IMS - ISO 9001:2015,
ISO 14001:2015,
ISO 45001:2018 &
ISPS COMPLIANT PORT

வ.உ.சிதம்பரனார் துறைமுகஆணையம்
वी.ओ. चिदम्बरनारपत्तनप्राधिकरण
V.O.CHIDAMBARANAR PORT AUTHORITY
पत्तन, पोतपरिवहनऔरजलमार्गमंत्रालय
CIVIL ENGINEERING DEPARTMENT
MINISTRY OF PORTS, SHIPPING AND
WATERWAYSभारतसरकार GOVERNMENT OF INDIA
ADMINISTRATIVE OFFICE, HARBOUR ESTATE,
TUTICORIN 628 004, TAMIL NADU

SAGARMALA
PORT-LED PROSPERITY

No. CIV-OFCPD-PRJ-DEVEL-V1-21(50298)/D.06 Date: 02.01.2025

CORRIGENDUM 2

To

All Bidders.

Sub: Development of Outer Harbour Container Terminal Project including Dredging and Construction of Breakwater at VOC Port on DBFOT Basis – Reply to the Pre bid Queries - reg.

Gentlemen,

With reference to the clarification sought by the Tenderers during the Pre – bid meeting, for the subject work held on **12.12.2024,** the pre bid reply of the subject tender is attached herewith.

The above changes are applicable to all corresponding clauses of the document wherever incorporated.

The amendment will form part of the Tender document to be signed in all pages by the Tenderers and to be enclosed along with the Tender documents –Bid - I (RFQ).

Encl: As above

Yours faithfully,

Sd/-

CHIEF ENGINEER

Pre- Bid Clarification for " Development of Outer Harbour Container Terminal Project including Dredging and Construction of Breakwater at VOC Port on DBFOT Basis"

Sl. No.	Tender Clause & Page No.	Tender Conditions	Queries by the Bidder	Clarification / Amendments by the Port
1.	RFQ Cl no. 1.1.1, Pg. No. 8	The indicative Project cost of Stage I is Rs 4494.46 Cr & Stage II is Rs 2561.49 Cr. However, the VGF will be limited to a maximum of Rs 1950.00 Cr or actual quote, whichever is lower.	Authority is requested to kindly increase the amount available for VGF to atleast 40% in accordance with the previously awarded port bids in the country. Current VGF (as per RFQ document) - 1950 Cr. (28% of the estimated project cost ie. 28%*7055 Cr = 1950 Cr)	RFQ clause stands.
2.	RFQ Cl no. 1.1.1, Pg. No. 8	The indicative Project cost of Stage I is Rs 4494.46 Cr & Stage II is Rs 2561.49 Cr. However, the VGF will be limited to a maximum of Rs 1950.00 Cr or actual quote, whichever is lower.	Authority is requested to kindly provide an enabling clause to the bidder such that the bidder shall be eligible to get proportionate increment in the VGF as referred in RFQ document (INR 1950 Cr.), if the total actual project cost incurred or to be incurred by the bidder increases. Example: Current total estimated project Cost - INR 7055 Cr and VGF is 28% of total estimated project cost ie. 1950 Cr. Considering a scenario wherein the total actual project cost increases to INR	RFQ clause stands.

Sl. No.	Tender Clause & Page No.	Tender Conditions	Queries by the Bidder	Clarification / Amendments by the Port
			10,000 Cr. In this scenario, bidder should be eligible to get the VGF based on the % of total actual project cost ie. INR 10000 Cr*28% = INR 2800 Cr.	
3	RFQ Cl no. 1.1.1, Pg. No. 8	The Authority intends to pre-qualify suitable Applicants (the "Bidders") who will be eligible for participation in the Bid Stage, for awarding the Project through an open competitive bidding process in accordance with the procedure set out herein.	**Bifurcating the qualification and bidding process: -** Authority is requested to kindly bifurcate the qualification and bidding process. Qualified bidder shall be intimated by the authority subsequent to which only qualified bidders should be allowed to participate in the bidding process.	Tender clause stands.
4	RFQ Cl no. 1.1.1, Pg. No. 8	The Authority intends to pre-qualify suitable Applicants (the "Bidders") who will be eligible for participation in the Bid Stage, for awarding the	An open competitive bidding process has been referred in the RFQ document. Authority is requested to clarify whether more chances will be given to further lower their bids via swiss challenge or auction process based on the competitive bids	The lowest VGF quoted bidder will be the selected bidder.

