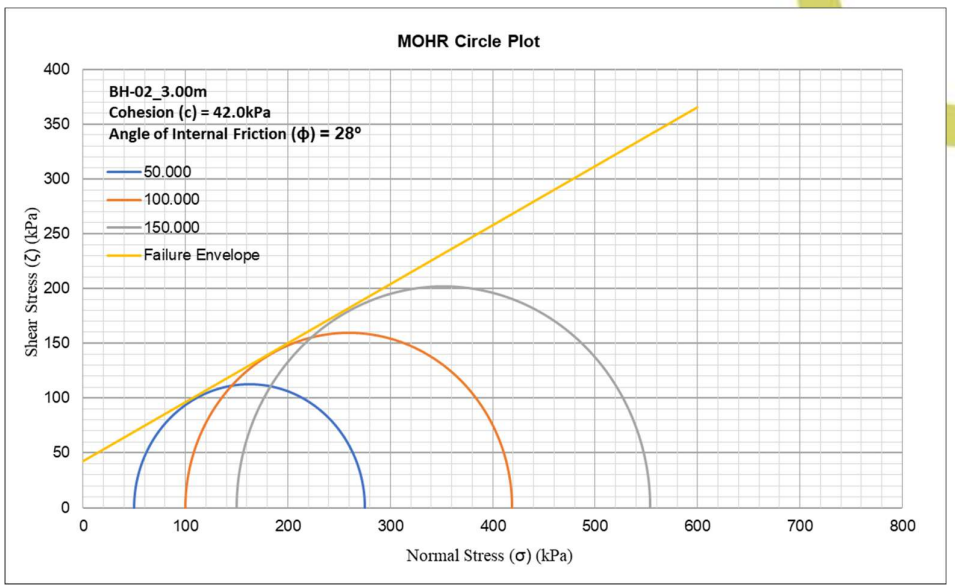
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	8.8	15.8	50.9	24.5	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Stiff, yellowish, fine-grained inorganic silt of lowPlasticity with sand (ML)	4	4	7	11	15	6.6	16.1	50.9	26.5	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							1.2	14.9	54.7	29.1	29	NP	NP	19.27	1.99	1.64	2.73	F	0.1	24	UU	42	28	0.02	0.132	0.771
3.00	SPT/DS		4	7	8	15	16	-																			
4.50	SPT/DS		4	5	7	12	12	0.7	7.0	60.1	32.2	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							1.6	3.8	67.8	26.9	26	NP	NP	17.60	1.84	1.56	2.69	F	0.12	25	UU	13	3	-	-	-
6.50	SPT/DS		6	8	11	19	18	-																			
7.50	SPT/DS		5	6	8	14	13	0.8	3.9	61.9	33.4	30	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS	Very stiff to hard, brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML)						0.6	2.7	66.8	29.9	27	NP	NP	19.08	1.70	1.43	2.74	F	0.07	25	-	-	-	-	-	-
9.50	SPT/DS		6	10	12	22	19	-																			
10.50	SPT/DS		7	15	16	31	25	0.2	2.7	69.8	27.3	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							0.2	8.6	64.2	27.1	24	NP	NP	20.06	1.96	1.63	2.49	F	0.11	26	-	-	-	-	-	-
12.50	SPT/DS		6	8	10	18	14	-																			
13.50	SPT/DS		7	10	13	23	16	6.8	4.5	62.6	26.2	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS							12.6	11.7	46.6	29.2	26	NP	NP	16.20	1.69	1.45	2.50	F	0.16	27	-	-	-	-	-	-
15.50	SPT/DS		6	12	16	28	18	-																			
16.50	SPT/DS		8	15	18	33	21	1.9	12.4	59.9	25.9	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS	Very Stiff, Browinish, fine grained Inorganic Clay of Low Compressibility (CL)						0.3	8.5	35.9	55.3	29	15	14	19.21	1.68	1.41	2.51	F	0.14	23	-	-	-	-	-	-
18.50	SPT/DS		5	10	16	26	15	-																			
19.50	SPT/DS		6	8	11	19	11	1.5	2.9	25.5	70.1	31	17	14	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	UDS	Very stiff, yellowish, fine-grained inorganic silt of low compressibility with sand and gravel (ML)						8.3	9.3	22.1	60.3	23	NP	NP	17.6	1.72	1.46	2.48	F	0.07	28	-	-	-	-	-	-
21.50	SPT/DS		8	9	12	21	12	-																			
22.50	SPT/DS		10	13	17	30	16	0.9	13.5	57.6	27.9	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	UDS							0.1	32.5	46.8	20.6	26	NP	NP	18.6	1.79	1.51	2.53	F	0.15	26	-	-	-	-	-	-
24.50	SPT/DS	Hard, yellowish, fine-grained inorganic silt of low compressibility with sand and gravel (ML) or Very dense, yellowish, fine-grained silty sand (SM).	11	12	24	36	17	-																			
25.50	SPT/DS		13	27	34	61	24	0.0	41.6	38.6	19.8	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	UDS							0.0	42.0	39.4	18.6	25	NP	NP	21.2	-	-	2.55	F	0	30	-	-	-	-	-	-
27.50	SPT/DS		12	28	36	64	24	-																			
28.50	SPT/DS		14	30	37	67	24	0.0	76.3	17.0	6.8	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	UDS							8.3	39.9	34.5	17.3	27	NP	NP	24.1	-	-	2.56	F	0	32	-	-	-	-	-	-
30.50	SPT/DS		13	35	41	76	25	-																			

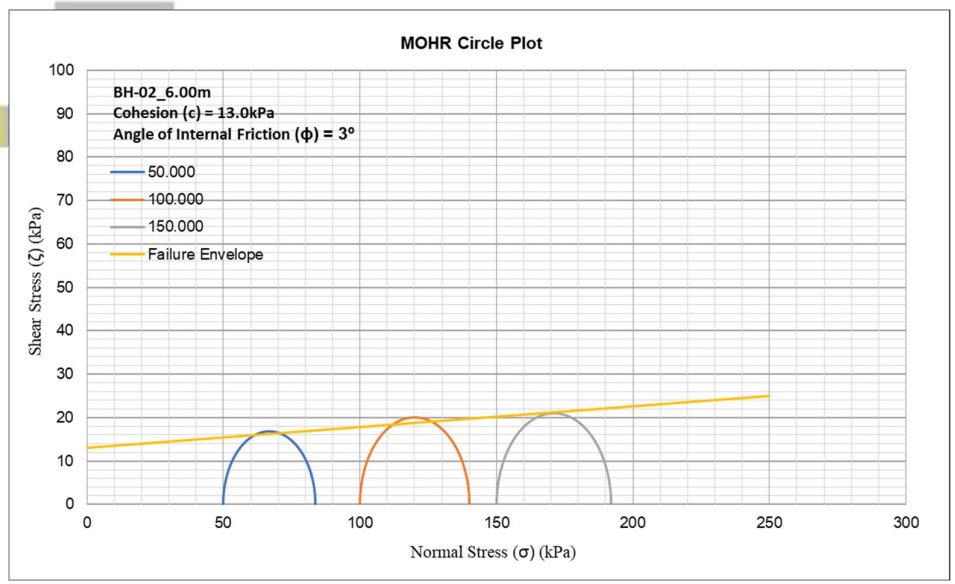
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

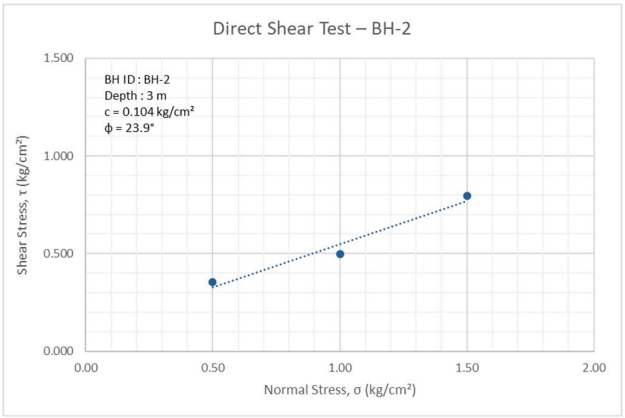

Grain Size Distribution Curve
BH-02_0m
BH-02_1.5m
BH-02_3m
BH-02_4.5m
BH-02_6m
BH-02_7.5m
BH-02_9m
Percent Finer (%)
Particle Size (mm)

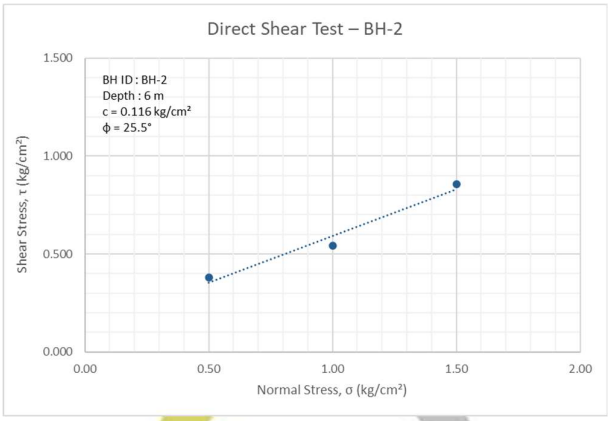

Grain Size Distribution Curve
BH-02_10.5m
BH-02_12m
BH-02_13.5m
BH-02_15m
BH-02_16.5m
BH-02_18m
BH-02_19.5m
Percent Finer (%)
Particle Size (mm)

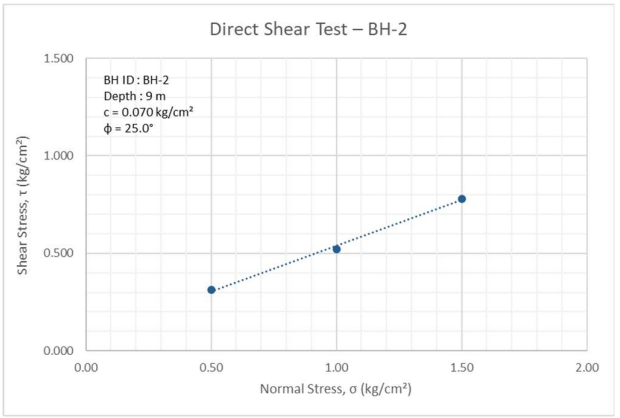

Grain Size Distribution Curve
BH-02_21m
BH-02_22.5m
BH-02_24m
BH-02_25.5m
BH-02_27m
BH-02_28.5m
BH-02_30m
Percent Finer (%)
Particle Size (mm)

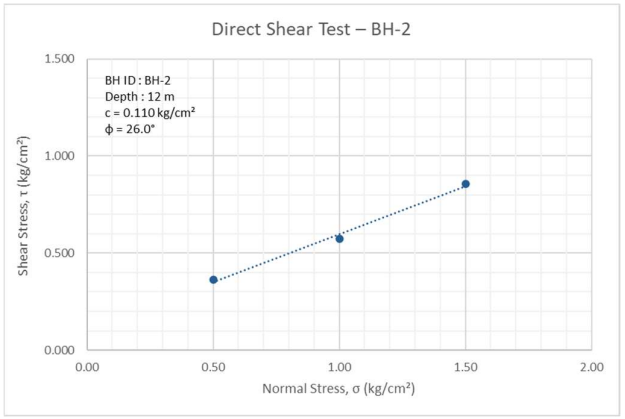

MOHR Circle Plot
BH-02_3.00m
Cohesion (c) = 42.0kPa
Angle of Internal Friction (ϕ) = 28°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

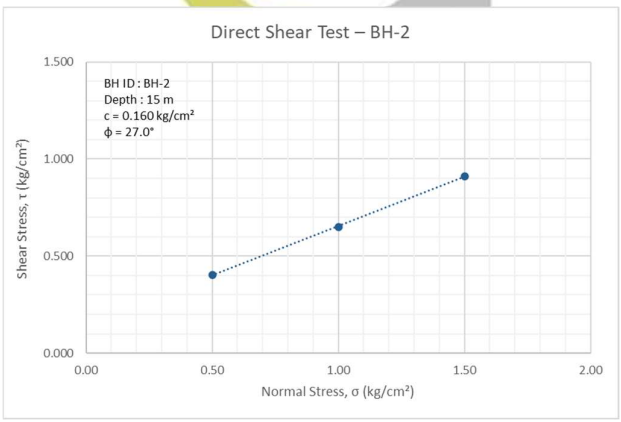

MOHR Circle Plot
BH-02_6.00m
Cohesion (c) = 13.0kPa
Angle of Internal Friction (ϕ) = 3°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

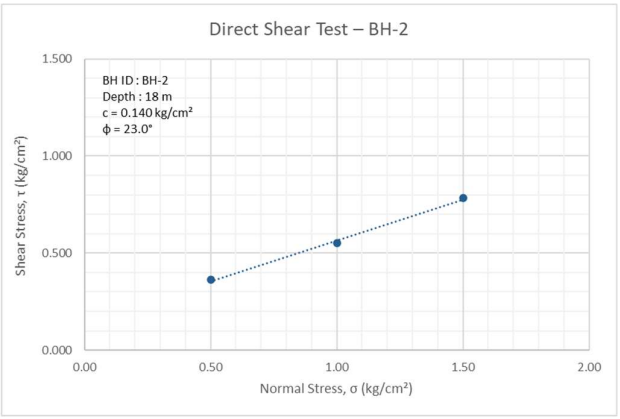

Direct Shear Test – BH-2
BH ID : BH-2
Depth : 3 m
c = 0.104 kg/cm²
ϕ = 23.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

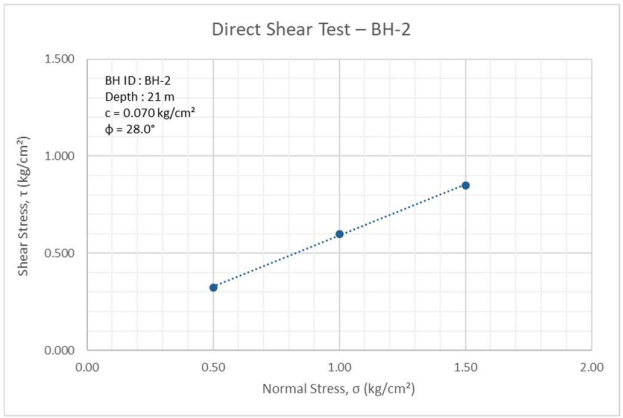

Direct Shear Test – BH-2
BH ID : BH-2
Depth : 6 m
c = 0.116 kg/cm²
ϕ = 25.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

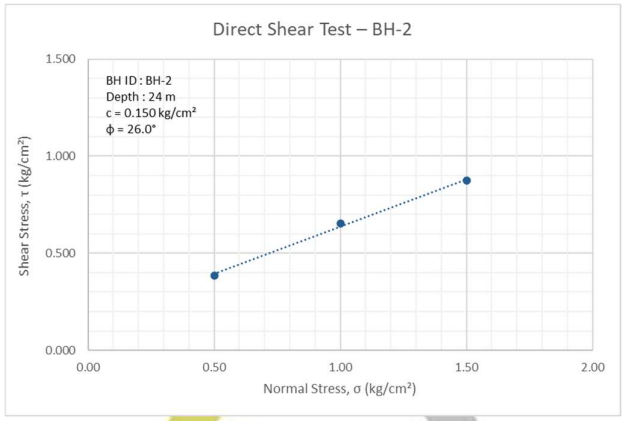

Direct Shear Test – BH-2
BH ID : BH-2
Depth : 9 m
c = 0.070 kg/cm²
ϕ = 25.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

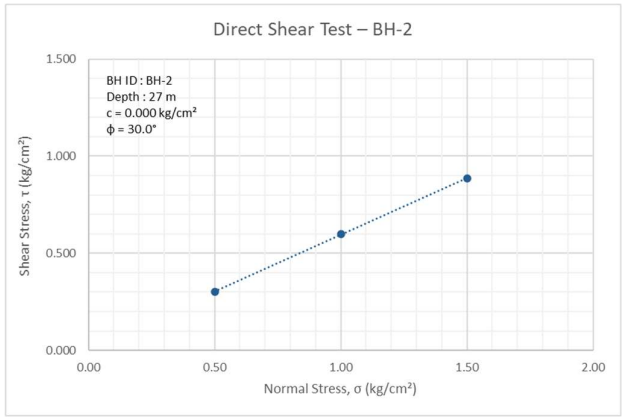

Direct Shear Test – BH-2
BH ID : BH-2
Depth : 12 m
c = 0.110 kg/cm²
ϕ = 26.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

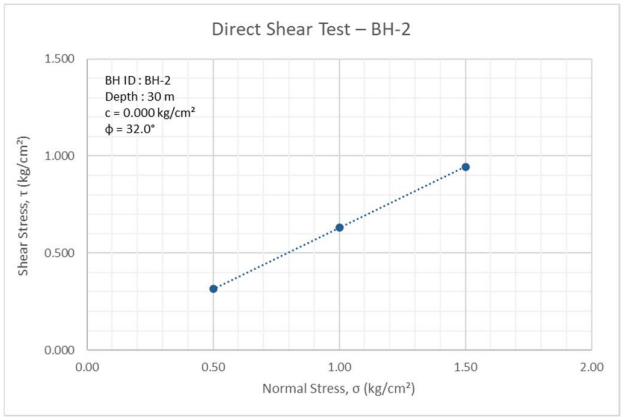

Direct Shear Test – BH-2
BH ID : BH-2
Depth : 15 m
c = 0.160 kg/cm²
ϕ = 27.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-2
BH ID : BH-2
Depth : 18 m
c = 0.140 kg/cm²
ϕ = 23.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-2
BH ID : BH-2
Depth : 21 m
c = 0.070 kg/cm²
ϕ = 28.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-2
BH ID : BH-2
Depth : 24 m
c = 0.150 kg/cm²
ϕ = 26.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-2
BH ID : BH-2
Depth : 27 m
c = 0.000 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

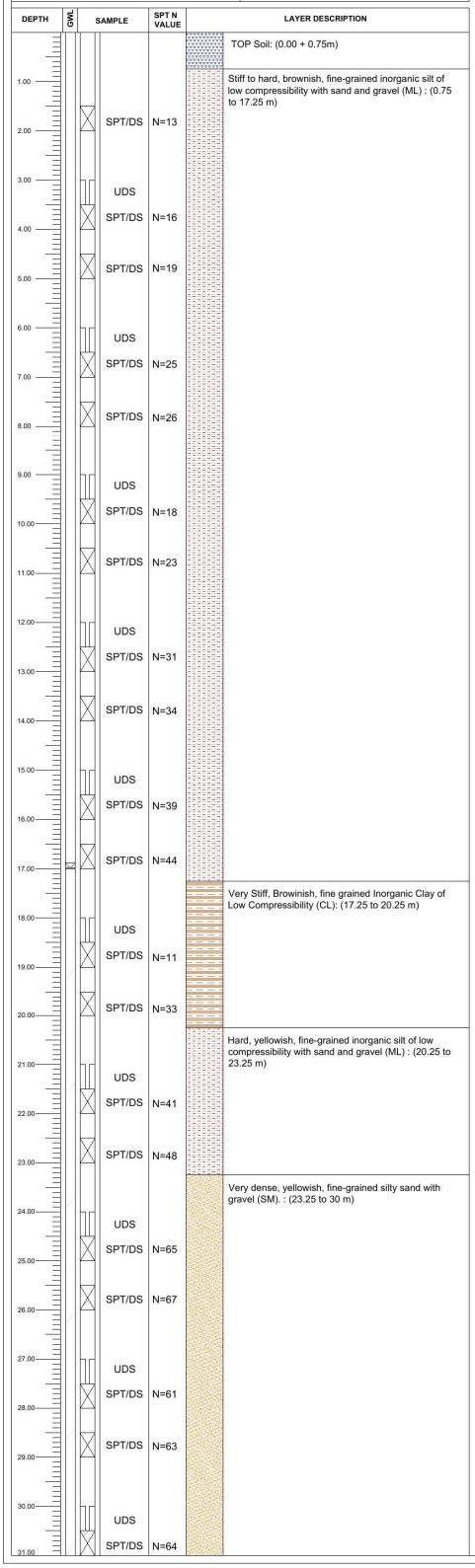

Direct Shear Test – BH-2
BH ID : BH-2
Depth : 30 m
c = 0.000 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Depot Station to Boraki MMTH (CH 0+000 km to 2+600 km)

BH ID : BH-03 | **Chainage** : 0+202 KM

Groundwater Level : 17.00M | **Location** : Lat. 28.493316 Long. 77.551465



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

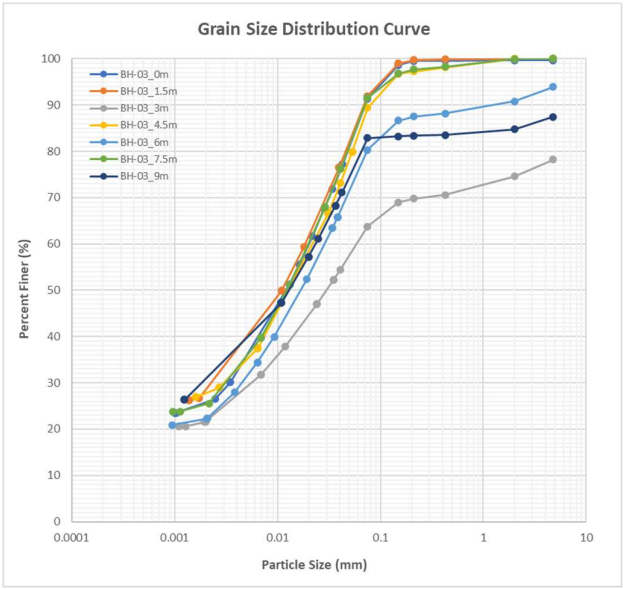
Soil

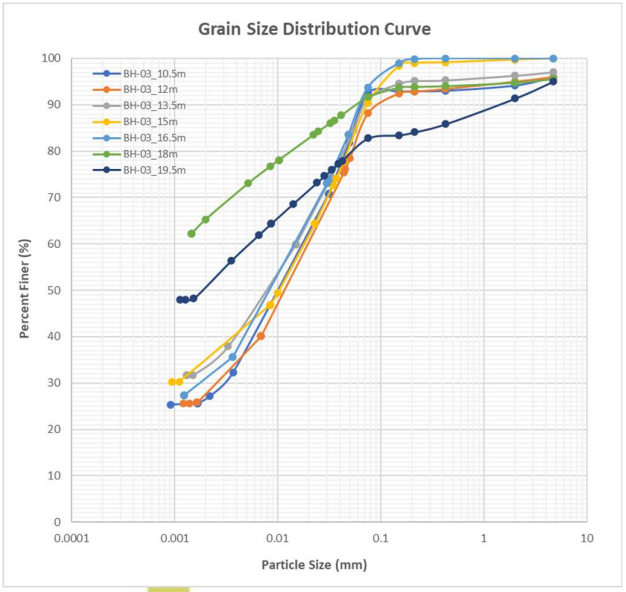
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