Sl. No.	Tender Clause & Page No.	Tender Conditions	Queries by the Bidder	Clarification / Amendments by the Port
		Project through an open competitive bidding process in accordance with the procedure set out herein.	received by the authority from other bidders.	
5	RFQ Cl no. 1.1.3, Pg. No. 9	The construction period for Stage I development is 36 months and Stage II development is 24 months.	Authority is requested to clarify that bidder shall be allowed to take extension in the specified timelines for project completion (ie. 36 months for Stage 1 and 24 months for Stage 2) upon request being made to authority for any reasons outside the control of the successful bidder and no penalty or breach of contract shall trigger on account of the same.	Tender clause stands. Further, Extension may be granted is as per the conditions laid out in Draft Concession Agreement.
6	RFQ Cl no. 1.1.3, 8. B: Container Handling Equipment: Pg. No. 12	Concessionaire shall provide following minimum numbers suitable container handling equipment's in each of the Container Terminal:	Concessionaire should be free to deploy the equipment (both type and quantity) to achieve the capacity of the respective phases. Tractor/ trailer can be deployed on hire basis instead of the purchase.	Tender clause stands. Tractor/ trailer can be deployed on hire basis.

Sl. No.	Tender Clause & Page No.	Tender Conditions	Queries by the Bidder	Clarification / Amendments by the Port
7	RFQ Cl no. 1.2.7, Pg. No. 20	As part of the Bidding Documents, the Authority will provide a draft Concession Agreement and feasibility report prepared by the Authority and other information pertaining/ relevant to the Project available with it.	Authority is requested to share data room for all the technical and other business/financial data (including all project feasibility reports) available with it pertaining to the project in order to enable the bidders to perform their due-diligence and self-assessment prior to submission of their financial bids.	The DPR of the project has been uploaded in the CPP portal / VOC Port website.
8	RFQ Cl no. 2.2.4 (ii) Pg. No. 25	Net worth (the "Net Worth") shall mean the sum of subscribed and paid up equity and reserves from which shall be deducted the sum of revaluation reserves, miscellaneous expenditure not written off and reserves not available for distribution to equity shareholders.	In the definition of Net worth Computation - Reserves not available for distribution to equity shareholders are to be excluded in accordance with the definition provided in RFQ - So please clarify, if any reserve is available for distribution as Bonus share but not as dividend whether that reserve will be excluded or not (example : Capital redemption reserve which is available only for distribution as Bonus Shares as per the provisions of the Companies Act, 2013).	As per the query, if Capital Redemption Reserve (CRR) can be used to the equity shareholder then it is part of computation of net worth.

Sl. No.	Tender Clause & Page No.	Tender Conditions	Queries by the Bidder	Clarification / Amendments by the Port
9	RFQ Cl no. 2.14 Pg. No. 37	Application Due Date	Request Authority to provide atleast 2 months extension from the date of uploading the clarifications, considering the size of the project and time required for carrying out the internal assessment.	Application due date is extended up to 10.02.2025 upto 15:00 hour. The Authority shall open the bids in CPP Portal on 11.02.2025 at 15:30 hours IST.
10	RFQ Cl no. 3.2.1 Pg. No. 44	Definition of Core Sector and Category 4 Eligible Projects.	Request you to please allow the inclusion of acquisition cost of power plants/other Eligible Projects to meet the construction experience on Eligible Projects.	RFQ clause stands.
11	RFQ Cl no. 3.2.1 (Definition of Core Sector) Pg. No. 44	Definition of Core Sector	Please clarify whether we can include the capex incurred on expanding the existing industrial/private business operations under category Industrial parks/Estates.	Please refer clause 3.2.1, 3.2.3 & 3.2.4 of RFQ.
12	RFQ General (Technical Eligibility Criteria) Pg. No. 44 & 45	General	Please clarify whether we can include the capex incurred and revenue generated from the operations outside India as well in order to satisfy the technical eligibility criteria.	Yes.
13	RFQ	General	Authority is requested to clarify whether the Tender Fees already paid by bidder	No.