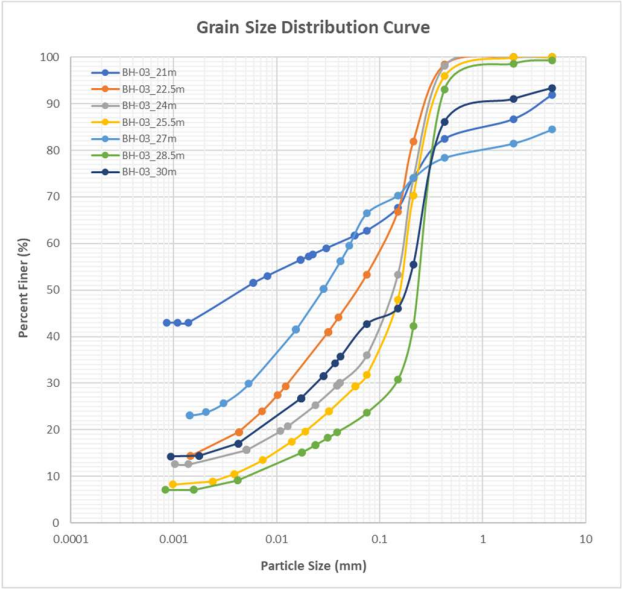
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-03	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	0+202	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	27-10-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	206.5	**End Date:**	27-10-2025
Project Code:	158_R0_DEST TO BOMM_0+000 km TO 2+586 km	**Water table Level [m]:**	17.00	**Location:**	**Lat:** 28°29'35.50", **Long:** 77°33'5.35"

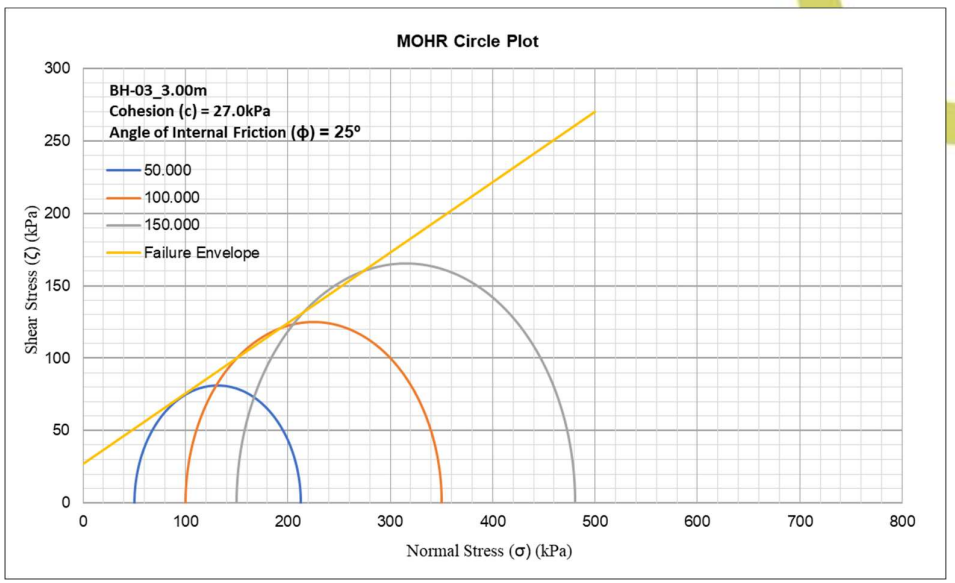
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	0.3	8.3	65.6	25.8	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Stiff to Very Stiff, yellowish, fine-grained inorganic silt of low Plasticity with sand (ML)	3	6	7	13	18	0.0	8.0	63.5	28.4	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							21.8	14.5	42.1	21.6	27	NP	NP	19.28	2.00	1.68	2.69	F	0.08	24	UU	27	25	0.022	0.058	0.926
3.00	SPT/DS		5	7	9	16	18	-																			
4.50	SPT/DS		7	8	11	19	19	0.0	10.6	61.6	27.8	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							6.1	13.6	58.1	22.2	27	NP	NP	18.30	1.84	1.55	2.67	F	0.11	25	UU	62	20	-	-	-
6.50	SPT/DS		8	10	15	25	23	-																			
7.50	SPT/DS		6	11	15	26	24	0.0	8.4	66.2	25.4	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS	Very stiff to hard, brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML)						12.5	4.6	52.0	30.9	28	NP	NP	17.07	1.57	1.34	2.50	F	0.06	26	-	-	-	-	-	-
9.50	SPT/DS		6	8	10	18	15	-																			
10.50	SPT/DS		7	9	14	23	19	4.0	3.4	65.9	26.7	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							4.0	7.7	60.5	27.8	25	NP	NP	20.48	1.67	1.39	2.39	F	0.04	28	-	-	-	-	-	-
12.50	SPT/DS		6	12	19	31	23	-																			
13.50	SPT/DS		9	13	21	34	24	2.9	5.7	57.4	34.0	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS							0.0	9.6	55.2	35.2	26	NP	NP	21.28	1.58	1.30	2.69	F	0.11	27	-	-	-	-	-	-
15.50	SPT/DS		11	15	24	39	26	-																			
16.50	SPT/DS		10	17	27	44	28	0.0	6.2	62.8	31.0	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS	Very Stiff, Browinish, fine grained Inorganic Clay of Low Compressibility (CL)						4.4	3.9	26.4	65.3	31	15	16	22.55	2.30	1.88	2.70	F	0.13	19	-	-	-	-	-	-
18.50	SPT/DS		3	4	7	11	7	-																			
19.50	SPT/DS		6	15	18	33	17	5.0	12.3	32.0	50.8	32	18	14	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	UDS	Hard, yellowish, fine-grained inorganic silt of low compressibility with sand and gravel (ML)						8.0	29.2	17.6	45.2	25	NP	NP	15.84	-	-	2.60	F	0.05	29	-	-	-	-	-	-
21.50	SPT/DS		8	16	25	41	19	-																			
22.50	SPT/DS		10	19	29	48	21	0.0	46.6	37.5	15.9	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	UDS	Very dense, yellowish, fine-grained silty sand with gravel (SM)						0.0	63.9	22.6	13.5	27	NP	NP	21.88	-	-	2.76	-	-	-	-	-	-	-	-	-
24.50	SPT/DS		14	29	36	65	25	-																			
25.50	SPT/DS		13	30	37	67	26	0.0	68.2	23.0	8.8	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	UDS							15.5	17.9	42.8	23.7	28	NP	NP	15.67	-	-	2.65	F	0	31	-	-	-	-	-	-
27.50	SPT/DS		9	26	35	61	23	-																			
28.50	SPT/DS		9	25	38	63	23	0.6	75.7	16.0	7.7	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	UDS							6.6	50.7	27.9	14.8	27	NP	NP	17.33	-	-	2.66	-	-	-	-	-	-	-	-	-
30.50	SPT/DS		14	26	38	64	22																				

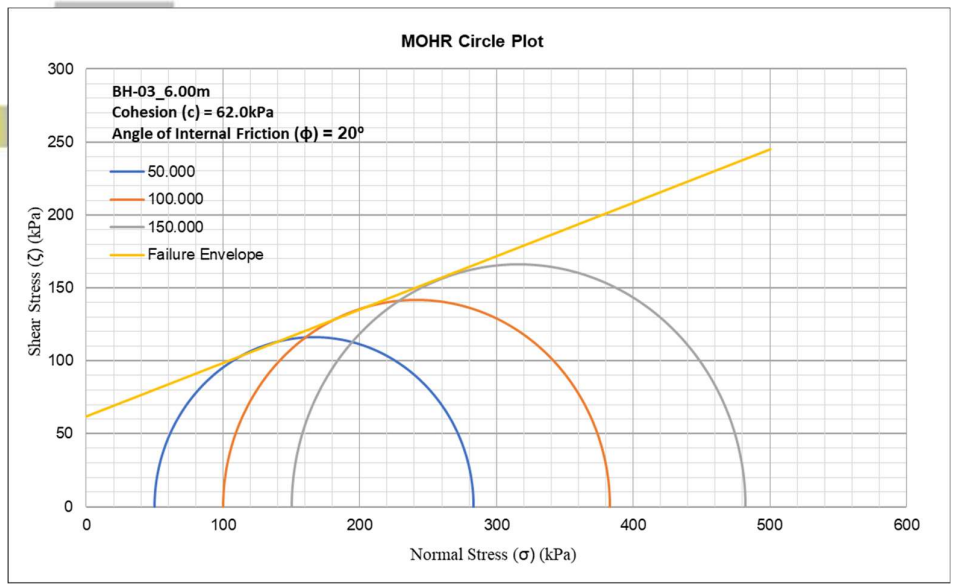
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

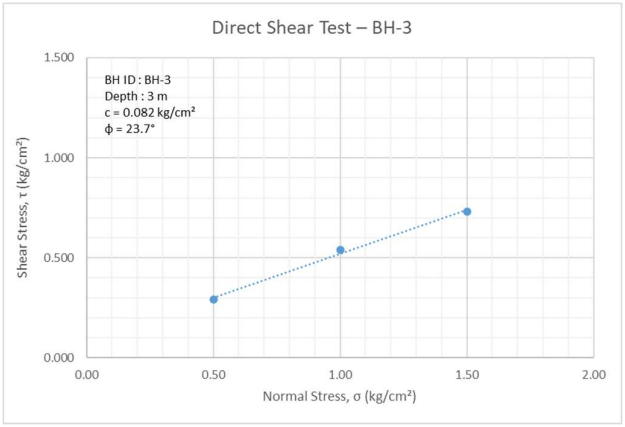

Grain Size Distribution Curve
BH-03_0m
BH-03_1.5m
BH-03_3m
BH-03_4.5m
BH-03_6m
BH-03_7.5m
BH-03_9m
Percent Finer (%)
Particle Size (mm)

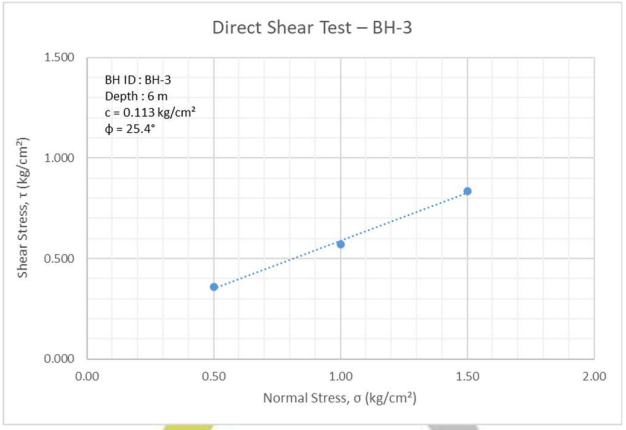

Grain Size Distribution Curve
BH-03_10.5m
BH-03_12m
BH-03_13.5m
BH-03_15m
BH-03_16.5m
BH-03_18m
BH-03_19.5m
Percent Finer (%)
Particle Size (mm)

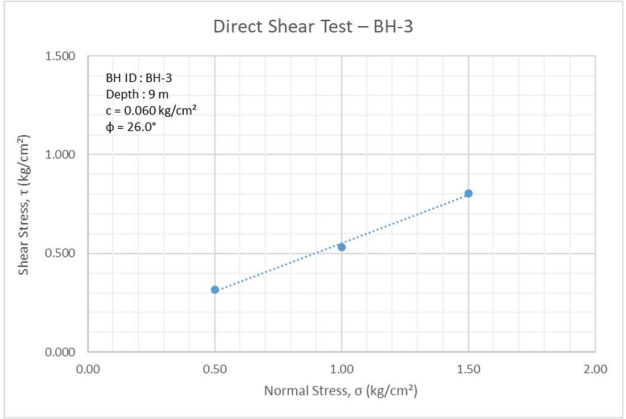

Grain Size Distribution Curve
BH-03_21m
BH-03_22.5m
BH-03_24m
BH-03_25.5m
BH-03_27m
BH-03_28.5m
BH-03_30m
Percent Finer (%)
Particle Size (mm)

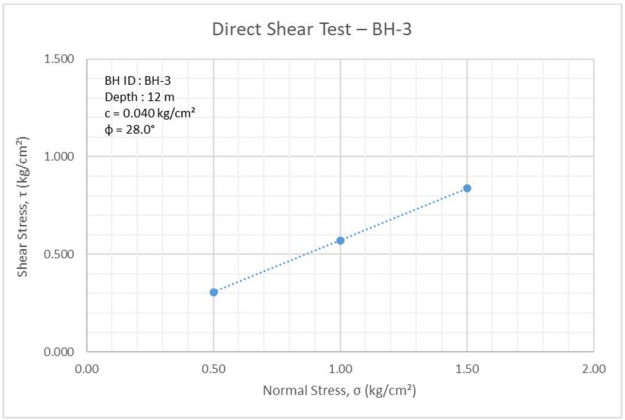

MOHR Circle Plot
BH-03_3.00m
Cohesion (c) = 27.0kPa
Angle of Internal Friction (ϕ) = 25°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

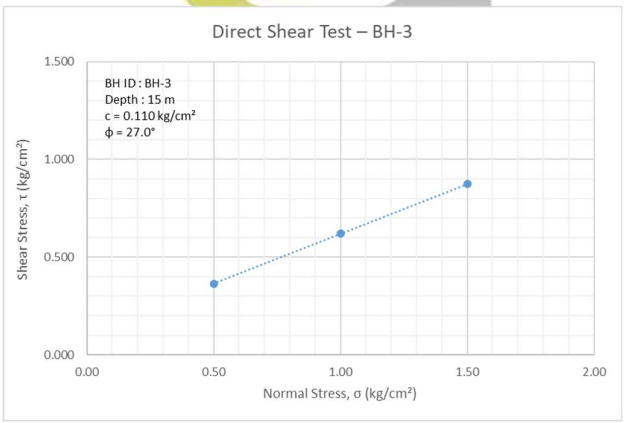

MOHR Circle Plot
BH-03_6.00m
Cohesion (c) = 62.0kPa
Angle of Internal Friction (ϕ) = 20°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

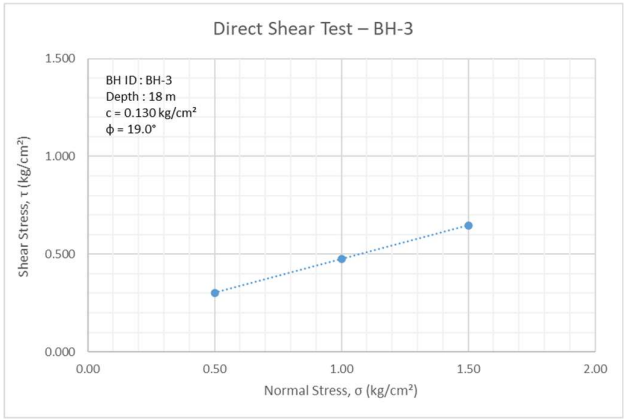

Direct Shear Test – BH-3
BH ID : BH-3
Depth : 3 m
c = 0.082 kg/cm²
ϕ = 23.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

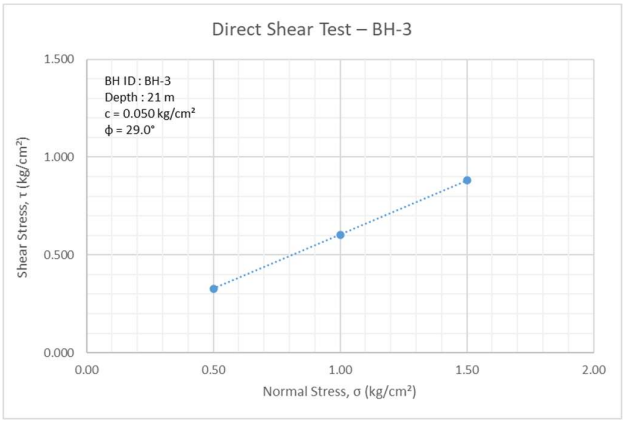

Direct Shear Test – BH-3
BH ID : BH-3
Depth : 6 m
c = 0.113 kg/cm²
ϕ = 25.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

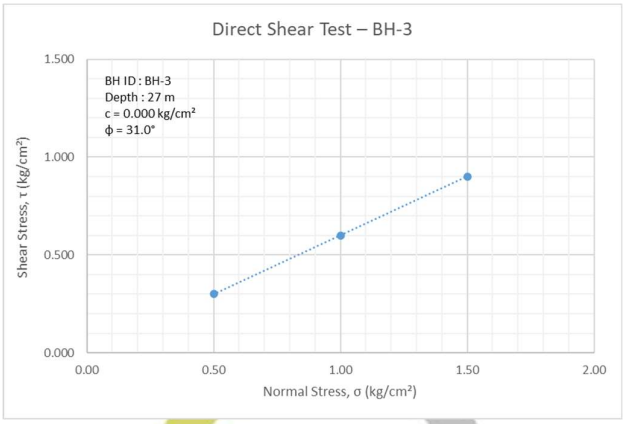

Direct Shear Test – BH-3
BH ID : BH-3
Depth : 9 m
c = 0.060 kg/cm²
ϕ = 26.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-3
BH ID : BH-3
Depth : 12 m
c = 0.040 kg/cm²
ϕ = 28.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-3
BH ID : BH-3
Depth : 15 m
c = 0.110 kg/cm²
ϕ = 27.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-3
BH ID : BH-3
Depth : 18 m
c = 0.130 kg/cm²
ϕ = 19.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-3
BH ID : BH-3
Depth : 21 m
c = 0.050 kg/cm²
ϕ = 29.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

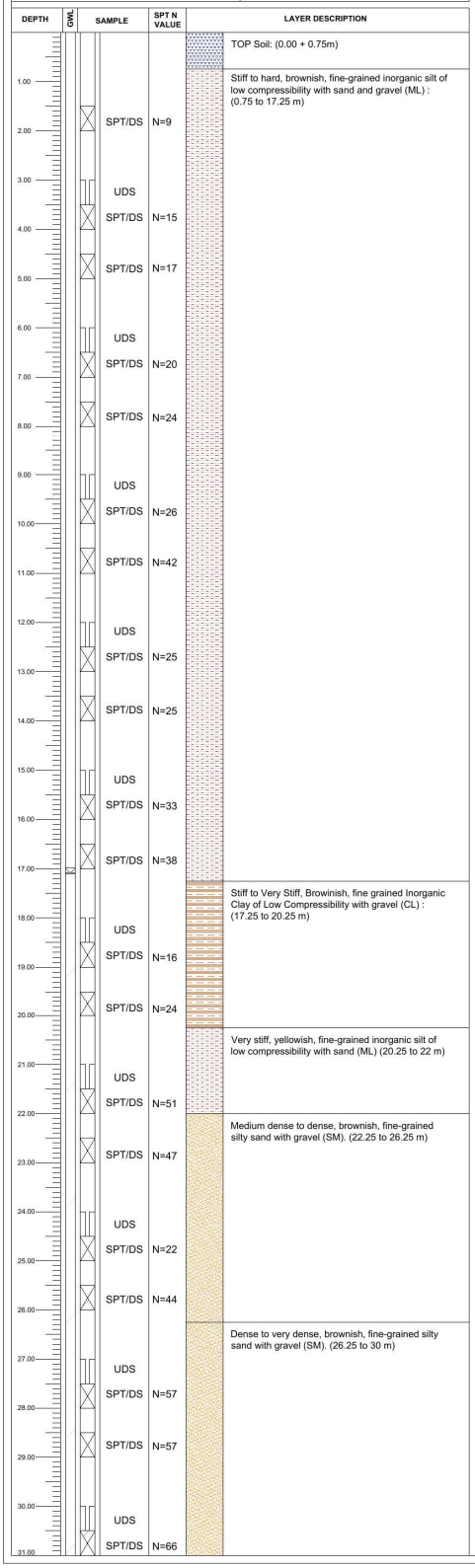

Direct Shear Test – BH-3
BH ID : BH-3
Depth : 27 m
c = 0.000 kg/cm²
ϕ = 31.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Depot Station to Boraki MMTH (CH 0+000 km to 2+600 km)

BH ID : BH-04 | **Chainage** : 0+291 KM

Groundwater Level : 17.10M | **Location** : Lat. 28.493736 Long. 77.552256



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

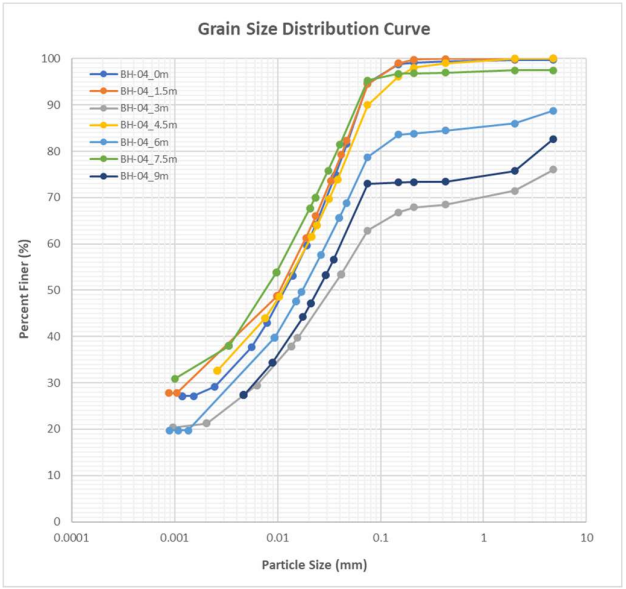
Soil

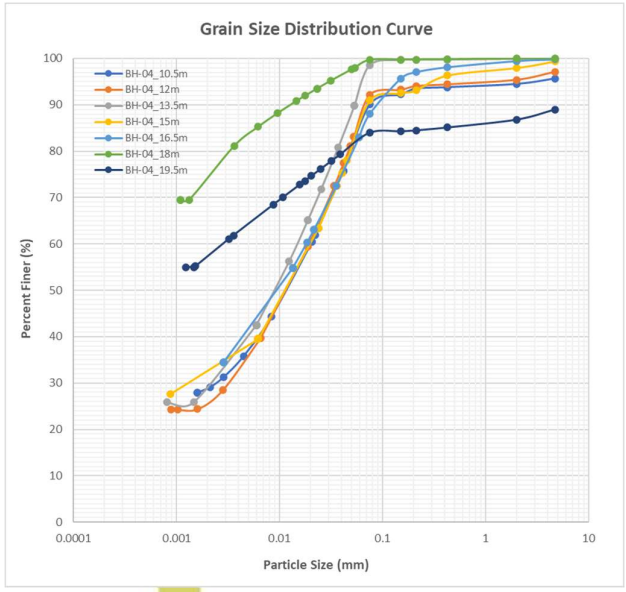
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