Sl. No.	Tender Clause & Page No.	Tender Conditions	Queries by the Bidder	Clarification / Amendments by the Port
	General		amounting Rs. 8,32,602/- shall be adjusted for this round of tender or an additional application fee shall be required to be paid by the bidder.	
14	RFQ Cl no. 3.2.3 Pg. No. 45	c. the capital cost of the project should be more than Rs 705.60 crores (Rupees Seven Hundred five crores and sixty lakhs only); and	Considering the higher project cost, request Authority to consider only the Phase – 1 estimated cost excluding VGF and accordingly amend the mentioned clause.	RFQ clause stands.
15	RFQ 1.2 Brief description of Bidding Process Pg. No. 18	Documentary Proof for the payment of Bid Security for an amount of Rs. 70.56 Crores (Rupees Seventy Crores and Fifty-Six Lakhs only)	Request Authority to consider bid security of 0.5% of the estimated project cost of Phase -1 excluding VGF to ensure more participation in the bidding process.	RFQ clause stands.
16	RFP Cl No 1.1.3 Pg. No. 12	The Concessionaire shall commence the construction activity of Container Terminal -2 (Berths III and IV), the day following completion of 24 calendar	Considering the size of the project & investment required, request the Authority to allow the Concessionaire to commence the construction activity of Container Terminal -2 (Berths III and IV), the day following completion of 24 calendar	RFQ clause stands.

Sl. No.	Tender Clause & Page No.	Tender Conditions	Queries by the Bidder	Clarification / Amendments by the Port
		months from the date when the average annual volume of cargo handled at the Project Facilities and Services reaches to a level of 70% of Project Capacity for 2 (two) consecutive years of stage I or the day following completion of 96 calendar months from the Date of Award of Concession, whichever is earlier	months from the date when the average annual volume of cargo handled at the Project Facilities and Services reaches to a level of 70% of Project Capacity for 2 (two) consecutive years of stage I, in order to mitigate the risk of being Non Performing Asset of Stage-II	
17	RFP Cl no 1.1.3 Pg. No. 09	A. Stage I (Construction Phase: 36 months) and Stage II (Construction Phase: 24 months)	It is requested that the Concessionaire shall be allowed to optimize the scope of the construction work without compromising required phase-wise capacity of 2 Mn TEUs	RFQ clause stands.
18	RFP Cl no. 2.1.6.1 Pg. No. 20	The Concessionaire shall have to pay to the Authority for the year commencing from 11th	Authority is requested to clarify that no premium shall be payable by the successful bidder in the scenerio wherein extension has been granted by the	RFQ clause stands.

Sl. No.	Tender Clause & Page No.	Tender Conditions	Queries by the Bidder	Clarification / Amendments by the Port
		year of award of concession, a premium in the form of Revenue Share equal to 1% of the total Gross Revenue earned and for each subsequent year thereafter, the Premium shall be determined by increasing the proportion of Premium in the respective year by an additional 1% as compared to the immediately preceding year	authority for any period beyond 11th year.	
19	RFP Cl no 1.2.6, Pg. No. 21	Bids are invited for the Project “on the basis of the lowest VGF required by a Bidder for implementing the Project. The VGF will be limited to a maximum of Rs 1950.00 Crs or actual	Considering the magnitude and higher capex of the project, request Authority to provide VGF upto 40% of the estimated project cost, which will increase the commercial feasibility of the project	RFQ clause stands.

Sl. No.	Tender Clause & Page No.	Tender Conditions	Queries by the Bidder	Clarification / Amendments by the Port
		quote, whichever is lower.		
20	RFP Cl no 1.2.6, Pg. No. 21	Bids are invited for the Project “on the basis of the lowest VGF required by a Bidder for implementing the Project. The VGF will be limited to a maximum of Rs 1950.00 Crs or actual quote, whichever is lower.	As per the DPR, Phase – 1 cost estimate is Rs. 4687 Cr which include about Rs. 2500 Cr towards dredging and breakwater, whereas overall cost of phase – 2 is only Rs. 2368 Cr. Considering the above, request Authority to allocate entire VGF in phase – 1 to make financially feasible.	RFQ clause stands.
21	RFP 1.2 Brief description of Bidding Process Pg. No. 18	The part of Bid document fee of Rs. 8,32,602/- is non-refundable.	Request Authority to refund the entire bid document fee to encourage active participation from potential bidders.	RFQ clause stands.
22	RFP 1.2 Brief description of Bidding Process Pg. No. 18	The Authority has adopted a single stage two-bid system (collectively referred to as the “Bidding Process”) for selection of the Bidder for award of the Project. The Bidder has to submit the	Please clarify on understanding of submission of BID-I online? as BID-II submission through online is mentioned in RFP clause 2.11.1 page no:34.	Yes, kindly refer clause 2.13.2 (a) of RFQ.

Sl. No.	Tender Clause & Page No.	Tender Conditions	Queries by the Bidder	Clarification / Amendments by the Port
		BID-I (RFQ) and BID-II (RFP) at single stage		
23	RFP Cl no. 3.3.2 Pg. No. 36	In the event that two or more Bidders quote the same amount of VGF (the "Tie Bidders"), the Authority shall identify the Selected Bidder by draw of lots, which shall be conducted, with prior notice, in the presence of the Tie Bidders who choose to attend.	In case of tie between any 2 bidders, authority is requested to grant an equal opportunity to both the bidders and an open competitive bidding process should be conducted between all the bidders instead of draw of lots.	This will be examined and subsequently it will be informed.
24	RFP Cl no 1.1.3 Pg. No. 09	A. Stage I (Construction Phase: 36 months) and Stage II (Construction Phase: 24 months)	Authority to grant Stage 1 Development construction phase as 48 Months and Stage 2 Development Construction phase as 36 Months	RFP clause stands.
25	DCA 6.5 Obligations of the Concessioning	In addition to any of its other obligations under this Agreement, during the Construction Phase, the Concessioning Authority	Request Authority to include "prioritize in allotment of rakes from Railways for quick turn around"	DCA clause stands.

<table>
<tr><th>Sl. No.</th><th>Tender Clause & Page No.</th><th>Tender Conditions</th><th>Queries by the Bidder</th><th>Clarification / Amendments by the Port</th></tr>
<tr><td></td><td>Authority

Pg. No. 62</td><td>shall:</td><td></td><td></td></tr>
<tr><td>26</td><td>DCA

Appendix 13 – Minimum Guaranteed Cargo

Pg. No. 201</td><td><table><tr><th>Period (from date of award of concession)</th><th>MGC</th></tr><tr><td>Upto 15th Year</td><td>No MGC</td></tr><tr><td>16th to 20th year</td><td>2 MTEUs</td></tr><tr><td>21st year to 25th year</td><td>2.4 MTEUs</td></tr><tr><td>26th year to 45th year</td><td>2.8 MTEUs</td></tr></table></td><td>Request Authority to consider MGC as given below for viability of the project<table><tr><th>Period (From date of award of concession)</th><th>MGC</th></tr><tr><td>Upto 15th Year</td><td>No MGC</td></tr><tr><td>16th to 20th year</td><td>1 MTEUs</td></tr><tr><td>21st year to 25th year</td><td>1.5 MTEUs</td></tr><tr><td>26th year to 45th year</td><td>2.0 MTEUs</td></tr></table></td><td>DCA clause stands.</td></tr>
<tr><td>27</td><td>DCA

Article – 9: Payment to the Concessioning Authority

9.2 Payments of Premium a)

Pg. No. 68</td><td>The Concessionaire shall have to pay to the Authority for the year commencing from 11th year of award of concession, a premium in the form of Revenue Share equal to 1% of the total Gross Revenue earned and for each subsequent year thereafter, the Premium shall be</td><td>Request Authority to increase the premium for every subsequent year by an additional 0.5% instead of 1% with a capping of 17.5%, in the mentioned clause which will assist in increasing the financial feasibility of the project.</td><td>DCA clause stands.</td></tr>
</table>

Sl. No.	Tender Clause & Page No.	Tender Conditions	Queries by the Bidder	Clarification / Amendments by the Port
		determined by increasing the proportion of Premium in the respective year by an additional 1% as compared to the immediately preceding year		
28	DPR 9.9 Viability Gap Funding Pg. No. 121	Government support as Viability Gap Funding for construction of breakwater, dredging in the basin and channel and fund construction of the Project in the tune of Rs.2500 Crores	As per the DPR, considering Rs. 2500 cr. as VGF, the IRR base case scenario is 16.54%, whereas as per the tender document, only Rs. 1950 Cr has been considered, which will reduce the feasibility of the project in accordance with DPR itself. Also, the traffic considered from year 14 of concession, is 4 MTEUs which is on the much optimistic side, based on the traffic study carried out almost 6 yrs ago. The Project cost estimation is as per the study carried out in 2022 and no	RFQ clause stands.