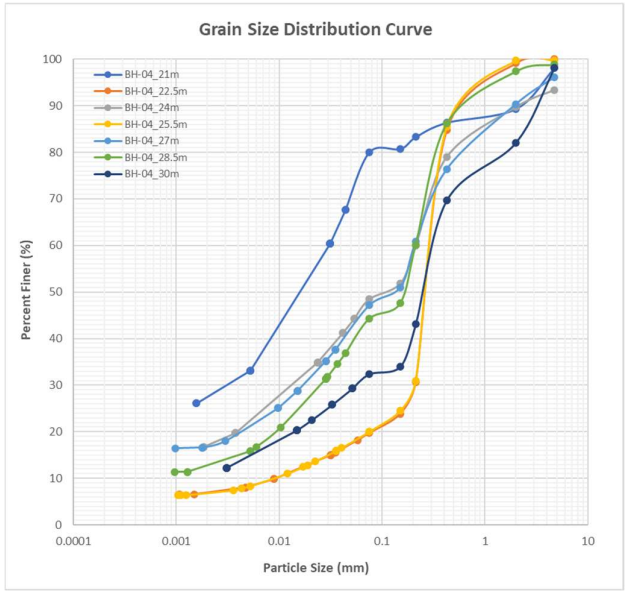
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-04	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	0+291	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	27-10-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	206.67	**End Date:**	29-10-2025
Project Code:	158_R0_DEST TO BOMM_0+000 km TO 2+586 km	**Water table Level [m]:**	17.10	**Location:**	**Lat:** 28°29'37.18", **Long:** 77°33'8.46"

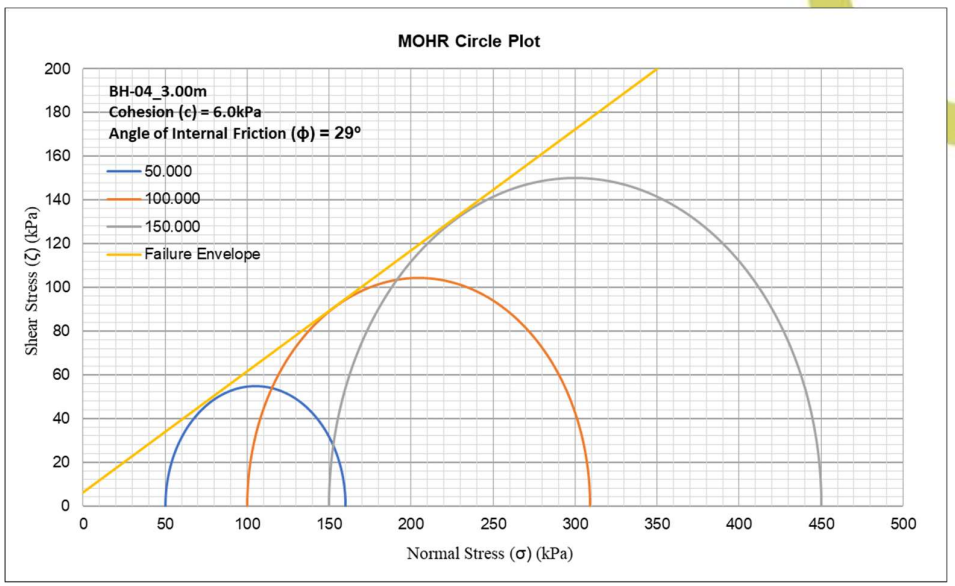
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	0.3	5.0	66.4	28.3	30	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Stiff to Very Stiff, yellowish, fine-grained inorganic silt of low Plasticity with sand (ML)	3	3	6	9	13	0.0	5.5	60.7	33.8	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							24.0	13.1	41.7	21.2	31	NP	NP	16.29	1.82	1.57	2.63	F	0.12	24	UU	6	29	0.026	0.082	0.88
3.00	SPT/DS		2	5	10	15	16	-																			
4.50	SPT/DS		2	6	11	17	17	0.0	10.0	59.0	31.0	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							11.3	10.0	55.0	23.7	28	NP	NP	14.15	1.90	1.66	2.59	F	0.11	25	UU	5	29	-	-	-
6.50	SPT/DS		4	8	12	20	19	-																			
7.50	SPT/DS		6	10	14	24	22	2.5	2.2	60.4	34.9	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS	Very stiff to hard, brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML)						17.3	9.7	55.4	17.6	25	NP	NP	15.53	2.09	1.81	2.38	F	0.08	27	-	-	-	-	-	-
9.50	SPT/DS		6	9	17	26	22	-																			
10.50	SPT/DS		7	15	27	42	34	4.3	5.6	61.2	28.9	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							2.9	4.9	66.2	26.0	27	NP	NP	25.36	1.66	1.33	2.72	F	0.10	28	-	-	-	-	-	-
12.50	SPT/DS		6	9	16	25	19	-																			
13.50	SPT/DS		6	9	16	25	18	0.0	1.4	69.1	29.5	30	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS							0.6	8.5	58.3	32.6	26.5	NP	NP	23.81	-	-	2.55	F	0.09	24	-	-	-	-	-	-
15.50	SPT/DS		7	12	21	33	22	-																			
16.50	SPT/DS		9	15	23	38	24	0.2	11.8	61.8	26.3	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS	Stiff to Very Stiff, Browinish, fine grained Inorganic Clay of Low Compressibility with gravel (CL)						0.0	0.3	25.5	74.2	31	16	15	27.90	1.43	1.12	2.51	F	0.15	23	-	-	-	-	-	-
18.50	SPT/DS		6	7	9	16	10	-																			
19.50	SPT/DS		9	10	14	24	14	11.0	5.0	26.7	57.3	33	17	16	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	UDS	Very stiff, yellowish, fine-grained inorganic silt of low compressibility with sand (ML)						1.8	18.1	52.5	27.5	23	NP	NP	23.00	1.63	1.33	2.31	F	0.05	29	-	-	-	-	-	-
21.50	SPT/DS		9	25	26	51	22	-																			
22.50	SPT/DS	Medium dense to dense, brownish, fine-grained silty sand with gravel (SM).	9	24	23	47	21	0.0	80.3	12.8	7.0	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	UDS							6.6	45.0	31.4	17.1	NP	NP	NP	22.50	1.60	1.31	2.44	F	0.00	28	-	-	-	-	-	-
24.50	SPT/DS		7	10	12	22	12	-																			
25.50	SPT/DS		12	18	26	44	19	0.2	79.8	13.1	6.9	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	UDS	Dense to very dense, brownish, fine-grained silty sand with gravel (SM).						3.8	49.0	30.3	16.9	NP	NP	NP	19.60	-	-	2.47	-	-	-	-	-	-	-	-	-
27.50	SPT/DS		13	26	31	57	22	-																			
28.50	SPT/DS		14	25	32	57	22	1.1	54.6	31.5	12.8	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	UDS							1.8	65.8	21.2	11.2	NP	NP	NP	23.7	-	-	2.58	F	0.00	31	-	-	-	-	-	-
30.50	SPT/DS		16	27	39	66	23																				

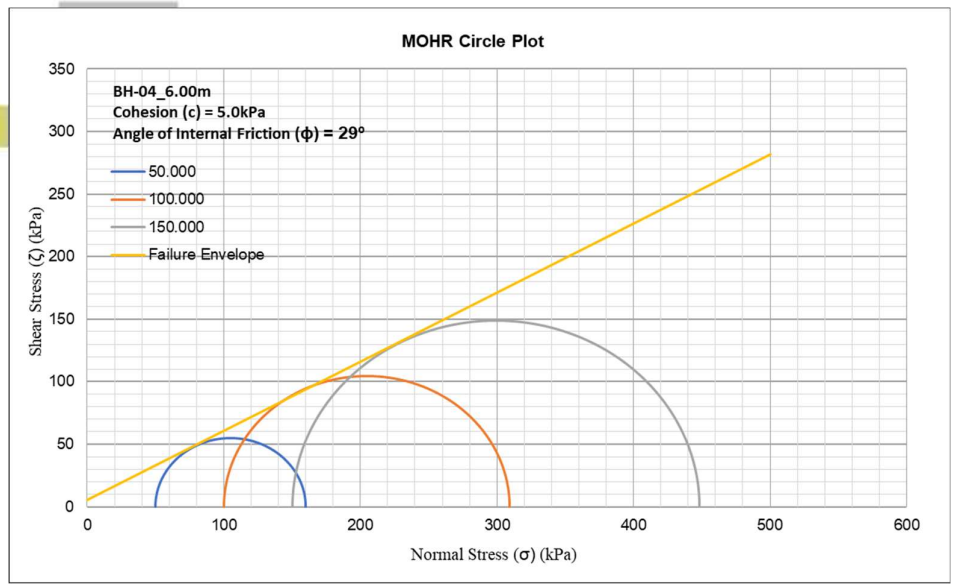
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

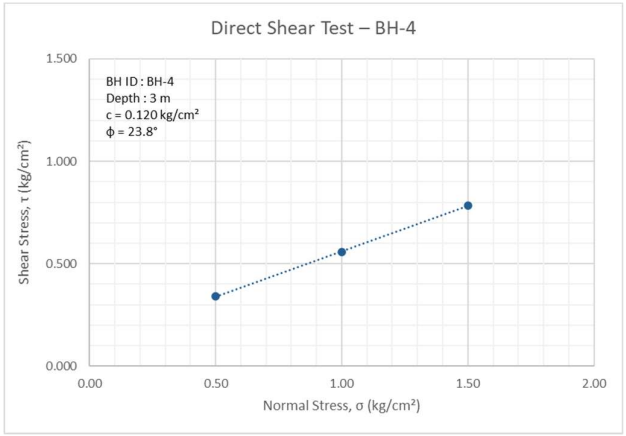

Grain Size Distribution Curve
BH-04_0m
BH-04_1.5m
BH-04_3m
BH-04_4.5m
BH-04_6m
BH-04_7.5m
BH-04_9m
Percent Finer (%)
Particle Size (mm)

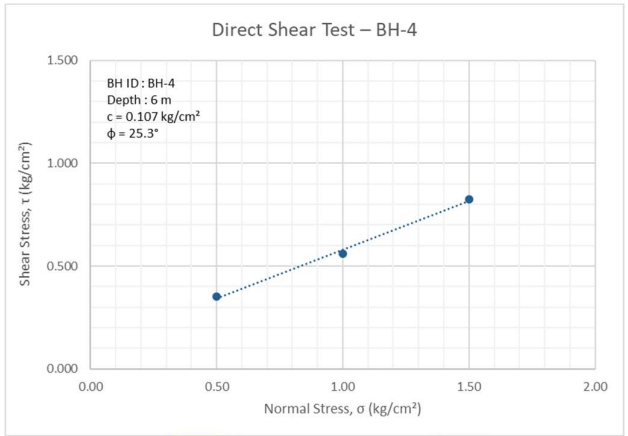

Grain Size Distribution Curve
BH-04_10.5m
BH-04_12m
BH-04_13.5m
BH-04_15m
BH-04_16.5m
BH-04_18m
BH-04_19.5m
Percent Finer (%)
Particle Size (mm)

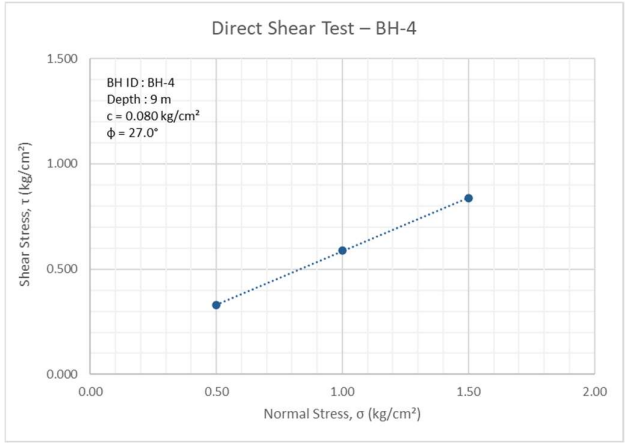

Grain Size Distribution Curve
BH-04_21m
BH-04_22.5m
BH-04_24m
BH-04_25.5m
BH-04_27m
BH-04_28.5m
BH-04_30m
Percent Finer (%)
Particle Size (mm)

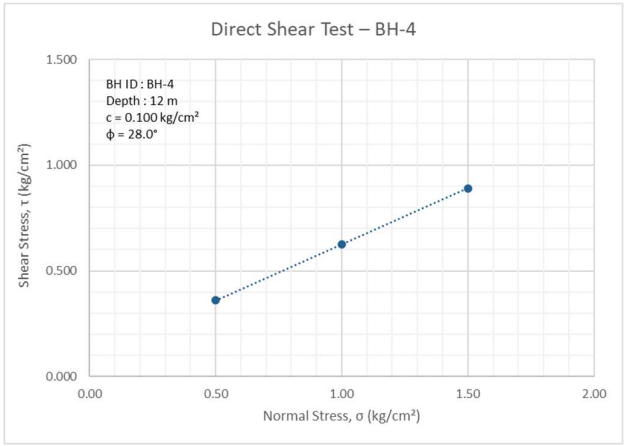

MOHR Circle Plot
BH-04_3.00m
Cohesion (c) = 6.0kPa
Angle of Internal Friction (ϕ) = 29°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

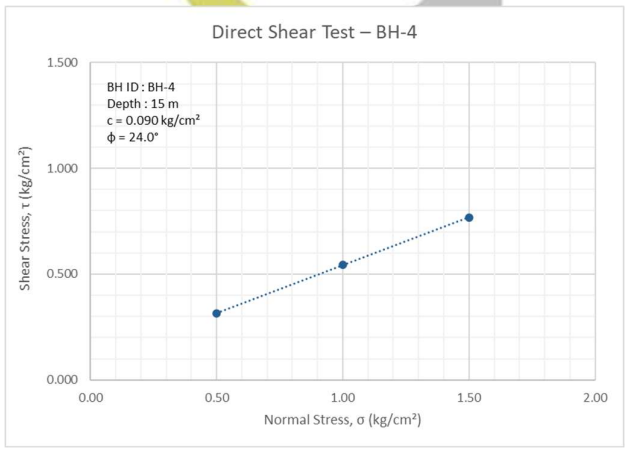

MOHR Circle Plot
BH-04_6.00m
Cohesion (c) = 5.0kPa
Angle of Internal Friction (ϕ) = 29°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

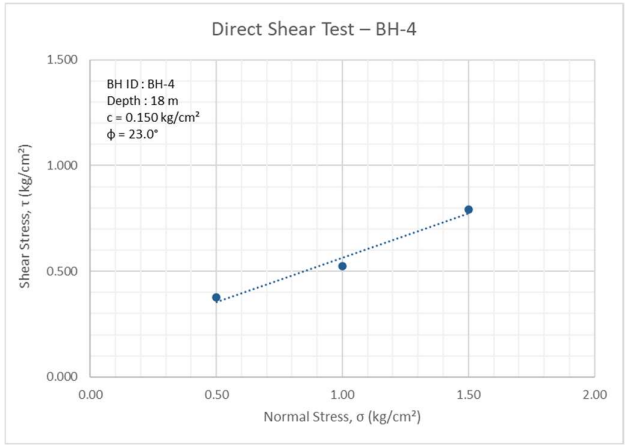

Direct Shear Test – BH-4
BH ID : BH-4
Depth : 3 m
c = 0.120 kg/cm²
ϕ = 23.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

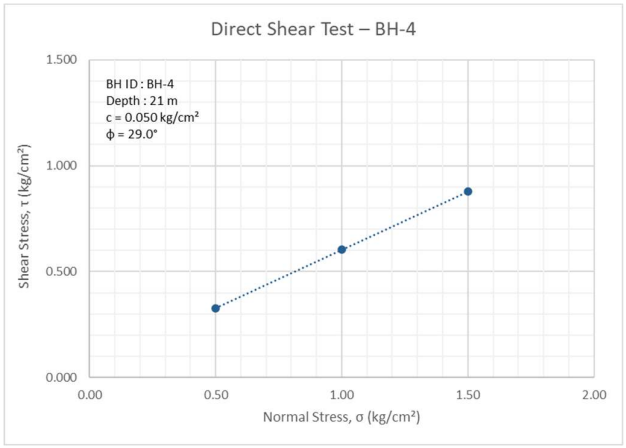

Direct Shear Test – BH-4
BH ID : BH-4
Depth : 6 m
c = 0.107 kg/cm²
ϕ = 25.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

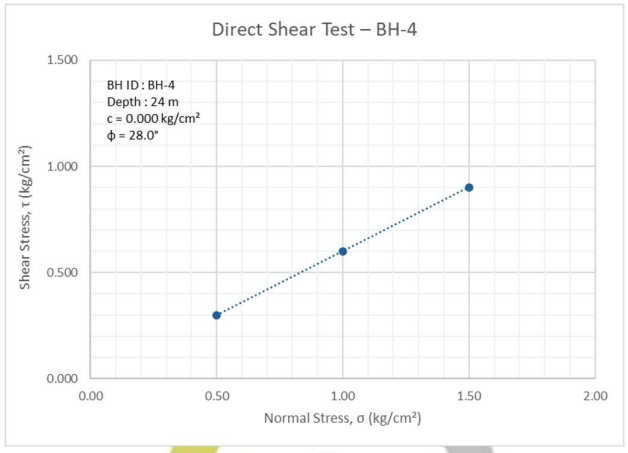

Direct Shear Test – BH-4
BH ID : BH-4
Depth : 9 m
c = 0.080 kg/cm²
ϕ = 27.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

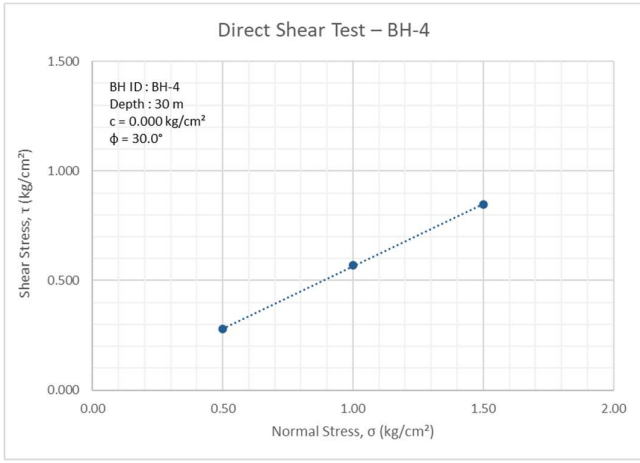

Direct Shear Test – BH-4
BH ID : BH-4
Depth : 12 m
c = 0.100 kg/cm²
ϕ = 28.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-4
BH ID : BH-4
Depth : 15 m
c = 0.090 kg/cm²
ϕ = 24.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-4
BH ID : BH-4
Depth : 18 m
c = 0.150 kg/cm²
ϕ = 23.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-4
BH ID : BH-4
Depth : 21 m
c = 0.050 kg/cm²
ϕ = 29.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-4
BH ID : BH-4
Depth : 24 m
c = 0.000 kg/cm²
ϕ = 28.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-4
BH ID : BH-4
Depth : 30 m
c = 0.000 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Depot Station to Boraki MMTH (CH 0+000 km to 2+600 km)

BH ID : BH-05	**Chainage** : 0+410 KM
Groundwater Level : 14.60M	**Location** : Lat. 28.494218 Long. 77.553316

DEPTH	GWL	SAMPLE	SPT N VALUE	LAYER DESCRIPTION
0.00				TOP Soil: (0.00 + 0.750m)
1.00				Stiff to hard, brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML) : (0.75 to 17.25 m)
2.00		SPT/DS	N=5	
3.00		UDS		
4.00		SPT/DS	N=8	
5.00		SPT/DS	N=16	
6.00		UDS		
7.00		SPT/DS	N=19	
8.00		SPT/DS	N=28	
9.00		UDS		
10.00		SPT/DS	N=30	
11.00		SPT/DS	N=38	
12.00		UDS		
13.00		SPT/DS	N=26	
14.00		SPT/DS	N=44	
15.00		UDS		
16.00		SPT/DS	N=43	
17.00		SPT/DS	N=40	
18.00		UDS		Stiff to Very Stiff, Browinish, fine grained Inorganic Clay of Low Compressibility with gravel (CL) : (17.25 to 20.25 m)
19.00		SPT/DS	N=9	
20.00		SPT/DS	N=36	
21.00		UDS		Very stiff, yellowish, fine-grained inorganic silt of low compressibility with sand (ML) : (20.25 to 26.25 m)
22.00		SPT/DS	N=51	
23.00		SPT/DS	N=34	
24.00		UDS		
25.00		SPT/DS	N=41	
26.00		SPT/DS	N=37	
27.00		UDS		Dense to very dense, brownish, fine-grained silty sand with clay and gravel (SM). : (26.25 to 30 m)
28.00		SPT/DS	N=44	
29.00		SPT/DS	N=50	
30.00		UDS		
31.00		SPT/DS	N=64	

LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

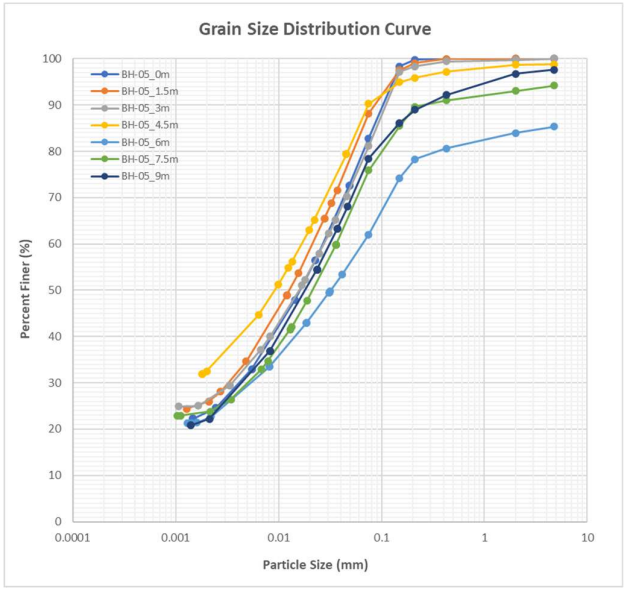
Soil

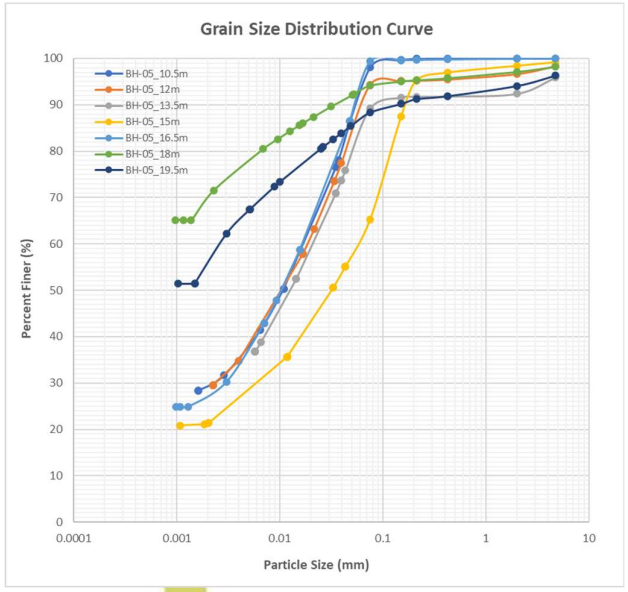
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

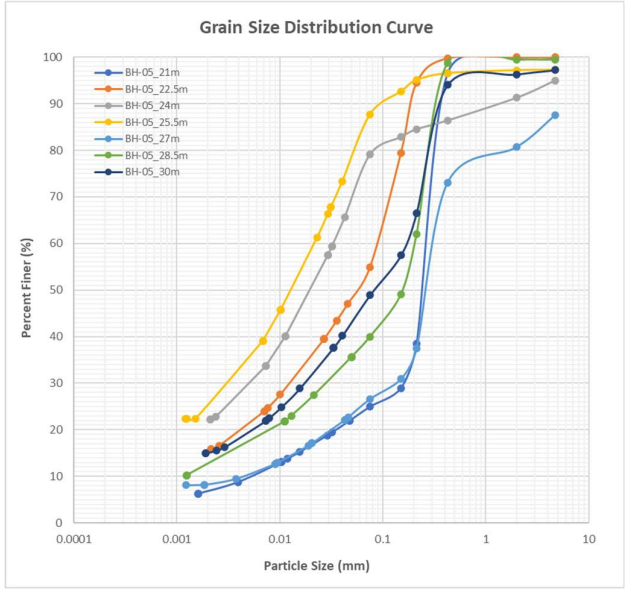
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-05	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	0+410	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	30-10-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	206.49	**End Date:**	30-10-2025
Project Code:	158_R0_DEST TO BOMM_0+000 km TO 2+586 km	**Water table Level [m]:**	14.60	**Location:**	**Lat:** 28°29'38.71", **Long:** 77°33'11.71"

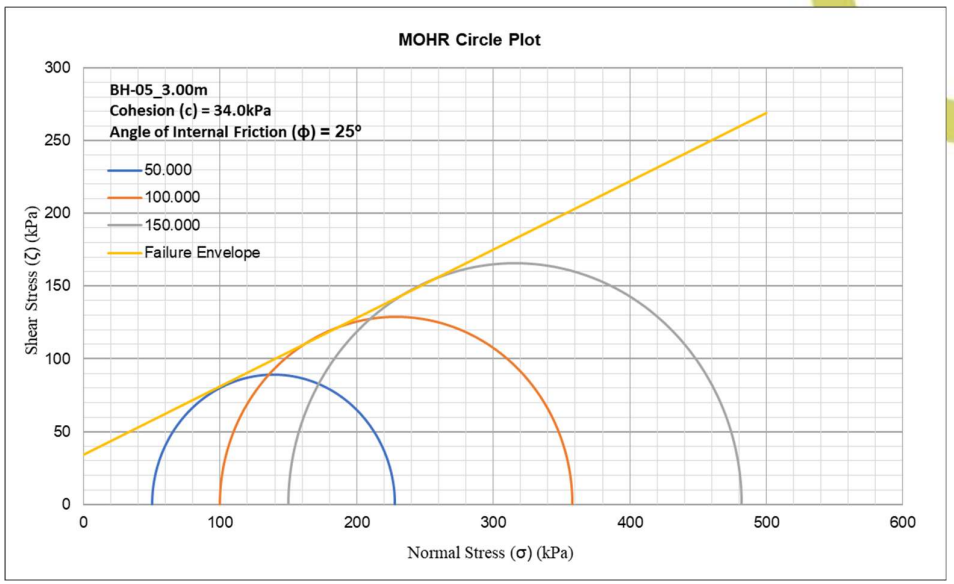
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	0.0	17.2	59.2	23.7	32	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Medium stiff, brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML)	2	2	3	5	7	0.0	11.9	62.3	25.8	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							0.0	18.9	54.9	26.2	30	NP	NP	19.90	1.87	1.56	2.57	F	0.1	23	UU	34	25	0.042	0.077	1.121
3.00	SPT/DS		3	4	4	8	9	-																			
4.50	SPT/DS	Stiff to Very Stiff, brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML)	4	8	8	16	16	1.2	8.6	57.8	32.5	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							14.6	23.4	39.7	22.3	26	NP	NP	16.17	1.98	1.70	2.54	F	0.09	26	UU	40	28	-	-	-
6.50	SPT/DS		6	9	10	19	18	-																			
7.50	SPT/DS		9	12	16	28	26	5.8	18.3	52.2	23.7	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS	Very stiff to hard, brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML)						2.4	19.2	56.5	22.0	25	NP	NP	-	-	-	-	F	0.08	27	-	-	-	-	-	-
9.50	SPT/DS		7	12	18	30	26	-																			
10.50	SPT/DS		9	17	21	38	31	0.0	1.9	68.5	29.6	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							1.6	4.0	94.4	0.0	27	NP	NP	20.84	1.64	1.36	2.56	F	0.05	29	-	-	-	-	-	-
12.50	SPT/DS		7	12	14	26	20	-																			
13.50	SPT/DS		12	20	24	44	32	4.1	6.7	89.2	0.0	30	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS							0.8	33.9	44.0	21.3	31	NP	NP	15.72	1.57	1.36	2.51	F	0.06	30	-	-	-	-	-	-
15.50	SPT/DS		13	18	25	43	22	-																			
16.50	SPT/DS		9	14	26	40	21	0.0	0.7	71.7	27.6	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS	Stiff to Very Stiff, Browinish, fine grained Inorganic Clay of Low Compressibility with gravel (CL)						1.8	4.1	24.3	69.9	32	16	16	23.55	1.58	1.28	2.35	F	0.16	21	-	-	-	-	-	-
18.50	SPT/DS		3	4	5	9	6	-																			
19.50	SPT/DS		7	14	22	36	19	3.7	8.0	32.4	55.9	32	19	13	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	UDS	Very stiff, yellowish, fine-grained inorganic silt of low compressibility with sand (ML)						0.2	74.9	18.1	6.9	29	NP	NP	19.80	2.07	1.73	2.51	F	0.08	36	-	-	-	-	-	-
21.50	SPT/DS		9	22	29	51	23	-																			
22.50	SPT/DS		7	14	20	34	18	0.0	45.1	54.9	0.0	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	UDS							5.0	15.9	79.1	0.0	26	NP	NP	21.71	1.71	1.40	2.47	F	0.05	30	-	-	-	-	-	-
24.50	SPT/DS		12	18	23	41	19	-																			
25.50	SPT/DS		8	17	20	37	18	2.8	9.6	62.3	25.4	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	UDS	Dense to very dense, brownish, fine-grained silty sand with clay and gravel (SM).						12.4	61.0	18.3	8.3	28	NP	NP	15.40	1.82	1.58	2.72	F	0.09	37	-	-	-	-	-	-
27.50	SPT/DS		9	19	25	44	20	-																			
28.50	SPT/DS		10	21	29	50	21	0.6	59.4	27.3	12.7	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	UDS							2.7	48.4	33.8	15.1	27	NP	NP	18.47	1.71	1.44	2.74	-	-	-	-	-	-	-	-	-
30.50	SPT/DS		14	29	35	64	24	-																			

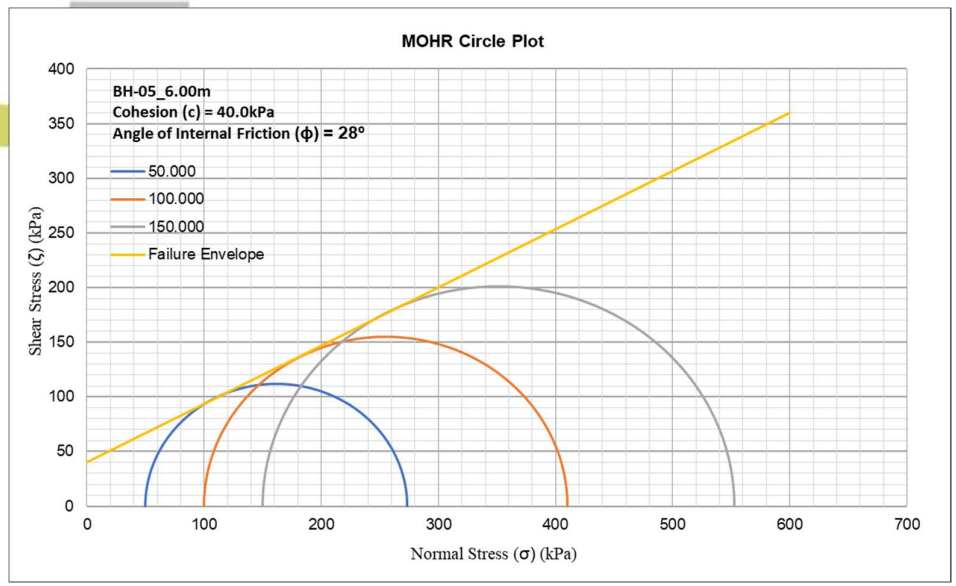
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

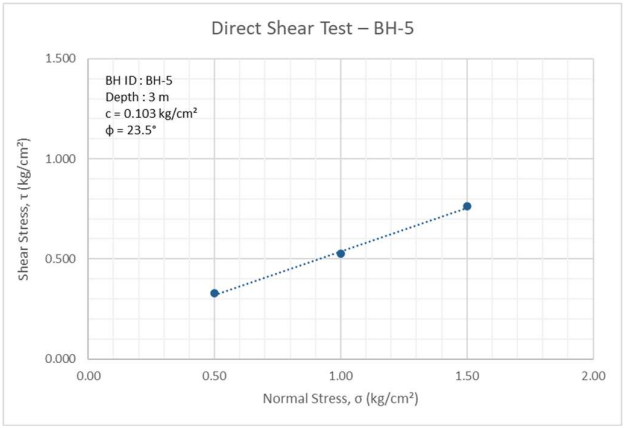

Grain Size Distribution Curve
BH-05_0m
BH-05_1.5m
BH-05_3m
BH-05_4.5m
BH-05_6m
BH-05_7.5m
BH-05_9m
Percent Finer (%)
Particle Size (mm)

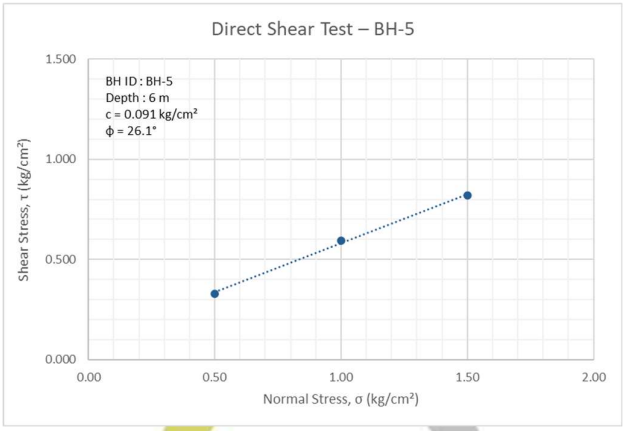

Grain Size Distribution Curve
BH-05_10.5m
BH-05_12m
BH-05_13.5m
BH-05_15m
BH-05_16.5m
BH-05_18m
BH-05_19.5m
Percent Finer (%)
Particle Size (mm)

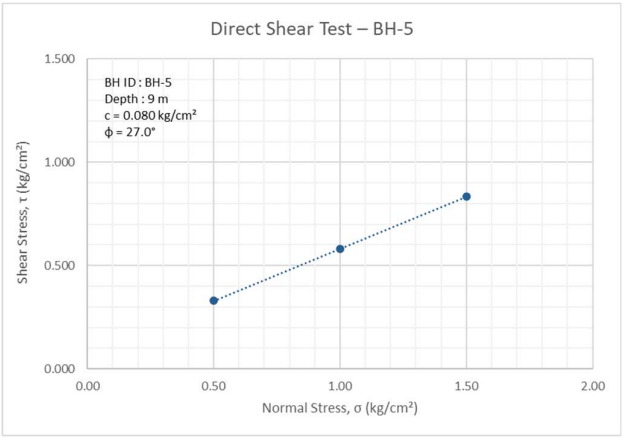

Grain Size Distribution Curve
BH-05_21m
BH-05_22.5m
BH-05_24m
BH-05_25.5m
BH-05_27m
BH-05_28.5m
BH-05_30m
Percent Finer (%)
Particle Size (mm)

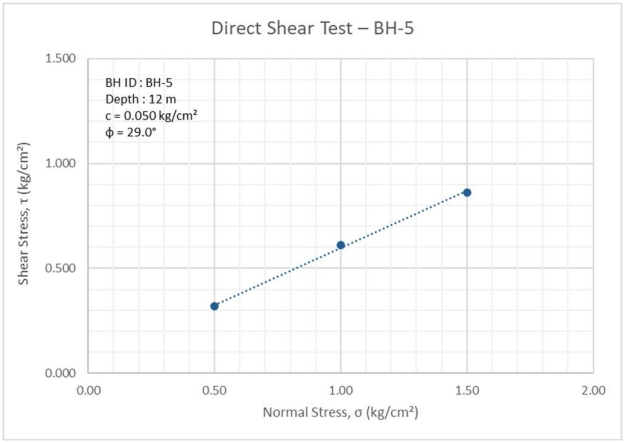

MOHR Circle Plot
BH-05_3.00m
Cohesion (c) = 34.0kPa
Angle of Internal Friction (ϕ) = 25°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

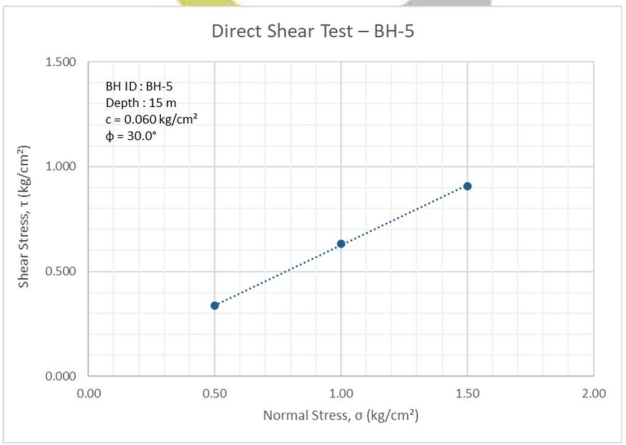

MOHR Circle Plot
BH-05_6.00m
Cohesion (c) = 40.0kPa
Angle of Internal Friction (ϕ) = 28°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

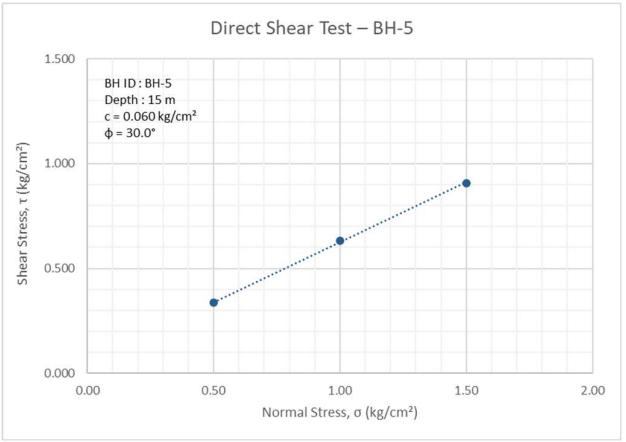

Direct Shear Test – BH-5
BH ID : BH-5
Depth : 3 m
c = 0.103 kg/cm²
ϕ = 23.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

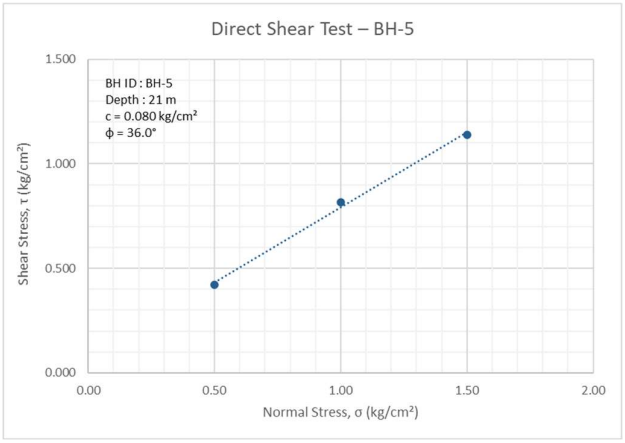

Direct Shear Test – BH-5
BH ID : BH-5
Depth : 6 m
c = 0.091 kg/cm²
ϕ = 26.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

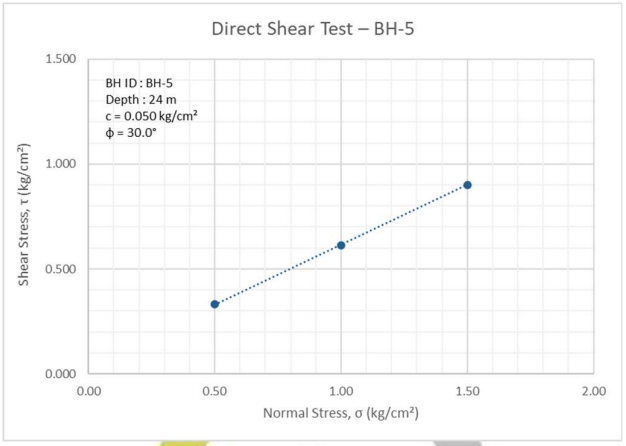

Direct Shear Test – BH-5
BH ID : BH-5
Depth : 9 m
c = 0.080 kg/cm²
ϕ = 27.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

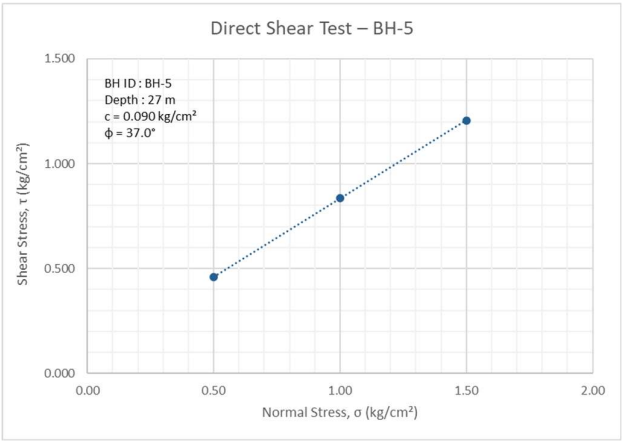

Direct Shear Test – BH-5
BH ID : BH-5
Depth : 12 m
c = 0.050 kg/cm²
ϕ = 29.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-5
BH ID : BH-5
Depth : 15 m
c = 0.060 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-5
BH ID : BH-5
Depth : 15 m
c = 0.060 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-5
BH ID : BH-5
Depth : 21 m
c = 0.080 kg/cm²
ϕ = 36.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-5
BH ID : BH-5
Depth : 24 m
c = 0.050 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

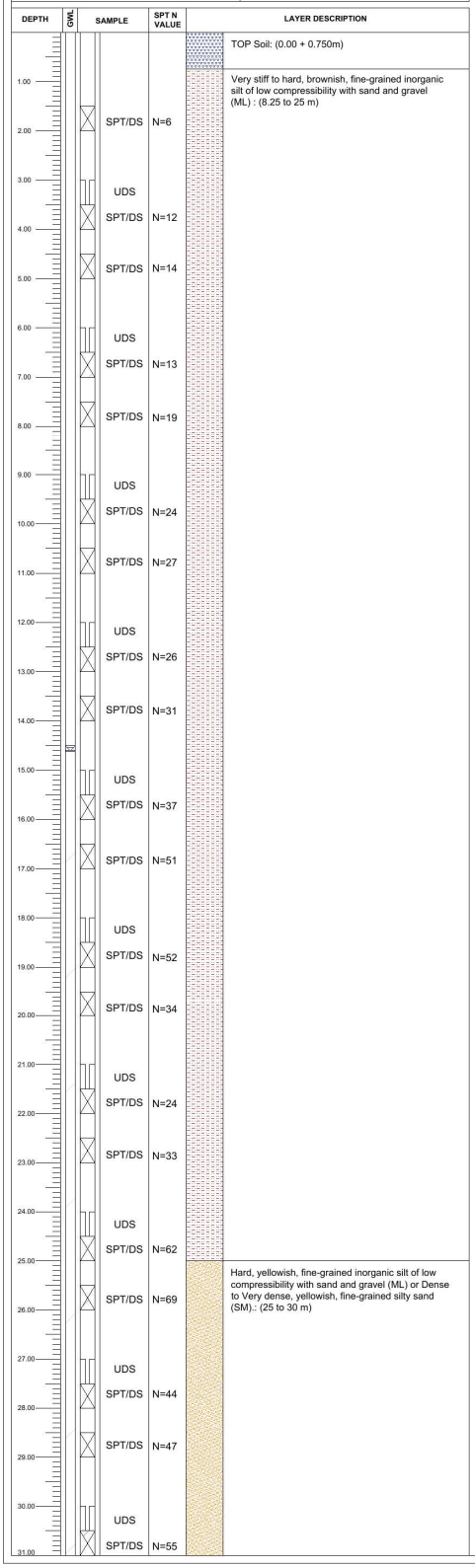

Direct Shear Test – BH-5
BH ID : BH-5
Depth : 27 m
c = 0.090 kg/cm²
ϕ = 37.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Depot Station to Boraki MMTH (CH 0+000 km to 2+600 km)

BH ID : BH-06 | **Chainage** : 0+501 KM

Groundwater Level : 14.50M | **Location** : Lat. 28.494662Long. 77.554107



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

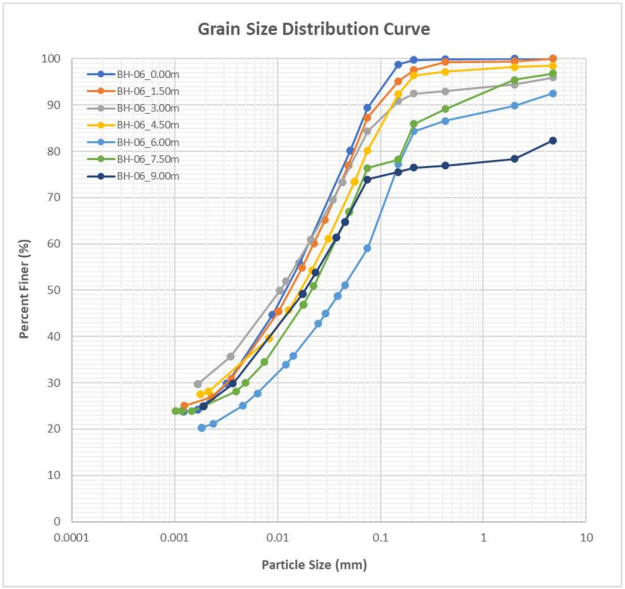
Soil

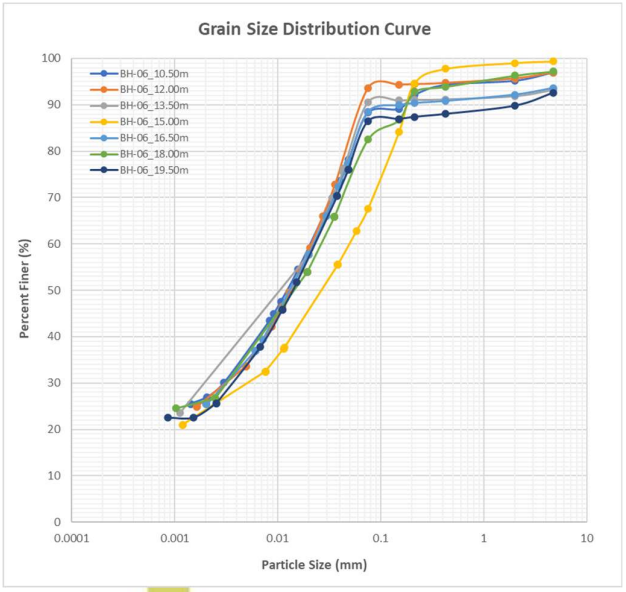
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

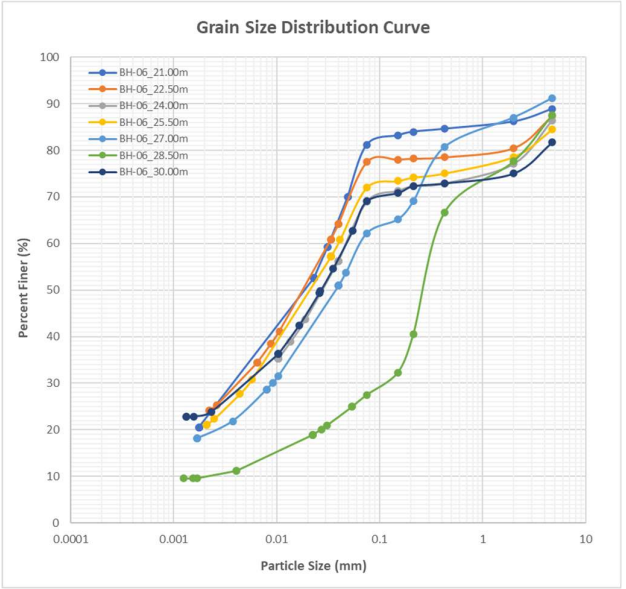
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-06	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	0+501	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	30-10-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	207.24	**End Date:**	30-10-2025
Project Code:	158_R0_DEST TO BOMM_0+000 km TO 2+586 km	**Water table Level [m]:**	14.50	**Location:**	**Lat:** 28°29'40.45", **Long:** 77°33'14.84"

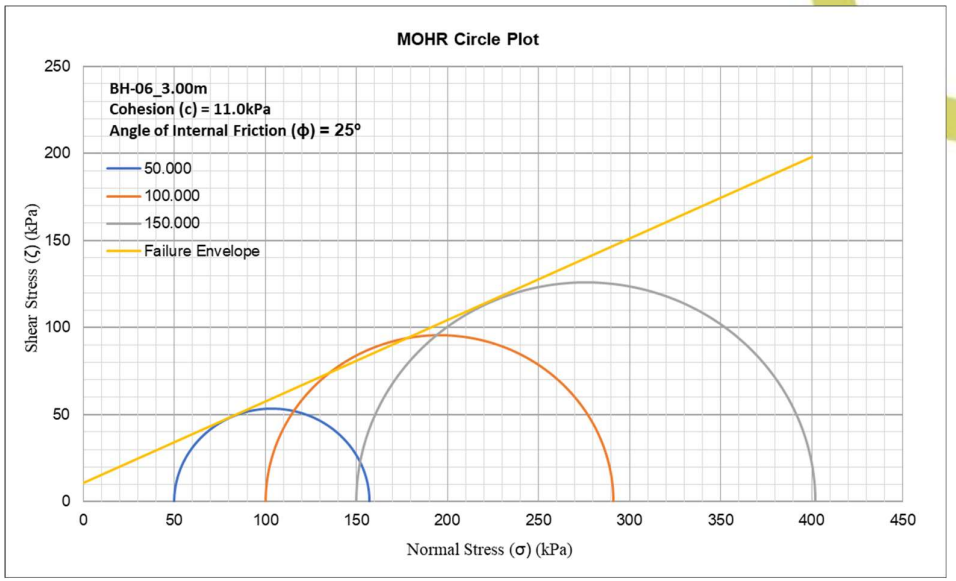
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	0.0	10.6	63.7	25.6	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Medium stiff to stiff, brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML)	2	3	3	6	8	0.0	12.7	60.7	26.5	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							4.1	11.6	53.2	31.1	29	NP	NP	14.04	2.02	1.78	2.63	F	0.03	26	UU	11	25	0.032	0.079	1.019
3.00	SPT/DS		5	6	6	12	13	-																			
4.50	SPT/DS		4	6	8	14	14	1.5	18.3	52.3	27.9	31	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							7.5	33.4	38.5	20.6	30	NP	NP	20.36	1.73	1.44	2.58	F	0.09	25	UU	23	27	-	-	-
6.50	SPT/DS		4	6	7	13	12	-																			
7.50	SPT/DS		6	8	11	19	17	3.2	20.4	51.2	25.2	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS	Very stiff to hard, brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML)						17.7	8.4	48.7	25.3	24	NP	NP	9.89	1.59	1.45	2.36	F	0.09	27	-	-	-	-	-	-
9.50	SPT/DS		8	10	14	24	20	-																			
10.50	SPT/DS		9	11	16	27	22	3.0	8.7	61.5	26.8	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							3.0	3.3	67.2	26.5	27	NP	NP	19.95	1.60	1.34	2.54	F	0.08	29	-	-	-	-	-	-
12.50	SPT/DS		9	12	14	26	20	-																			
13.50	SPT/DS		11	14	17	31	22	6.8	2.7	60.2	30.4	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS							0.6	31.8	43.3	24.2	30	NP	NP	15.60	1.90	1.64	2.71	F	0.05	27	-	-	-	-	-	-
15.50	SPT/DS		10	16	21	37	20	-																			
16.50	SPT/DS		10	24	27	51	24	6.4	5.1	60.9	27.6	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS							2.8	14.7	56.3	26.2	29	NP	NP	22.50	2.09	1.7	2.45	F	0.05	33	-	-	-	-	-	-
18.50	SPT/DS		13	23	29	52	24	-																			
19.50	SPT/DS		7	14	20	34	18	7.4	6.1	62.3	24.2	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	UDS							11.1	7.7	59.1	24.1	25	NP	NP	19.03	2.47	2.07	2.76	F	0.05	33	-	-	-	-	-	-
21.50	SPT/DS		7	9	15	24	15	-																			
22.50	SPT/DS		8	14	19	33	17	12.6	9.9	40.6	36.9	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	UDS							13.6	17.4	37.8	31.2	27	NP	NP	18.19	2.00	1.69	2.45	F	0.07	26	-	-	-	-	-	-
24.50	SPT/DS		4	9	14	23	13	-																			
25.50	SPT/DS	Hard, yellowish, fine-grained inorganic silt of low compressibility with sand and gravel (ML) or Dense to Very dense, yellowish, fine-grained silty sand (SM).	23	31	38	69	27	15.5	12.5	48.5	23.6	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	UDS							8.8	29.0	43.3	18.9	26	NP	NP	23.52	1.86	1.50	2.40	F	0.04	30	-	-	-	-	-	-
27.50	SPT/DS		8	18	26	44	20	-																			
28.50	SPT/DS		7	19	28	47	20	12.4	60.1	17.6	9.9	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	UDS							18.3	12.6	45.7	23.5	28	NP	NP	22.24	1.94	1.59	2.58	F	0.02	32	-	-	-	-	-	-
30.50	SPT/DS		10	25	30	55	22	-																			

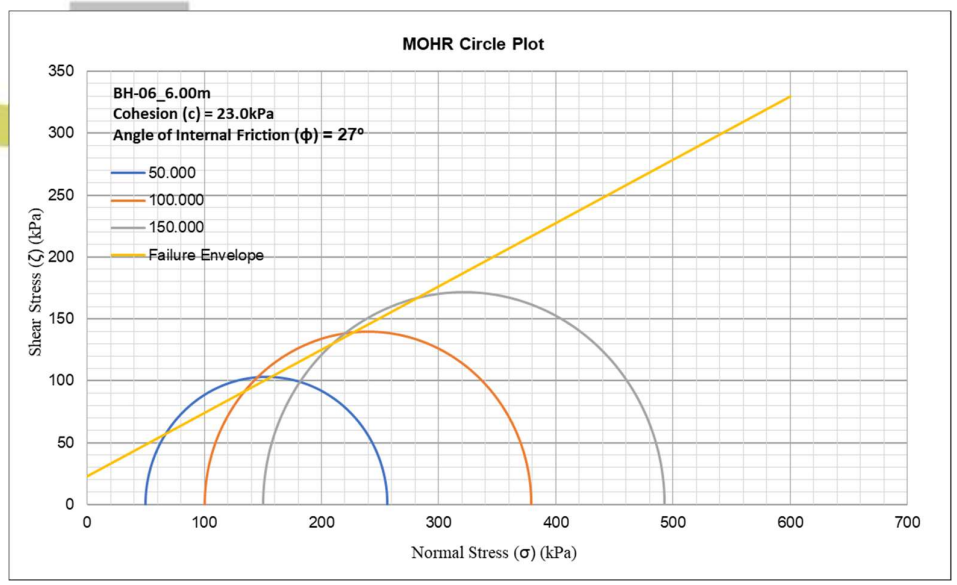
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

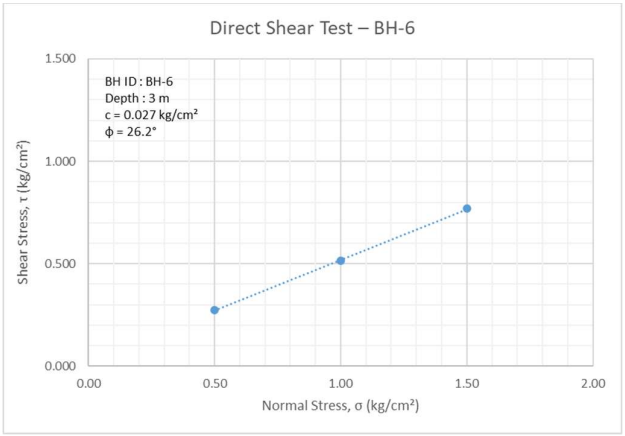

Grain Size Distribution Curve
BH-06_0.00m
BH-06_1.50m
BH-06_3.00m
BH-06_4.50m
BH-06_6.00m
BH-06_7.50m
BH-06_9.00m
Percent Finer (%)
Particle Size (mm)

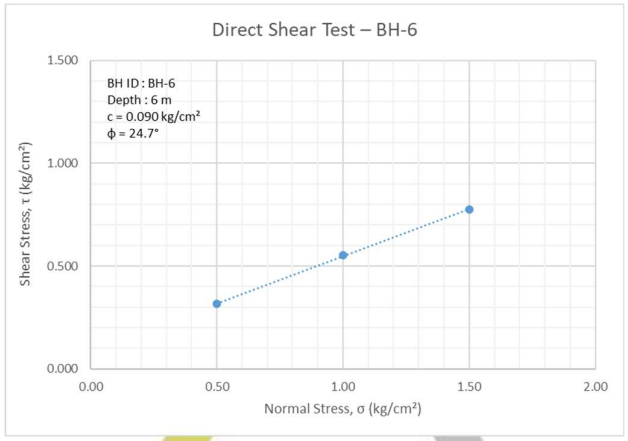

Grain Size Distribution Curve
BH-06_10.50m
BH-06_12.00m
BH-06_13.50m
BH-06_15.00m
BH-06_16.50m
BH-06_18.00m
BH-06_19.50m
Percent Finer (%)
Particle Size (mm)

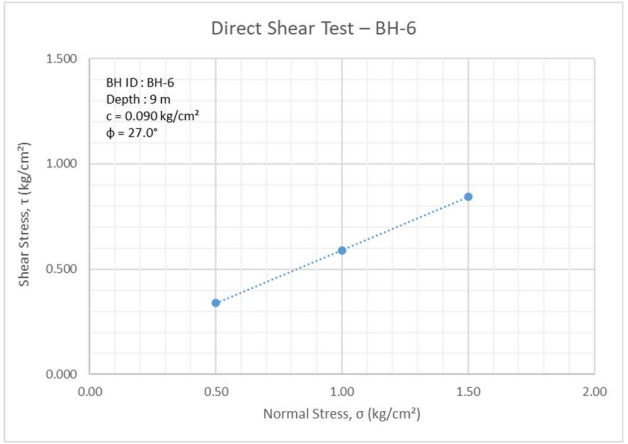

Grain Size Distribution Curve
BH-06_21.00m
BH-06_22.50m
BH-06_24.00m
BH-06_25.50m
BH-06_27.00m
BH-06_28.50m
BH-06_30.00m
Percent Finer (%)
Particle Size (mm)

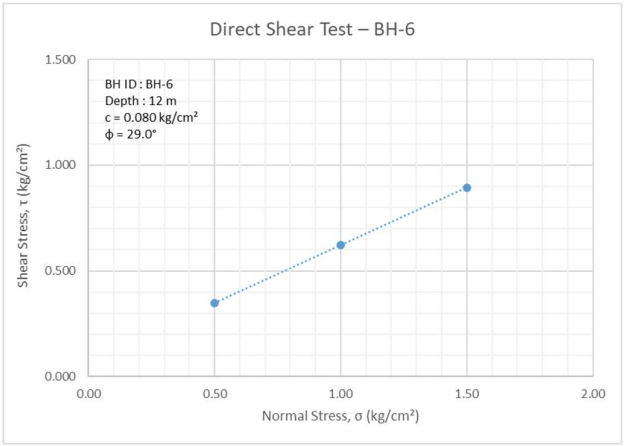

MOHR Circle Plot
BH-06_3.00m
Cohesion (c) = 11.0kPa
Angle of Internal Friction (ϕ) = 25°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

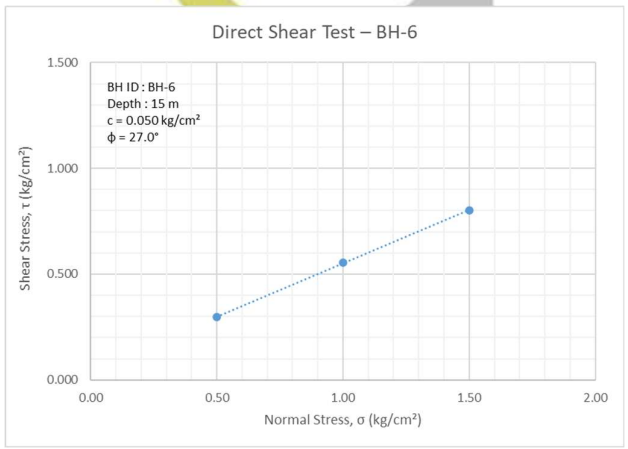

MOHR Circle Plot
BH-06_6.00m
Cohesion (c) = 23.0kPa
Angle of Internal Friction (ϕ) = 27°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

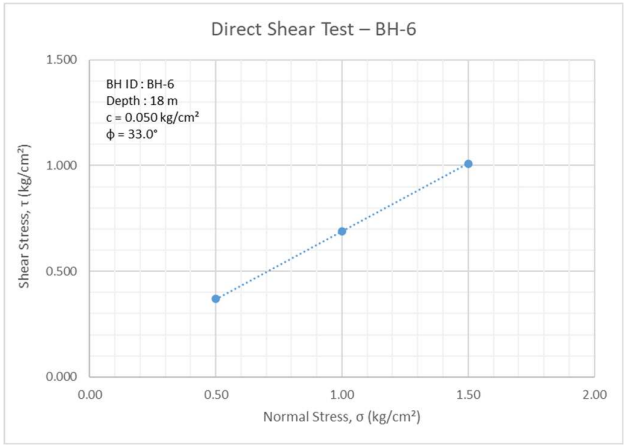

Direct Shear Test – BH-6
BH ID : BH-6
Depth : 3 m
c = 0.027 kg/cm²
ϕ = 26.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

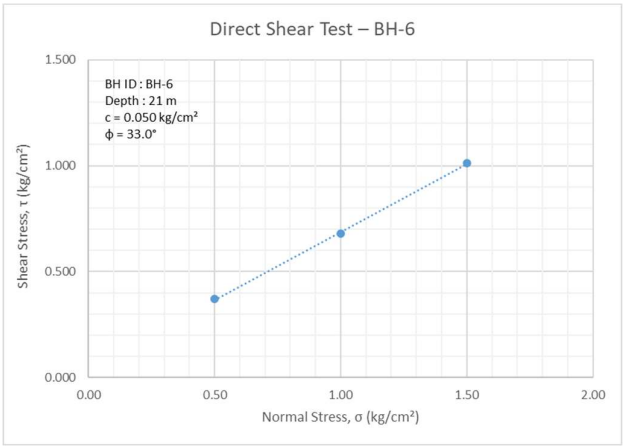

Direct Shear Test – BH-6
BH ID : BH-6
Depth : 6 m
c = 0.090 kg/cm²
ϕ = 24.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

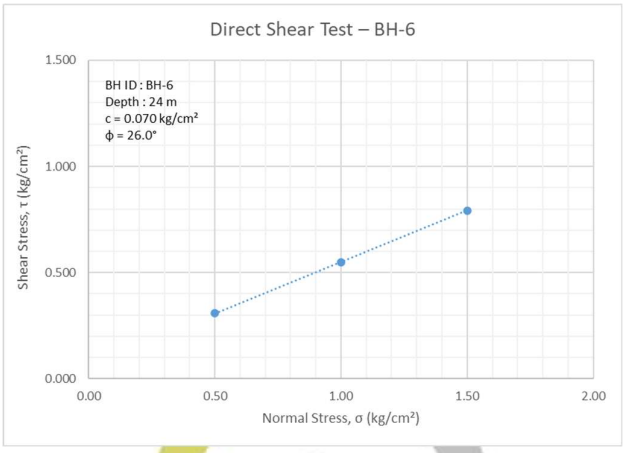

Direct Shear Test – BH-6
BH ID : BH-6
Depth : 9 m
c = 0.090 kg/cm²
ϕ = 27.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

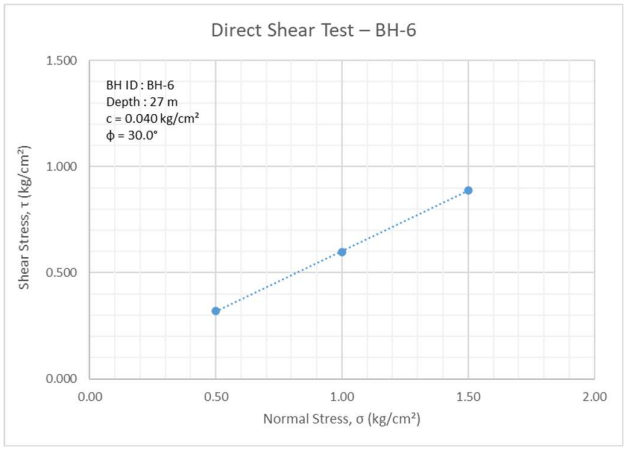

Direct Shear Test – BH-6
BH ID : BH-6
Depth : 12 m
c = 0.080 kg/cm²
ϕ = 29.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-6
BH ID : BH-6
Depth : 15 m
c = 0.050 kg/cm²
ϕ = 27.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-6
BH ID : BH-6
Depth : 18 m
c = 0.050 kg/cm²
ϕ = 33.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-6
BH ID : BH-6
Depth : 21 m
c = 0.050 kg/cm²
ϕ = 33.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-6
BH ID : BH-6
Depth : 24 m
c = 0.070 kg/cm²
ϕ = 26.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