Sl. No.	Tender Clause & Page No.	Tender Conditions	Queries by the Bidder	Clarification / Amendments by the Port
			escalation on the project cost considered as per market conditions. Considering the above facts, request the Authority to consider 40% of the estimated project cost as VGF.	
29	DCA APPENDIX 14 PERFORMANCE STANDARDS Pg. No. 203 APPENDIX 14 PERFORMANCE STANDARDS Pg. No. 203	The indicative norms for Gross Berth Output for different categories of cargo are as follows: (Feeder vessel) : [25 moves per hour]	Request you to consider gross berth output for feeder vessel as 17 moves per hour in accordance with MCA.	DCA clause stands.
30	DCA APPENDIX 14 PERFORMANCE STANDARDS Pg. No. 204	Performance Evaluation and calculation of liquidated damages: Performance evaluation shall be made on a	Request Authority to include the following point in the mentioned clause. “Provided such liquidated damages shall not in aggregate exceed 5%”.	DCA clause stands.

Sl. No.	Tender Clause & Page No.	Tender Conditions	Queries by the Bidder	Clarification / Amendments by the Port
		quarterly review of the reports furnished by the Concessionaire and/or the records of the Concessionaire and/or by an enquiry by the Concessioning Authority. The Concessionaire shall be liable to pay liquidated damages determined at the rate of [1% of the Tariff collected and other revenues derived from the project in the respective quarter for every shortfall of 10%] in the average performance which shall be assessed in the following manner.		
31	DPR 6.4 Detailing of container	**Dwell Time** The dwell time for import is 2 days and for export is 4	The average dwell time of 3 is applied to calculate the yard capacity and accordingly 35 Ha has arrived.	Tender clause stands.

Sl. No.	Tender Clause & Page No.	Tender Conditions	Queries by the Bidder	Clarification / Amendments by the Port
	terminal capacity and stacking yard area for proposed container terminal at outer Harbour area. Pg. No. 77	days. The existing container traffic at VOCPA has almost equal split between import and export in terms of TEUs volume. Hence the dwell time of 3 is applied to calculate the yard capacity.	Request Authority to allocate the entire 51 ha of land, which will allow flexibility on the dwell time and will assist to increase the efficiency of the terminal.	
32	General	-----	According to clause 1.1.3, 8, C of the RFQ regarding Container Handling Equipment, we kindly request you to consider accepting equipment for hire.	Tractor/ trailer can be deployed on hire basis.
33	General	-----	Request you to provide the following detail pertaining to rail connectivity: a. Details of Railway connectivity to Outer Harbour envisaged — Take-off Points, RoW area etc. b. Expansion proposal on the rail connectivity to VOC port, if any. Additionally, request the Authority to kindly	The Port is in the process of planning the rail-road connectivity of the proposed Outer Harbour project. The rail facility till the entrance of Outer Harbour Container Terminals will be provided by the Concessioning Authority. Concessionaire shall develop the railway facilities from the entrance of the Outer Harbour terminals. RFQ Clause stands.

Sl. No.	Tender Clause & Page No.	Tender Conditions	Queries by the Bidder	Clarification / Amendments by the Port
			include Railway Connectivity upto Outer Harbour to be in their scope	
34	General	-----	Please suggest whether Environment Clearance for the Project is obtained. If yes, request to share the copy of the same. If not, please share the current status and the timeline by which the EC is envisaged to be secured.	The EIA study of the Project and Public hearing has been completed and the final EIA report has been submitted to Tamil Nadu Pollution Control Board for further process. The EC & CRZ clearance will be received before opening of the RFP.
35	General	-----	We request to please share – a. Soil Investigation Reports which were carried out by the Authority b. Traffic Potential Assessment studies carried out by Drewry and Aecom. c. Auto CAD file of Project Layout and plan for the project. Detailed report on Dredging quantities and Bathymetry studies	The DPR of the project has been uploaded in the CPP portal / VOC Port website. The Auto CAD file of Project Layout, Bathymetry survey and plan for the project is enclosed as **Annexure I**. The extract soil investigation report available is enclosed as **Annexure II**.
36	General	-----	Please provide details of Water and Electricity allocation and take off points	The take-off points for water and electricity will be provided to the pre-qualified bidders during RFP stage.
37	General	-----	Please provide details of assets to be handed over to the Concessionaire.	The details of assets to be handed over are detailed in Appendix 2 of DCA.