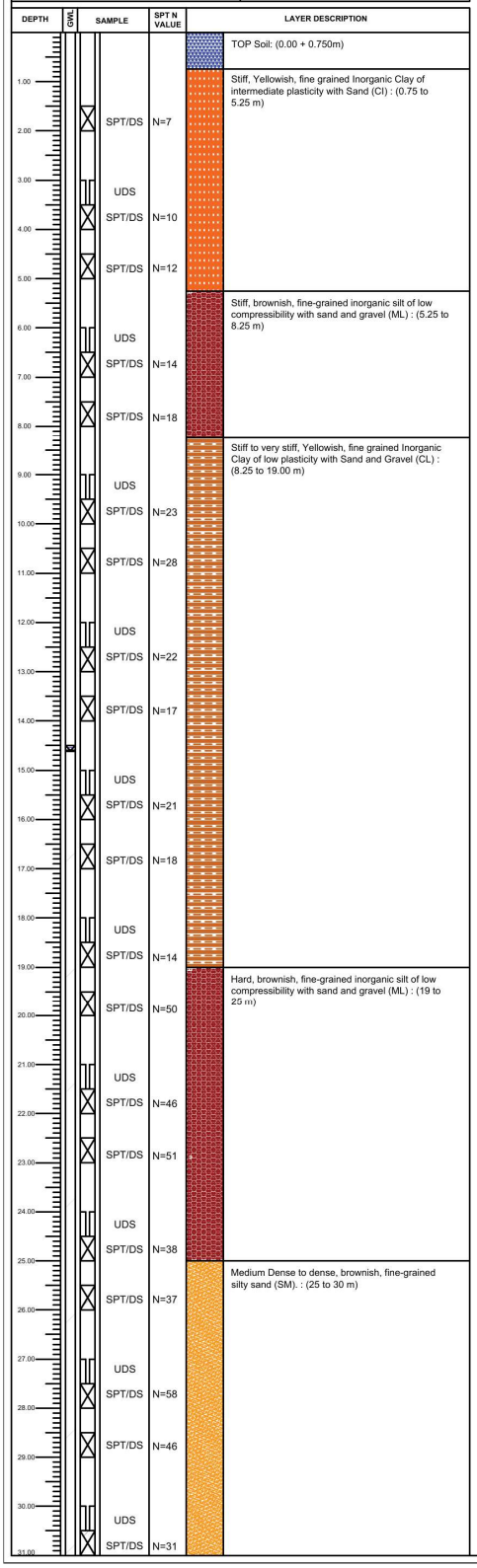

Direct Shear Test – BH-6
BH ID : BH-6
Depth : 27 m
c = 0.040 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Depot Station to Boraki MMTH (CH 0+000 km to 2+600 km)

BH ID : BH-07 | **Chainage** : 0+622 KM

Groundwater Level : 14.50M | **Location** : Lat. 28.495297 Long. 77.555105



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

Soil

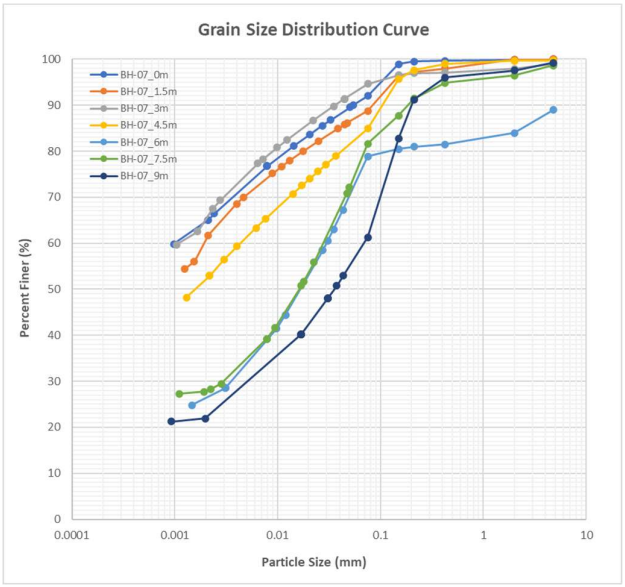
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

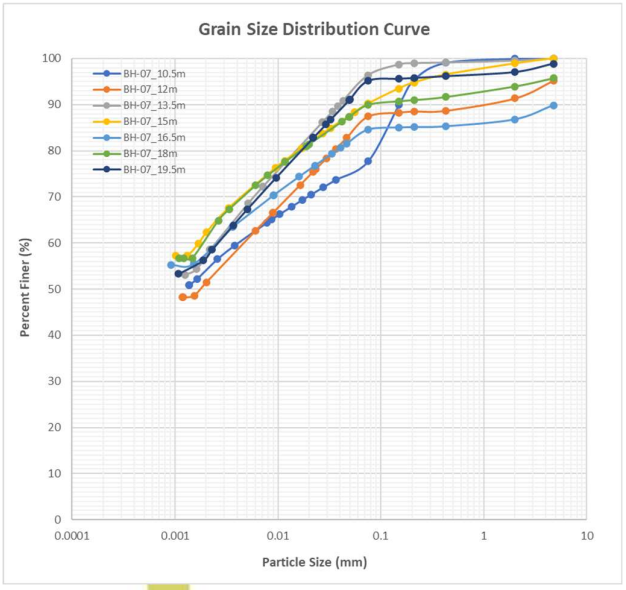
GOMA ENGINEERING AND CONSULTANCY
Quality we put forward

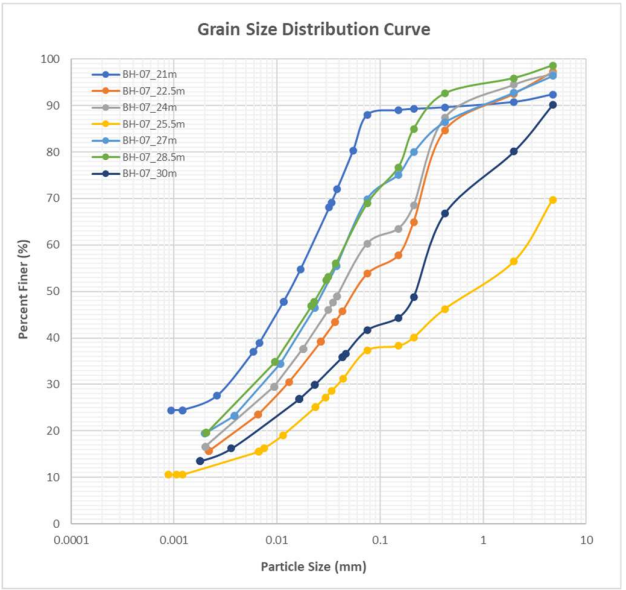
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-07	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	0+622	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	01-11-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	207.65	**End Date:**	04-11-2025
Project Code:	158_R0_DEST TO BOMM_0+000 km TO 2+586 km	**Water table Level [m]:**	13.40	**Location:**	**Lat:** 28°29'42.23", **Long:** 77°33'2.28"

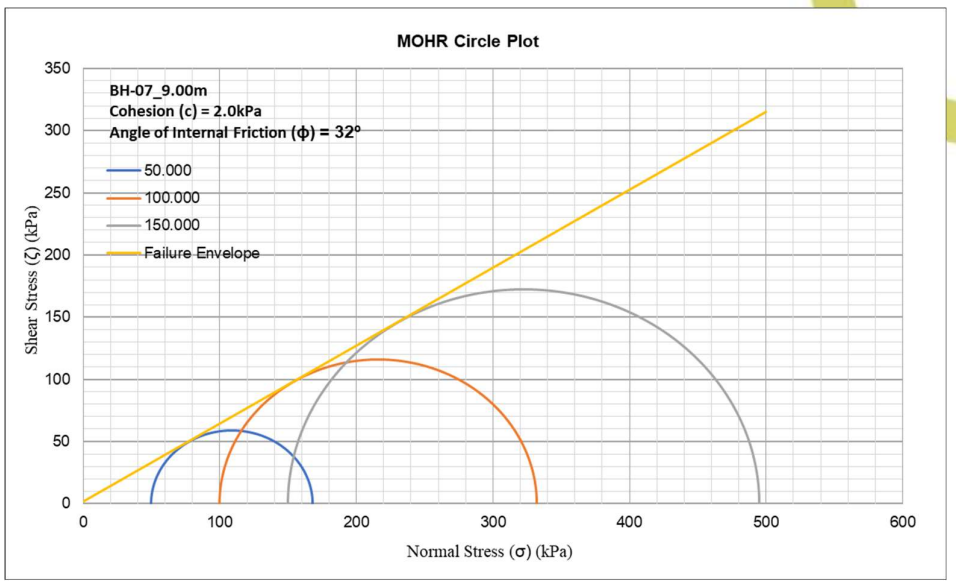
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	0.0	8.0	27.4	64.7	32	16	16	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Stiff, Yellowish, fine grained Inorganic Clay of intermediate plasticity with Sand (CI)	2	3	4	7	10	0.0	11.3	28.1	60.7	34	18	16	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							1.1	4.2	29.5	65.2	37	18	19	18.38	1.69	1.43	2.53	F	0.09	19	-	-	-	-	-	-
3.00	SPT/DS		4	5	5	10	11	-																			
4.50	SPT/DS		4	5	7	12	12	0.3	14.9	32.7	52.2	31	16	15	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS	Stiff, brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML)						11.0	10.1	52.5	26.4	29	NP	NP	16.22	1.82	1.57	2.64	F	0.06	26	-	-	-	-	-	-
6.50	SPT/DS		4	6	8	14	13	-																			
7.50	SPT/DS		5	7	11	18	16	1.3	17.0	53.8	27.9	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS	Very Stiff, brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML)						0.8	38.0	39.2	22.0	30	NP	NP	14.22	1.63	1.43	2.66	F	0.04	28	UU	2	32	0.015	0.095	2.039
9.50	SPT/DS		7	9	14	23	20	-																			
10.50	SPT/DS		9	12	16	28	23	0.0	22.3	23.6	54.1	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							4.8	7.7	36.1	51.3	27	NP	NP	15.52	2.18	1.89	2.59	F	0.1	29	UU	2	10	-	-	-
12.50	SPT/DS		6	10	12	22	17	-																			
13.50	SPT/DS		5	8	9	17	12	0.0	3.6	39.1	57.3	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS	Stiff to very stiff, Yellowish, fine grained Inorganic Clay of low plasticity with Sand and Gravel (CL)						0.0	9.8	28.1	62.1	31	15	16	18.81	-	-	2.53	F	0.16	23	-	-	-	-	-	-
15.50	SPT/DS		5	8	13	21	15	-																			
16.50	SPT/DS		5	7	11	18	12	10.1	5.3	26.6	58.0	30	16	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS							4.3	5.7	29.0	61.0	32	17	15	19.93	2.35	1.96	2.68	-	-	-	-	-	-	-	-	-	-
18.50	SPT/DS		4	6	8	14	9	-																			
19.50	SPT/DS	Hard, brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML)	9	20	30	50	24	1.1	3.7	38.2	57.0	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	UDS							7.6	4.4	61.6	26.5	24	NP	NP	18.47	1.93	1.63	2.65	F	0.08	32	-	-	-	-	-	-
21.50	SPT/DS		8	18	28	46	22	-																			
22.50	SPT/DS		10	19	32	51	23	2.8	43.4	35.2	18.6	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	UDS							3.2	36.5	37.2	23.1	26	NP	NP	19.60	-	-	2.64	-	-	-	-	-	-	-	-	-	-
24.50	SPT/DS		9	15	23	38	19	-																			
25.50	SPT/DS	Medium Dense to dense, brownish, fine-grained silty sand (SM).	4	17	20	37	18	30.2	32.4	25.3	12.1	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	UDS							3.7	26.4	50.4	19.5	25	NP	NP	18.95	2.01	1.7	2.67	F	0.02	31	-	-	-	-	-	-
27.50	SPT/DS		14	25	33	58	24	-																			
28.50	SPT/DS		13	22	24	46	20	1.4	29.6	51.5	17.5	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	UDS							9.9	48.4	27.8	13.9	28	NP	NP	16.23	2.16	1.86	2.69	-	-	-	-	-	-	-	-	-	-
30.50	SPT/DS		12	14	17	31	16	-																			

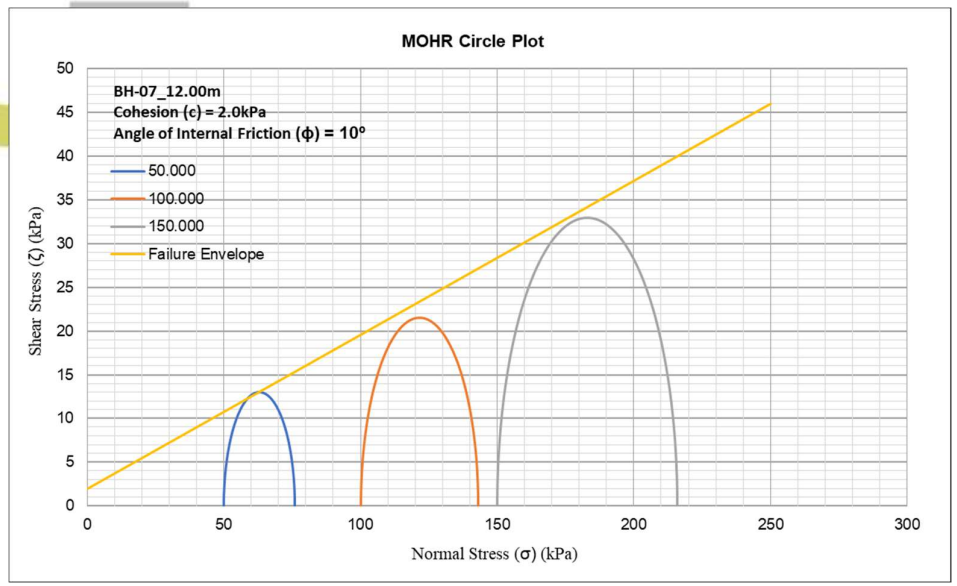
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

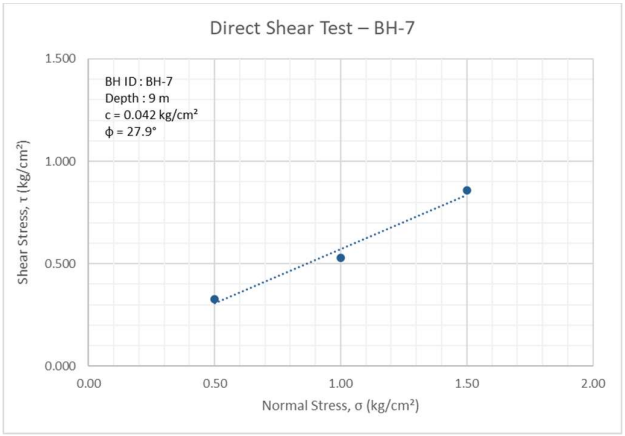

Grain Size Distribution Curve
BH-07_0m
BH-07_1.5m
BH-07_3m
BH-07_4.5m
BH-07_6m
BH-07_7.5m
BH-07_9m
Percent Finer (%)
Particle Size (mm)

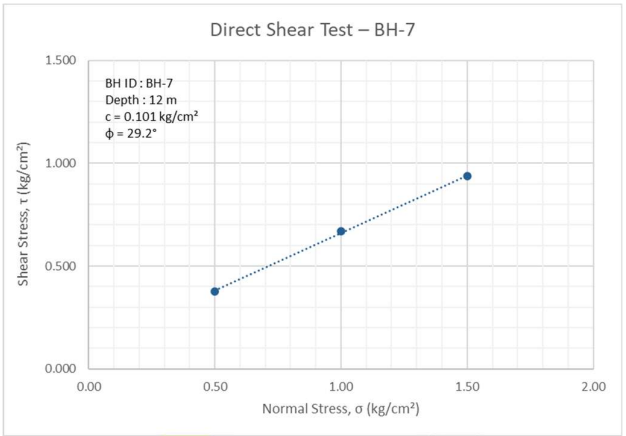

Grain Size Distribution Curve
BH-07_10.5m
BH-07_12m
BH-07_13.5m
BH-07_15m
BH-07_16.5m
BH-07_18m
BH-07_19.5m
Percent Finer (%)
Particle Size (mm)

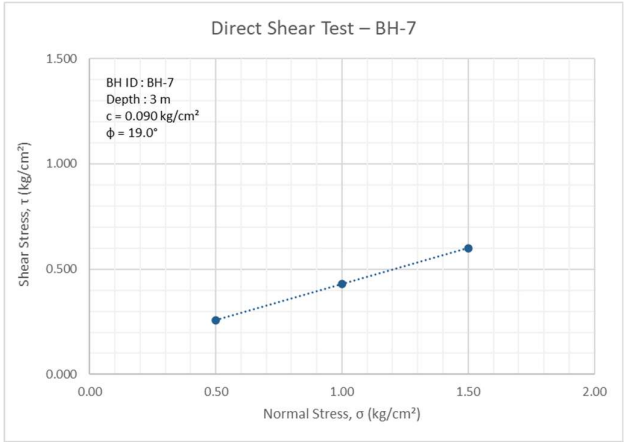

Grain Size Distribution Curve
BH-07_21m
BH-07_22.5m
BH-07_24m
BH-07_25.5m
BH-07_27m
BH-07_28.5m
BH-07_30m
Percent Finer (%)
Particle Size (mm)

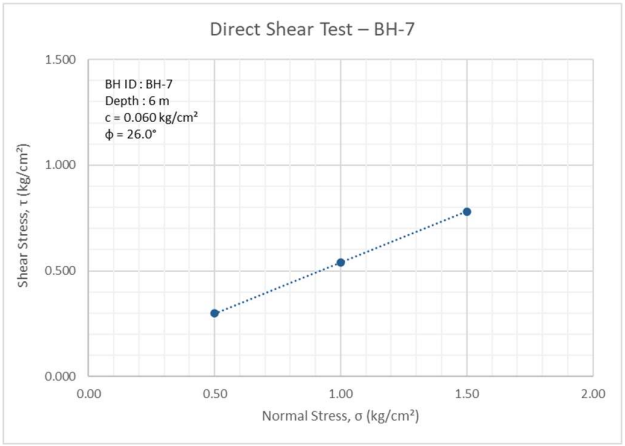

MOHR Circle Plot
BH-07_9.00m
Cohesion (c) = 2.0kPa
Angle of Internal Friction (ϕ) = 32°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

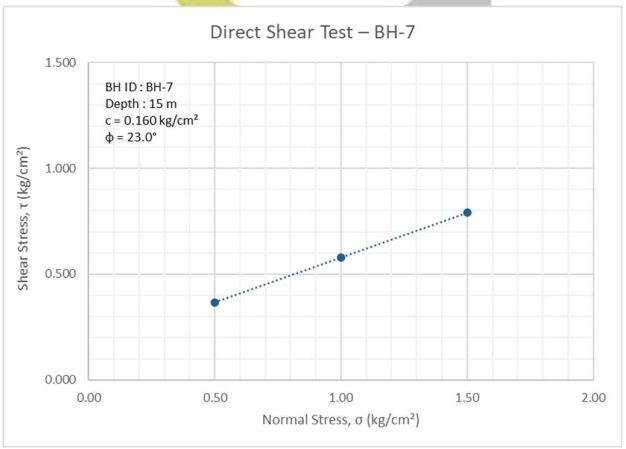

MOHR Circle Plot
BH-07_12.00m
Cohesion (c) = 2.0kPa
Angle of Internal Friction (ϕ) = 10°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

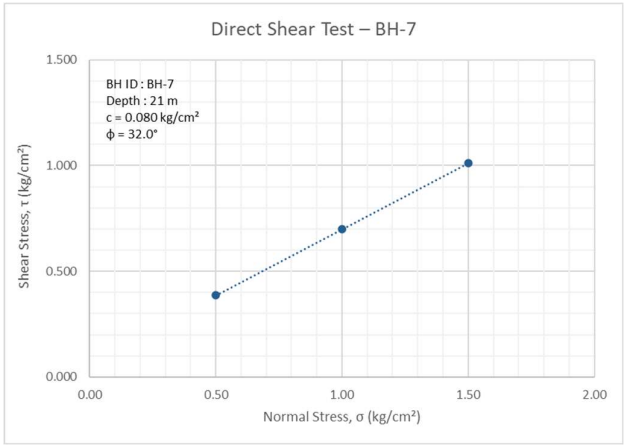

Direct Shear Test – BH-7
BH ID : BH-7
Depth : 9 m
c = 0.042 kg/cm²
ϕ = 27.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

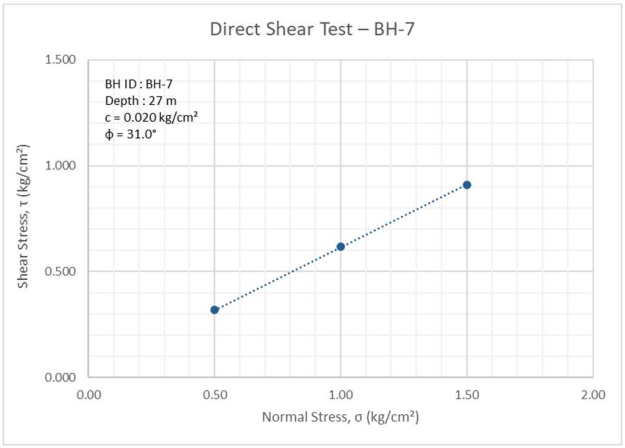

Direct Shear Test – BH-7
BH ID : BH-7
Depth : 12 m
c = 0.101 kg/cm²
ϕ = 29.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-7
BH ID : BH-7
Depth : 3 m
c = 0.090 kg/cm²
ϕ = 19.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-7
BH ID : BH-7
Depth : 6 m
c = 0.060 kg/cm²
ϕ = 26.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-7
BH ID : BH-7
Depth : 15 m
c = 0.160 kg/cm²
ϕ = 23.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-7
BH ID : BH-7
Depth : 21 m
c = 0.080 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-7
BH ID : BH-7
Depth : 27 m
c = 0.020 kg/cm²
ϕ = 31.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Depot Station to Boraki MMTH (CH 0+000 km to 2+600 km)