DRAFT COPY
DRAFT COPY
N
S
E
W
Scale:1 :20000
Scale:1 cm = 200.00 Meters
250 500 1000 1500 2000 Meters
Date of Survey: February-April 2019
LOCATION MAP :
INDIA
ARABIAN SEA
BAY O F BENGAL
INDIAN OCEAN
TUTICORIN PORT PROJECT REGION
Notes :
1. Soundings Were reduced to CD using observed tides at Tuticorin Port .
2. Bathymetry acquired using Odom MK III Dual Frequency Echosounder.
3. Horizontal positioning acquired using Trimble GPS Beacon Receiver.
4. Annotations are in metres and suffix in decimetres.
5. Contour depths are in Metres.
6. Sounding Spacing 100x100m interval.
Geodetic Details :
Spheroid : WGS 84
Semi major axis (a) : 6378137.00 m
Flattening (1/f) : 298.2572
Grid Projection : U.T.M. Zone 44
Latitude of origin : 0° equator
Longitude of origin (CM) : 81° East
Scale factor on CM : 0.9996
False easting : 500000m E
False northing : 0m N
Unit : International Metre
TIDAL INFORMATION: (PREDICTED TIDE TABLE,SOI)
Place: Tuticorin
Position: Latitude 8°48' N, Longitude 78°10' E
Height above Chart Datum: MHWS 0.99 Metre; MHWN 0.71 Metre; MLWN 0.55 Metre; MLWS 0.29 Metre
MSL 0.64 Metre
CLIENT :
V.O.CHIDAMBARANAR PORT TRUST
TUTICORIN
SURVEYED BY:
INDIAN INSTITUTE OF TECHNOLOGY
CHENNAI-600 036
PROJECT TITLE :
BATHYMETRY SURVEY
FOR THE DEVELOPMENT OF OUTER HARBOUR
AT V.O.CHIDAMBARANAR PORT, TUTICORIN
DRAWING TITLE :
BATHYMETRY MAP
PROPOSED OUTER HARBOUR AREA
Boat : Ronaldo, RPR, Velankani
Surveyed by : Sakthivel/Vasanth/Lakshman/Ram Singh
Survey period : Feb-Apr 2019
Processed by : Maheshvaran/Rajiv/Arun
Drawn by : Srinath
Checked by : Dr.Sriganesh
(Prof.K.MURALI)
GULF
OF
MANNAR
COASTLINE
OPEN BULK STORAGE YARD
STACK YARD
Red Gate
Yellow Gate
Blue Gate
Green Gate
South North Road
37 Ha
7.5 Ha
NORTH BREAK WATER (2025 m)
SOUTH BREAK WATER
EASTERN BREAK WATER (2000m)
TURNING CIRCLE
EXISTING CHANNEL
OUTER APPROACH CHANNEL
78°08' E
78°10' E
78°12' E
78°14' E
78°16' E
78°18' E
78°20' E
08°48' N
08°46' N
08°44' N
08°42' N
08°40' N
184000 mX
186000 mX
188000 mX
190000 mX
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202000 mX
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206000 mX
208000 mX
974000 mY
972000 mY
970000 mY
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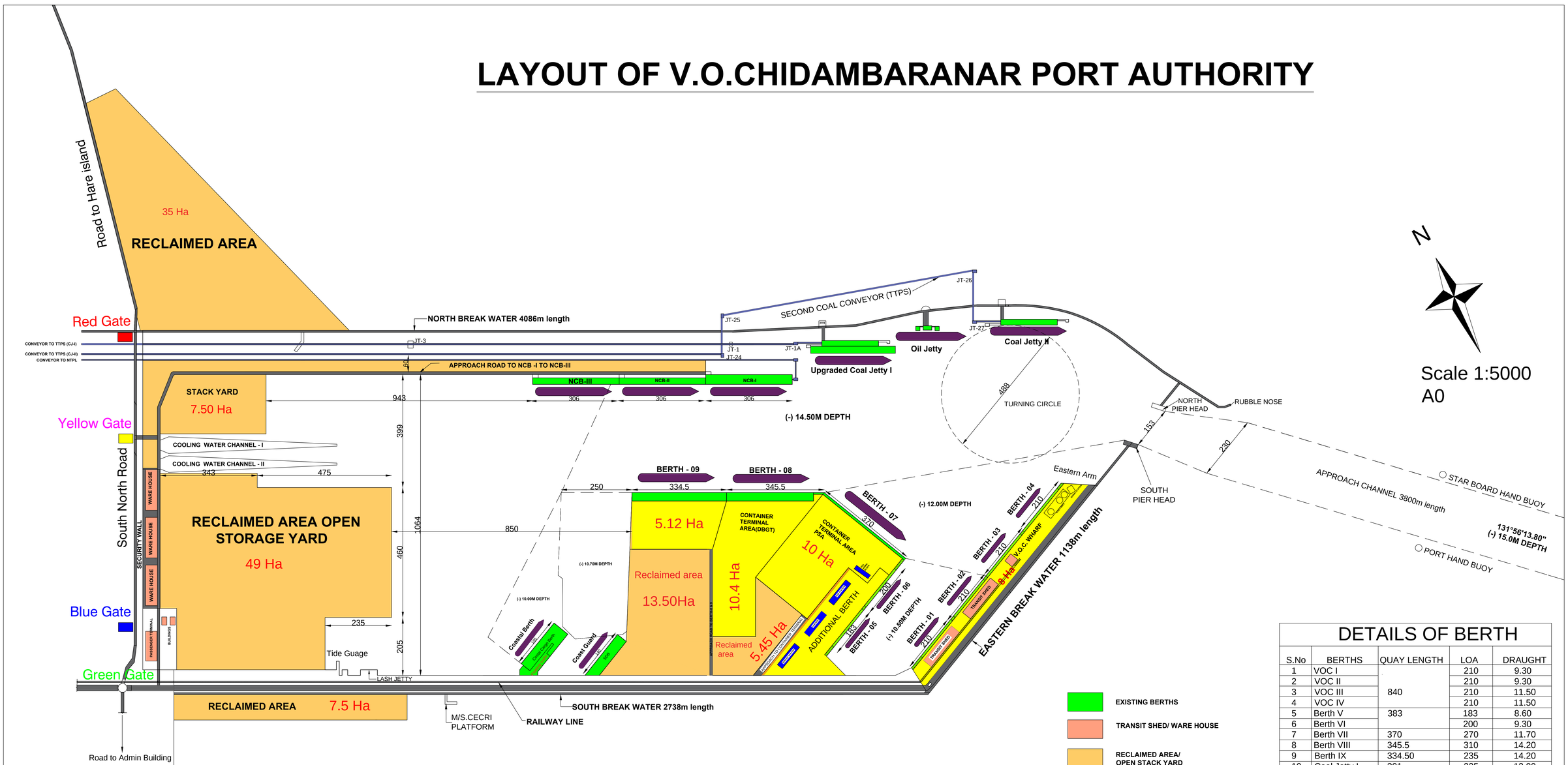
966000 mY
964000 mY
962000 mY
960000 mY