BH ID : BH-08 | **Chainage** : 0+701 KM

Groundwater Level : 14.50M | **Location** : Lat. 28.495697 Long. 77.555777

DEPTH	GWL	SAMPLE	SPT N VALUE	LAYER DESCRIPTION
0.00				TOP Soil: (0.00 + 0.750m)
1.00				Stiff, Yellowish, fine grained Inorganic Clay of intermediate plasticity with Sand (CI) : (0.75 to 10.00 m)
2.00		SPT/DS	N=22	
3.00		UDS		
4.00		SPT/DS	N=11	
5.00		SPT/DS	N=16	
6.00		UDS		
7.00		SPT/DS	N=21	
8.00		SPT/DS	N=14	
9.00		UDS		
10.00		SPT/DS	N=24	
11.00		SPT/DS	N=28	Very Stiff to Hard, brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML) : (10 to 14.25 m)
12.00		UDS		
13.00		SPT/DS	N=26	
14.00		SPT/DS	N=38	
15.00		UDS		Stiff to very stiff, brownish, fine grained Inorganic Clay of low plasticity with Sand and Gravel (CL) : (14.25 to 19 m)
16.00		SPT/DS	N=43	
17.00		SPT/DS	N=28	
18.00		UDS		
19.00		SPT/DS	N=11	
20.00		SPT/DS	N=38	Very stiff to Hard, brownish, fine grained Inorganic Clay of low plasticity with Sand and Gravel (CL) : (19 to 23.25 m)
21.00		UDS		
22.00		SPT/DS	N=18	
23.00		SPT/DS	N=31	
24.00		UDS		Hard, brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML) : (23.25 to 30 m)
25.00		SPT/DS	N=41	
26.00		SPT/DS	N=43	
27.00		UDS		
28.00		SPT/DS	N=65	
29.00		SPT/DS	N=60	
30.00		UDS		
31.00		SPT/DS	N=56	

LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

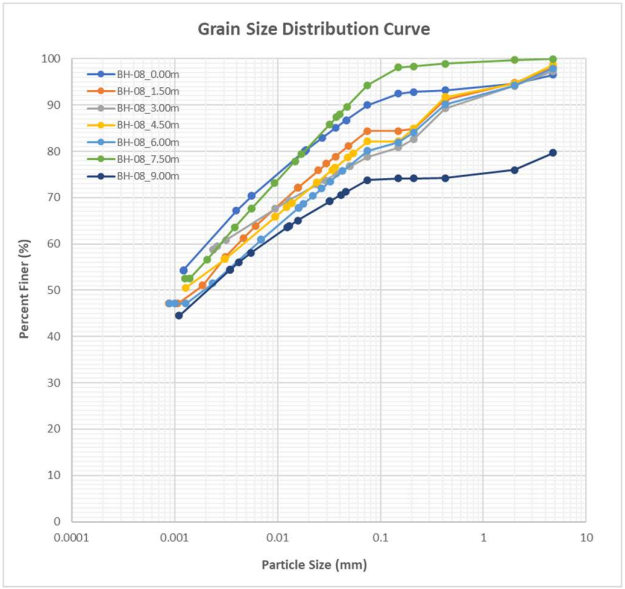
Soil

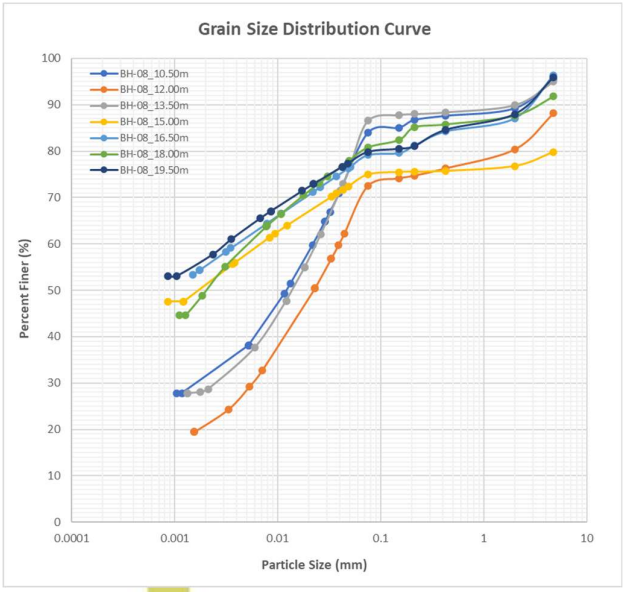
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

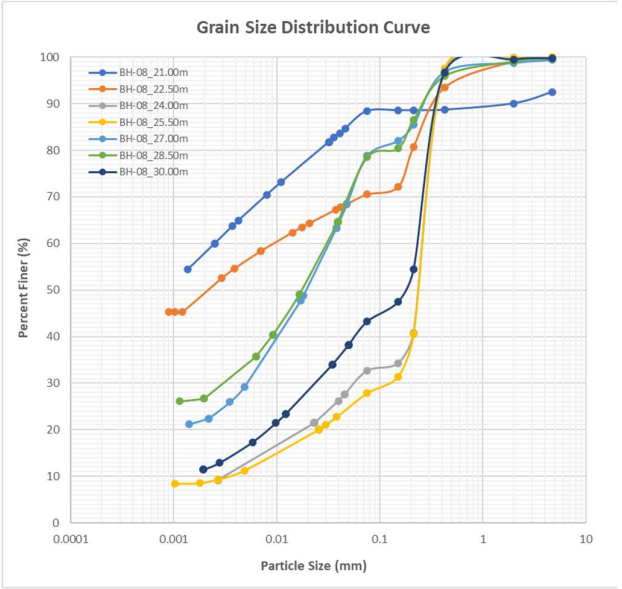
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-08	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	0+701	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	02-11-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	206.91	**End Date:**	07-11-2025
Project Code:	158_R0_DEST TO BOMM_0+000 km TO 2+586 km	**Water table Level [m]:**	14.30	**Location:**	**Lat:** 28°29'44.00", **Long:** 77°33'21.00"

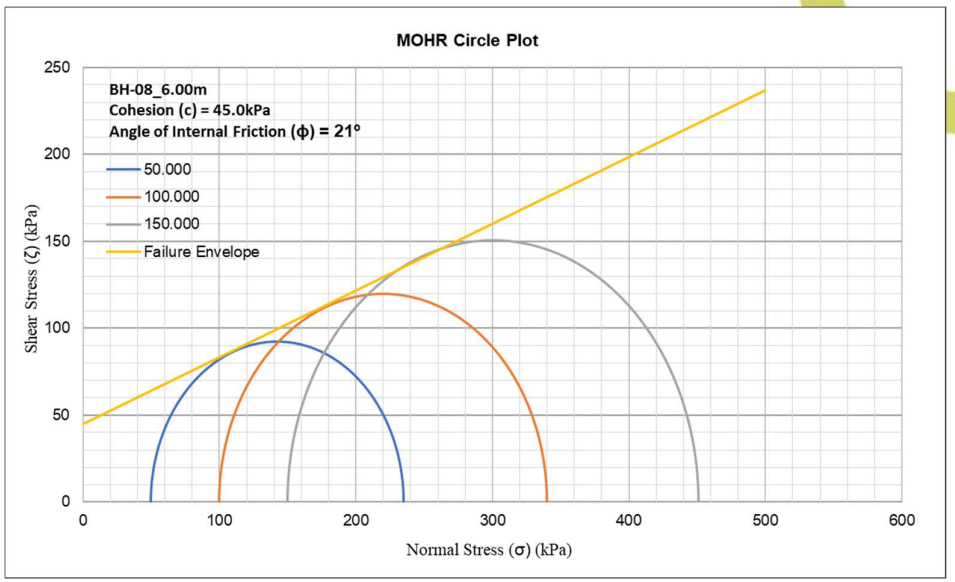
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	0.0	12.5	30.3	59.7	32	19	13	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Stiff to Very Stiff, Yellowish, fine grained Inorganic Clay of intermediate plasticity with Sand (CI)	5	9	13	22	31	0.0	11.3	32.5	51.8	36	18	18	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							2.0	12.0	78.8	0.0	38	17	21	15.10	1.72	1.49	2.55	F	0.18	17	-	-	-	-	-	-
3.00	SPT/DS		5	5	6	11	12	-																			
4.50	SPT/DS		6	7	9	16	16	0.0	14.0	28.5	53.6	36	19	17	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							4.4	33.0	29.8	50.3	36	17	19	14.52	1.60	1.40	2.65	F	0.09	28	UU	45	21	0.024	0.100	1.529
6.50	SPT/DS		6	9	12	21	20	-																			
7.50	SPT/DS		5	6	8	14	13	0.3	10.5	38.0	56.2	37	19	18	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS							4.5	8.8	24.1	49.7	38	20	18	16.25	2.23	1.92	2.4	F	0.14	30	UU	38	19	-	-	-
9.50	SPT/DS		8	12	12	24	20	-																			
10.50	SPT/DS	Very Stiff to Hard, brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML)	7	13	15	28	23	0.0	2.0	52.4	31.5	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							0.3	35.4	51.5	21.1	28	NP	NP	17.90	-	-	2.57	F	0.08	27	-	-	-	-	-	-
12.50	SPT/DS		9	11	15	26	20	-																			
13.50	SPT/DS		11	17	21	38	27	0.1	37.6	58.1	28.5	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS	Stiff to very stiff, brownish, fine grained Inorganic Clay of low plasticity with Sand and Gravel (CL)						0.7	3.0	23.8	51.2	33	15	18	24.40	1.87	1.50	2.66	-	-	-	-	-	-	-	-	-
15.50	SPT/DS		13	19	24	43	22	-																			
16.50	SPT/DS		9	12	16	28	17	7.3	5.0	23.8	55.3	30	17	12	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS							0.8	5.1	31.0	49.9	31	16	15	18.08	1.91	1.62	2.63	F	0.21	20	-	-	-	-	-	-
18.50	SPT/DS		4	5	6	11	7	-																			
19.50	SPT/DS	Very stiff to Hard, brownish, fine grained Inorganic Clay of low plasticity with Sand and Gravel (CL)	8	15	23	38	19	4.8	5.5	23.0	56.9	32	19	13	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	UDS							8.3	4.9	30.5	58.0	32	17	15	20.06	1.89	1.57	2.57	-	-	-	-	-	-	-	-	-
21.50	SPT/DS		5	6	12	18	11	-																			
22.50	SPT/DS		9	13	18	31	17	2.6	15.9	21.1	49.4	29	15	14	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	UDS	Hard, brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML)						4.3	19.5	32.7	0.0	31	NP	NP	18.82	1.95	1.64	2.69	F	0.16	28	-	-	-	-	-	-
24.50	SPT/DS		8	16	25	41	19	-																			
25.50	SPT/DS		12	17	26	43	20	5.7	19.2	19.1	8.8	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	UDS							6.9	31.1	56.7	22.2	23	NP	NP	21.04	2.02	1.67	2.55	F	0.04	32	-	-	-	-	-	-
27.50	SPT/DS		14	29	36	65	26	-																			
28.50	SPT/DS		15	26	34	60	24	3.1	71.6	51.6	26.9	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	UDS							1.2	21.1	31.6	11.6	25	NP	NP	23.61	-	-	2.61	-	-	-	-	-	-	-	-	-
30.50	SPT/DS		15	24	32	56	22	-																			

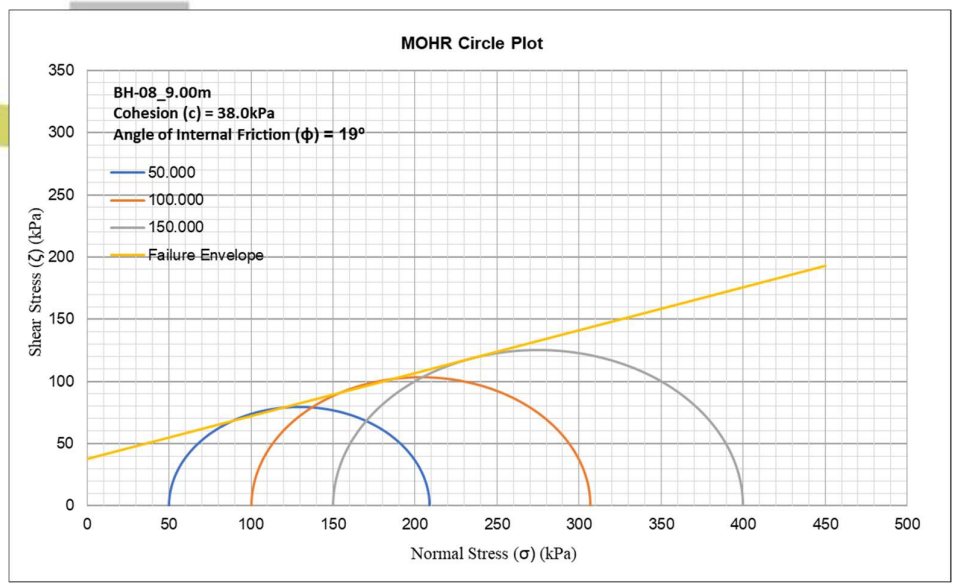
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

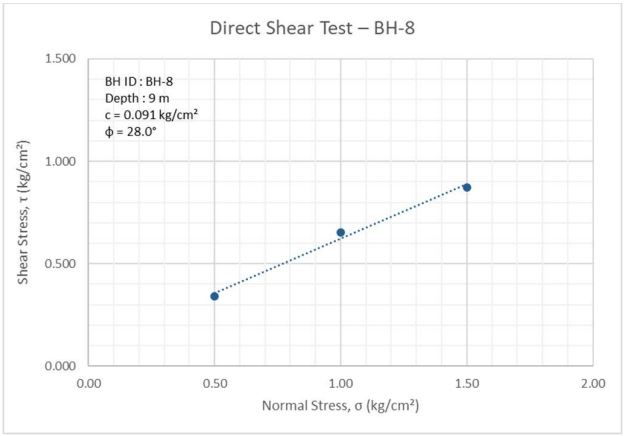

Grain Size Distribution Curve
BH-08_0.00m
BH-08_1.50m
BH-08_3.00m
BH-08_4.50m
BH-08_6.00m
BH-08_7.50m
BH-08_9.00m
Percent Finer (%)
Particle Size (mm)

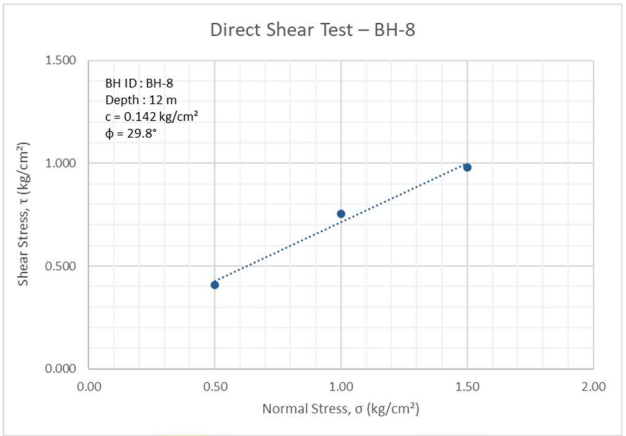

Grain Size Distribution Curve
BH-08_10.50m
BH-08_12.00m
BH-08_13.50m
BH-08_15.00m
BH-08_16.50m
BH-08_18.00m
BH-08_19.50m
Percent Finer (%)
Particle Size (mm)

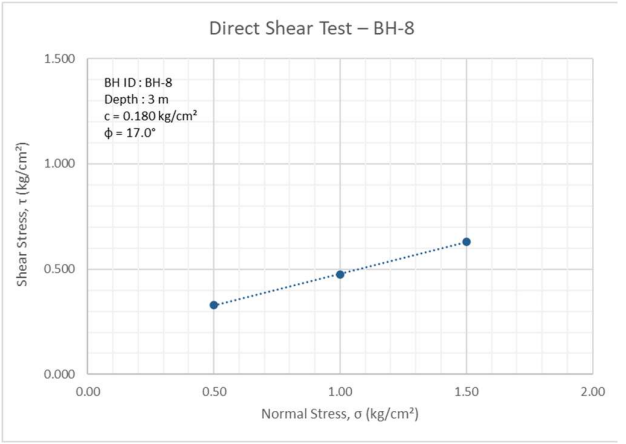

Grain Size Distribution Curve
BH-08_21.00m
BH-08_22.50m
BH-08_24.00m
BH-08_25.50m
BH-08_27.00m
BH-08_28.50m
BH-08_30.00m
Percent Finer (%)
Particle Size (mm)

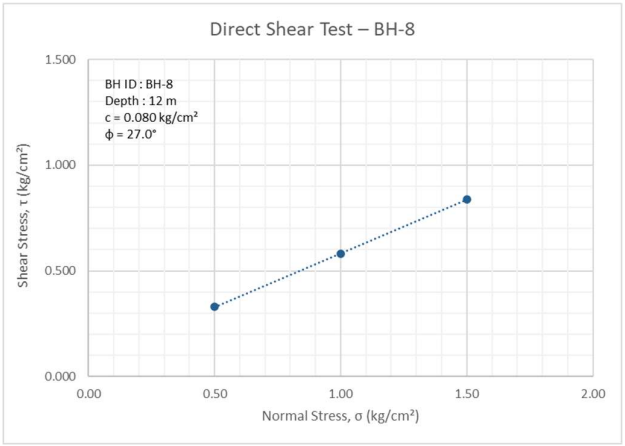

MOHR Circle Plot
BH-08_6.00m
Cohesion (c) = 45.0kPa
Angle of Internal Friction (ϕ) = 21°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

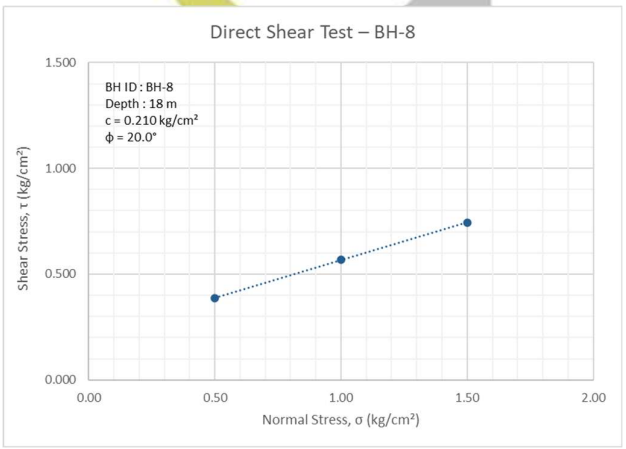

MOHR Circle Plot
BH-08_9.00m
Cohesion (c) = 38.0kPa
Angle of Internal Friction (ϕ) = 19°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

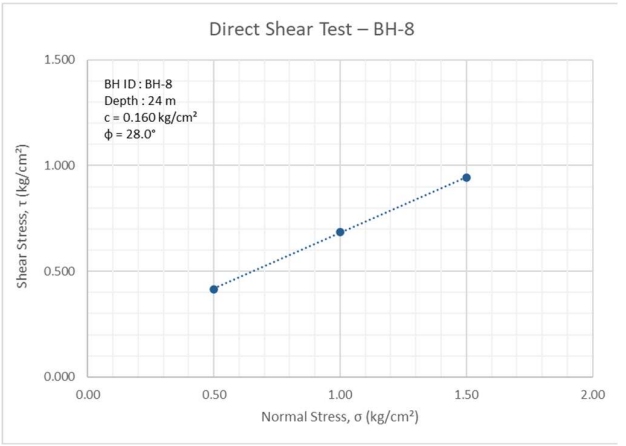

Direct Shear Test – BH-8
BH ID : BH-8
Depth : 9 m
c = 0.091 kg/cm²
ϕ = 28.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

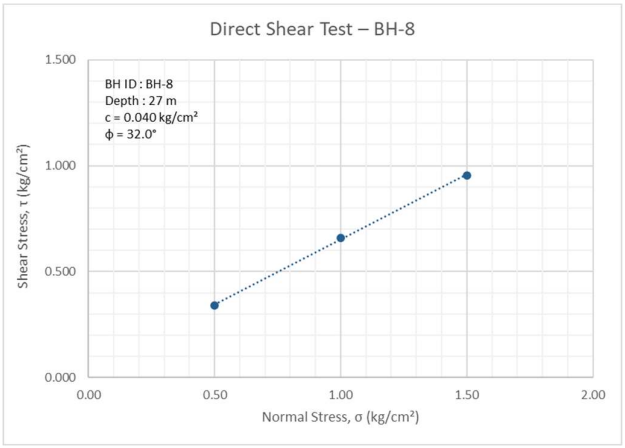

Direct Shear Test – BH-8
BH ID : BH-8
Depth : 12 m
c = 0.142 kg/cm²
ϕ = 29.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-8
BH ID : BH-8
Depth : 3 m
c = 0.180 kg/cm²
ϕ = 17.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-8
BH ID : BH-8
Depth : 12 m
c = 0.080 kg/cm²
ϕ = 27.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-8
BH ID : BH-8
Depth : 18 m
c = 0.210 kg/cm²
ϕ = 20.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-8
BH ID : BH-8
Depth : 24 m
c = 0.160 kg/cm²
ϕ = 28.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-8
BH ID : BH-8
Depth : 27 m
c = 0.040 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Depot Station to Boraki MMTH (CH 0+000 km to 2+600 km)

BH ID : BH-8A | **Chainage** : 0+734 KM

Groundwater Level : 14.30 M | **Location** : Lat. 28.496165 Long. 77.556112

DEPTH	GWL	SAMPLE	SPT N VALUE	LAYER DESCRIPTION
				TOP Soil: (0.00 + 0.750m)
1.00				Stiff, Yellowish, fine grained Inorganic Clay of intermediate plasticity with Sand (CI): (0.75 to 3.75 m)
2.00		SPT/DS	N=8	
3.00		UDS		
		SPT/DS	N=11	
4.00				Stiff to very stiff, Yellowish, fine grained Inorganic Clay of low plasticity with Sand (CL): (3.75 to 10 m)
		SPT/DS	N=16	
5.00				
6.00		UDS		
		SPT/DS	N=28	
7.00				
		SPT/DS	N=18	
8.00				
9.00		UDS		
		SPT/DS	N=11	
10.00				Very Stiff to Hard, brownish, fine grained inorganic silt of low compressibility with sand and gravel (ML): (10 to 14.25 m)
		SPT/DS	N=16	
11.00				
12.00		UDS		
		SPT/DS	N=30	
13.00				
		SPT/DS	N=32	
14.00				
15.00		UDS		Stiff to very stiff, brownish, fine grained Inorganic Clay of low plasticity with Sand and Gravel (CL): (14.25 to 19 m)
		SPT/DS	N=23	
16.00				
		SPT/DS	N=25	
17.00				
18.00		UDS		
		SPT/DS	N=26	
19.00				
		SPT/DS	N=26	Very stiff to Hard, brownish, fine grained Inorganic Clay of low plasticity with Sand and Gravel (CL): (19.25 to 23.25 m)
20.00				
21.00		UDS		
		SPT/DS	N=24	
22.00				
		SPT/DS	N=26	
23.00				
24.00		UDS		Hard, brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML): (23.25 to 26.25 m)
		SPT/DS	N=26	
25.00				
		SPT/DS	N=27	
26.00				
27.00		UDS		Very dense, brownish, finegrained silty sand with gravel (SM): (26.25 to 30 m)
		SPT/DS		
28.00				
		SPT/DS		
29.00				
30.00		UDS		
		SPT/DS		
31.00				

LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

Soil

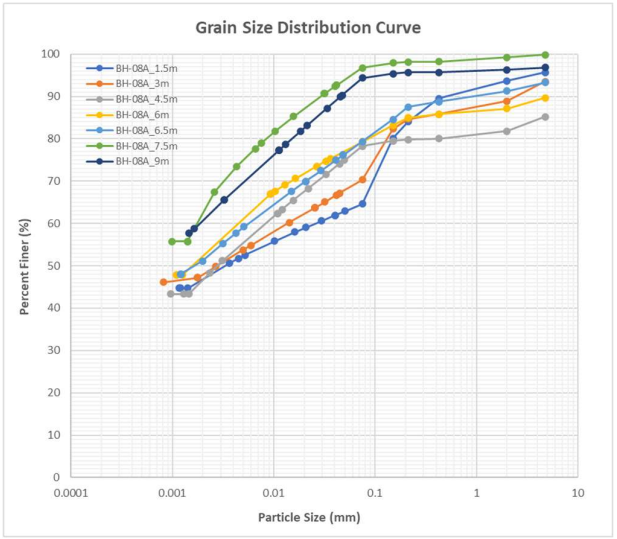
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

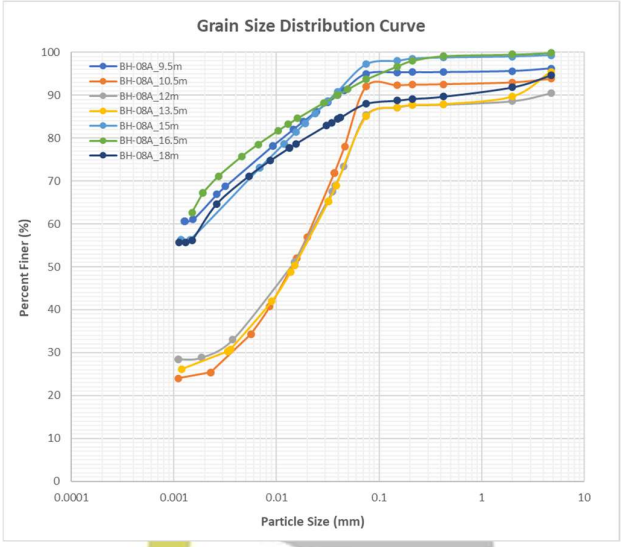
GOMA ENGINEERING AND CONSULTANCY
Quality we put forward

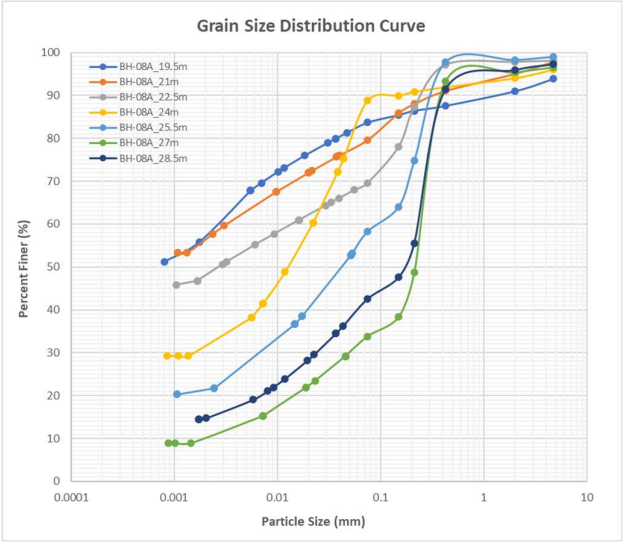
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-08A	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	0+734	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	04-12-2025
Stretch:	Depot Station to Boraki MMTH	**Elevation [m]:**	206.58	**End Date:**	05-12-2025
Project Code:	158_R0_DEST TO BOMM_0+000 km TO 2+586 km	**Water table Level [m]:**	14.30	**Location:**	**Lat:** 28°49'61.65", **Long:** 77°55'61.12"

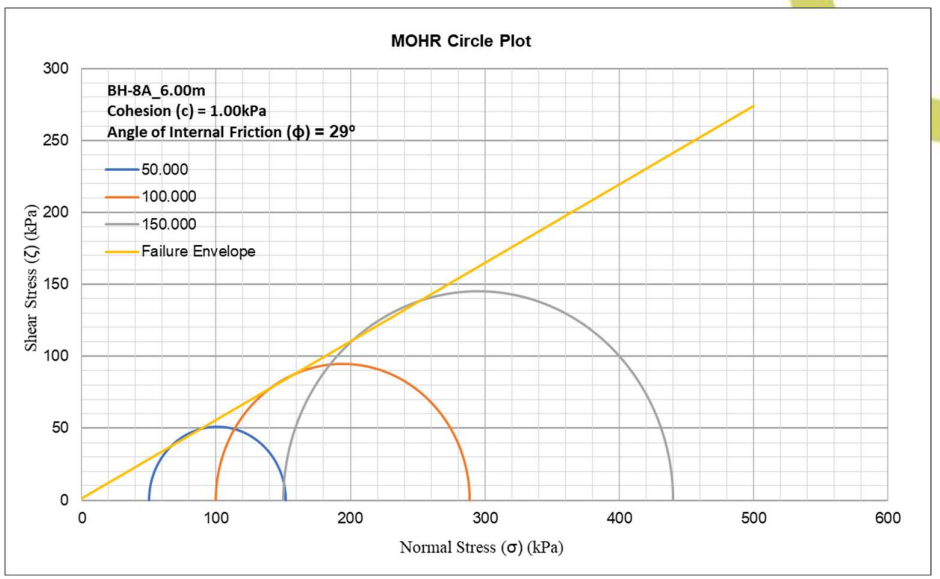
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil	-	-	-	-	-	3.1	28.6	23.2	45.1	37	15	22	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Stiff, Yellowish, fine grained Inorganic Clay of intermediate plasticity with Sand (CI)	2	3	3	6	8	4.3	31.1	17.7	46.9	38	18	20	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							6.5	23.2	22.3	48.0	36	16	20	6.39	-	-	2.63	F	0.02	28	-	-	-	-	-	-
3.00	SPT/DS		3	4	6	10	11	-																			
4.50	SPT/DS	Stiff to very stiff, Yellowish, fine grained Inorganic Clay of low plasticity with Sand (CL)	5	7	9	16	16	1.8	6.9	31.5	46.7	33	18	15	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							10.4	10.4	27.0	52.3	32	17	15	17.04	1.63	1.39	2.47	F	0.08	24	UU	1	29	-	-	-
6.50	SPT/DS		10	12	18	30	28	6.7	10.5	28.1	51.2	30	16	14	-	-	-	2.68	-	-	-	-	-	-	-	-	-
7.50	SPT/DS		7	9	11	20	18	0.2	10.5	34.4	62.4	34	16	18	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS							3.2	3.1	33.7	60.7	31	15	16	17.17	1.78	1.52	2.65	F	0.07	26	UU	2	28	-	-	-
9.50	SPT/DS		2	4	9	13	11	3.7	1.2	31.1	63.9	32	17	15	-	-	-	2.60	-	-	-	-	-	-	-	-	-
10.50	SPT/DS	Very Stiff to Hard, brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML)	5	8	12	20	16	6.2	1.8	66.9	25.2	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							9.5	5.0	56.1	29.3	27	NP	NP	17.44	1.88	1.51	2.56	F	0.14	35	-	-	-	-	-	-
12.50	SPT/DS		11	17	23	40	30	-																			
13.50	SPT/DS		14	19	25	44	32	4.5	10.4	56.9	28.2	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS	Stiff to very stiff, brownish, fine grained Inorganic Clay of low plasticity with Sand and Gravel (CL)						0.7	2.1	37.4	59.8	31	16	NP	27.28	-	-	2.57	F	0.08	32	-	-	-	-	-	-
15.50	SPT/DS		17	21	25	46	23	-																			
16.50	SPT/DS		20	24	30	54	25	0.1	6.2	26.0	67.7	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS							5.4	6.6	27.5	60.5	26	NP	NP	16.46	-	-	2.62	-	-	-	-	-	-	-	-	-
18.50	SPT/DS		15	23	36	59	26	-																			
19.50	SPT/DS	Very stiff to Hard, brownish, fine grained Inorganic Clay of low plasticity with Sand and Gravel (CL)	19	27	33	60	26	6.2	10.2	26.5	57.2	29	15	14	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	UDS							2.1	18.3	23.2	56.4	32	17	15	20.85	1.98	1.65	2.53	F	0.22	20	-	-	-	-	-	-
21.50	SPT/DS		21	25	31	56	24	-																			
22.50	SPT/DS		23	29	34	63	26	1.9	28.5	21.6	47.9	33	16	17	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	UDS	Hard, brownish, fine-grained inorganic silt of low compressibility with sand and gravel (ML)						4.0	7.2	57.1	31.7	29	NP	NP	26.93	-	-	2.53	F	0.07	30	-	-	-	-	-	-
24.50	SPT/DS		24	30	34	64	26	-																			
25.50	SPT/DS		26	31	37	68	27	1.0	40.7	36.9	21.4	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	UDS	Very dense, brownish, fine-grained silty sand withgravel (SM)						3.4	62.8	23.7	10.1	27	NP	NP	18.26	-	-	2.46	-	-	-	-	-	-	-	-	-
27.50	SPT/DS		40	50/2cm	-	Refusal	Refusal	-																			
28.50	SPT/DS		47	50/7cm	-	Refusal	Refusal	2.7	54.7	27.9	14.7	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	UDS							2.2	61.0	24.3	12.5	26	NP	NP	11.61	-	-	2.67	F	0.09	26	-	-	-	-	-	-
30.50	SPT/DS		50	50/2cm	-	Refusal	Refusal	-																			

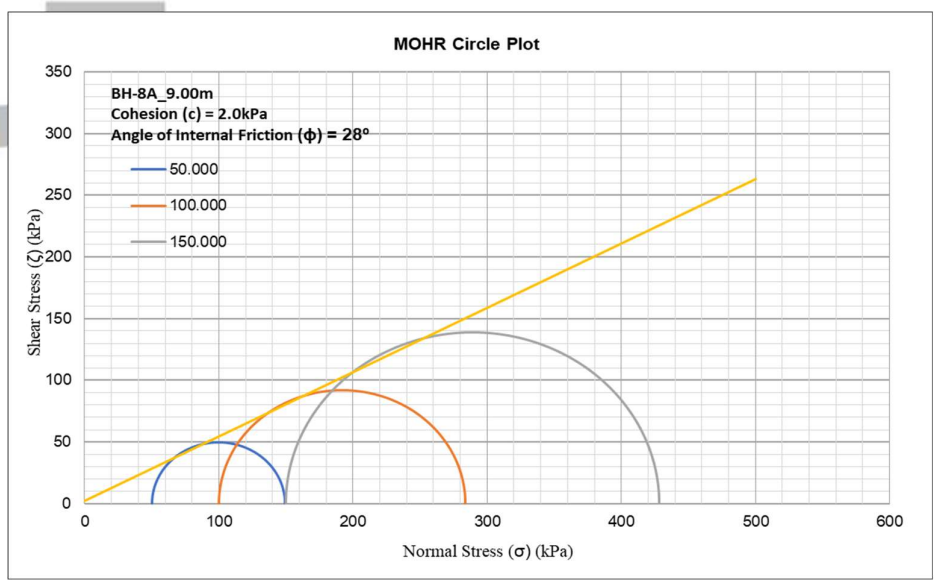
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

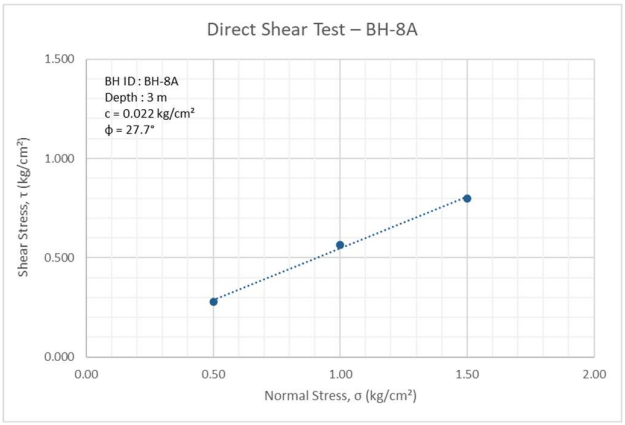

Grain Size Distribution Curve
BH-08A_1.5m
BH-08A_3m
BH-08A_4.5m
BH-08A_6m
BH-08A_6.5m
BH-08A_7.5m
BH-08A_9m
Percent Finer (%)
Particle Size (mm)

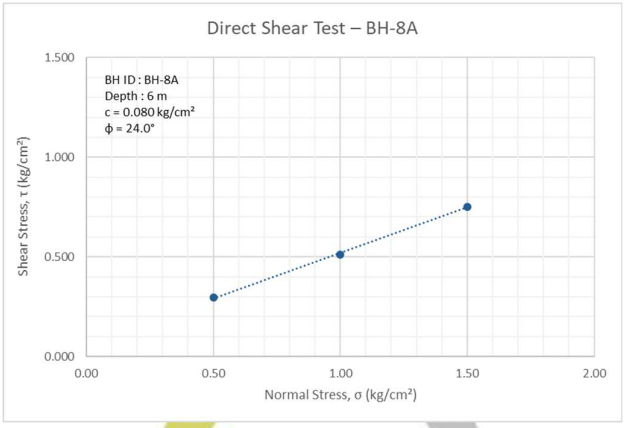

Grain Size Distribution Curve
BH-08A_9.5m
BH-08A_10.5m
BH-08A_12m
BH-08A_13.5m
BH-08A_15m
BH-08A_16.5m
BH-08A_18m
Percent Finer (%)
Particle Size (mm)

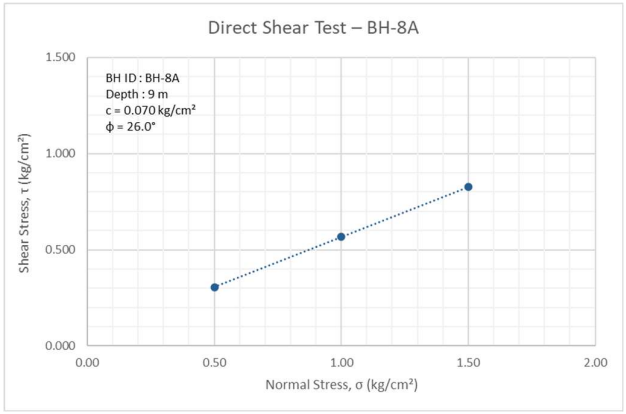

Grain Size Distribution Curve
BH-08A_19.5m
BH-08A_21m
BH-08A_22.5m
BH-08A_24m
BH-08A_25.5m
BH-08A_27m
BH-08A_28.5m
Percent Finer (%)
Particle Size (mm)

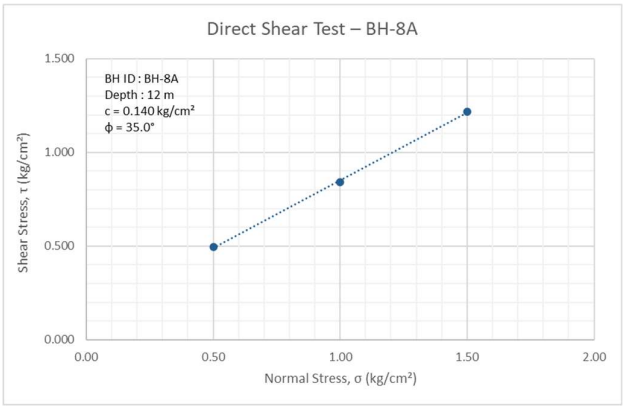

MOHR Circle Plot
BH-8A_6.00m
Cohesion (c) = 1.00kPa
Angle of Internal Friction (ϕ) = 29°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

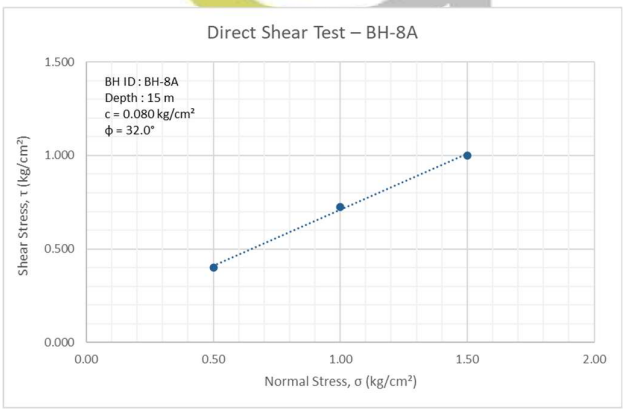

MOHR Circle Plot
BH-8A_9.00m
Cohesion (c) = 2.0kPa
Angle of Internal Friction (ϕ) = 28°
50.000
100.000
150.000
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

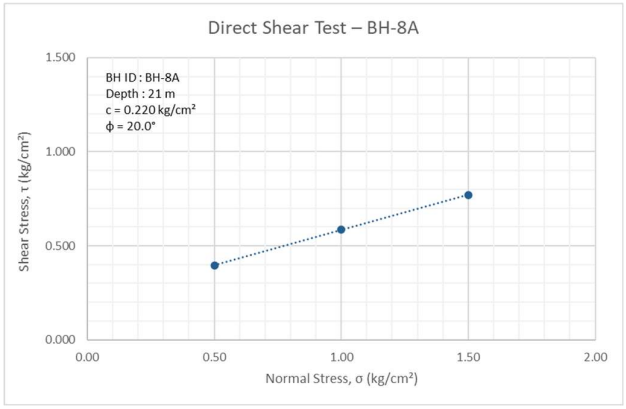

Direct Shear Test – BH-8A
BH ID : BH-8A
Depth : 3 m
c = 0.022 kg/cm²
ϕ = 27.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

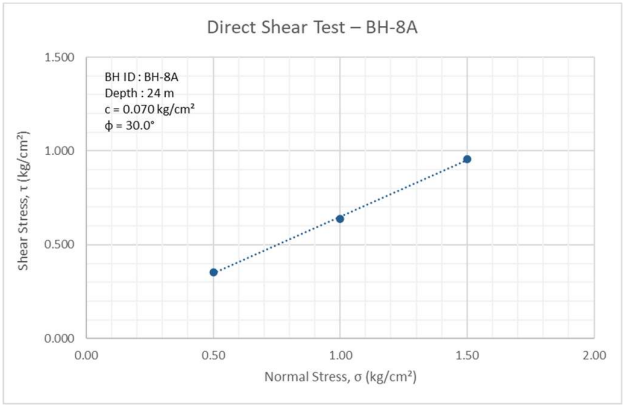

Direct Shear Test – BH-8A
BH ID : BH-8A
Depth : 6 m
c = 0.080 kg/cm²
ϕ = 24.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

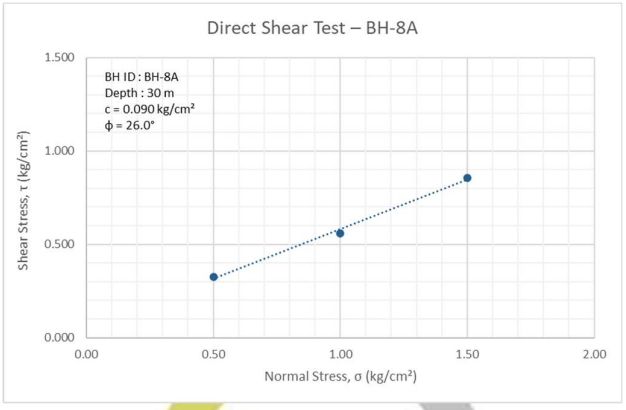

Direct Shear Test – BH-8A
BH ID : BH-8A
Depth : 9 m
c = 0.070 kg/cm²
ϕ = 26.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-8A
BH ID : BH-8A
Depth : 12 m
c = 0.140 kg/cm²
ϕ = 35.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-8A
BH ID : BH-8A
Depth : 15 m
c = 0.080 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-8A
BH ID : BH-8A
Depth : 21 m
c = 0.220 kg/cm²
ϕ = 20.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-8A
BH ID : BH-8A
Depth : 24 m
c = 0.070 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-8A
BH ID : BH-8A
Depth : 30 m
c = 0.090 kg/cm²
ϕ = 26.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00