LAYOUT OF V.O.CHIDAMBARANAR PORT AUTHORITY



DETAILS OF BERTH

S.No	BERTHS	QUAY LENGTH	LOA	DRAUGHT
1	VOC I	840	210	9.30
2	VOC II		210	9.30
3	VOC III		210	11.50
4	VOC IV		210	11.50
5	Berth V	383	183	8.60
6	Berth VI		200	9.30
7	Berth VII	370	270	11.70
8	Berth VIII	345.5	310	14.20
9	Berth IX	334.50	235	14.20
10	Coal Jetty I	301	225	13.00
11	Coal Jetty II	318	225	14.00
12	Oil Jetty	150	150-228	13.00
13	NCB I	306	245	14.00
14	NCB II	306	245	14.00
15	NCB III	306	245	5.00
16	Coastal Berth	185	160	9.00
17	Shallow Berth	140	120	5.85
18	Eastern Arm	140	100	7.40

Geotechnical Investigation Report

In the Inner Harbour Basin
and
Approach Channel
at
V.O.Chidambaranar Port

For

V.O.Chidambaranar Port Trust

Revision: 01

Project Date: February - June 2018

Prepared By

Horizon Survey Company India Pvt. Ltd.

Plot A-732, M.I.D.C, Khairne,
TTC Industrial Area,
Thane-Belapur Road,
Navi Mumbai - 400 710, India

Tel.: +91 9833 975 010
Fax: +91 9833 973 123
E-mail: enquiries.india@horizon-geosciences.com

HSC Project No.: GT-VOCPT-088

Document No. : GT-VOCPT-088 - Geotechnical Report -V1_Rev 01

Project Information	
Document Type :	Geotechnical Investigation Report
Project :	Geotechnical Investigation in the Inner Harbour Basin and Approach Channel at VOCPT Port, Tuticorin
Client / PMIT :	V.O.Chidambaranar Port Trust
HSC Project No. :	GT-VOCPT-088
Document No. :	GT-VOCPT-088 - Geotechnical Report -V1_Rev 01

Issued To: V.O.Chidambaranar Port Trust	
For the Attention of :	Chief Engineer
Address :	V.O. Chidambaranar Port Trust Tuticorin -628004 Tamil Nadu, India
Tel : **Fax :** **Email :**	+91 461 2352252 +91 461 2354270 ce@vocport.gov.in

Issued By: Horizon Survey Company India Pvt. Ltd.	
General Manager :	Mr. Sudesh Tiwari
Address :	Horizon Survey Company India. Pvt. Ltd. Plot A-732, M.I.D.C, Khairane T.T.C Indl. Area, Thane-Belapur Road, Navi Mumbai 400 710.
Email :	s.tiwari@horizon-geosciences.com

Revision Control					
Revision No.	**Description**	**Prepared By**	**Checked By**	**Approved By**	**Issue Date**
0	Report	VN	KB	ST	09-06-2018
01	Report	VN	KB	ST	07-08-2018

GQP Volume Description		
Volume No.	**Volume Title**	**Contents**
1	GT-VOCPT-088 - Geotechnical Quality Plan - Rev0	Project Description, Methodology to carry out the work and proposed equipment

Service Warranty

The data presented within the report and associated charts/drawings have been acquired and processed to meet the requirements of the contract as agreed by the VOCPT. Any unauthorised use of the information presented within this report and charts/drawings is prohibited. Horizon Survey Company India Pvt. Ltd. will not accept any liability if the data is used for purposes other than those agreed in the contract.

Table of Contents

List of Tables

List of Charts

The charts listed in **Table 1** (presented in **ENGINEERING ILLUSTRATIONS**) are associated with this report document.

The charts have been compiled on A1 / A3 size paper with scales as:

List of Charts		
Chart Title	**Drawing Number**	**Chart Number**
Borehole Location Plan	GT-VOCPT-088 SSB01	01 of 07
Sub Seabed Stratigraphy- Section A-A	GT-VOCPT-088 -SSB02	02 of 07
Sub Seabed Stratigraphy- Section B-B	GT-VOCPT-088 -SSB03	03 of 07
Sub Seabed Stratigraphy- Section C-C	GT-VOCPT-088 -SSB04	04 of 07
Sub Seabed Stratigraphy- Section D-D	GT-VOCPT-088 -SSB05	05 of 07
Sub Seabed Stratigraphy- Section E-E	GT-VOCPT-088 -SSB06	06 of 07
Sub Seabed Stratigraphy- Section F-F	GT-VOCPT-088 -SSB07	07 of 07

Table 1: List of Charts

Abbreviations& Acronyms

The following list of abbreviations and acronyms may be present within the document:

CD	Chart Datum
dGPS	Differential Global Positioning System
FVST	Field Vane Shear Test
HSIPL	Horizon Survey Company India Pvt. Ltd.
JUB	Jack Up Barge
PMC	Project Management Consultants
SBL	Sea Bed Level
SPT	Standard Penetration Test
TD	Termination Depth
UTM	Universal Transverse Mercator
WGS	World Geodetic System
WRT	With Respect To

Reference Colour Code

The following reference colour coding may be used within this procedure:

XXX	Reference to an independent external document.
XXX	Reference to another section or article within this document.
XXX	Important Note / Caution.

EXECUTIVE SUMMARY

Site Location: V O Chidambarnar Port Tuticorin, East Coast of India.

Investigation Date: 22nd February 2018 to 20thMay 2018.

Key observations:

The sub sea bed stratigraphy encountered in the "*Approach Channel*" depicts the following:

- The top layer mostly comprises of SAND / Silty SAND followed by SANDSTONE.
- However in boreholes, BH-20 thru BH-23 the top layer comprises of GRAVELS / ROCK FRAGMENTS.
- In boreholes BH-06 thru BH-10, BH-4 and BH-2 SANDSTONE is not encountered.
- In BH-07 after the top SAND layer, CLAY is encountered from a level of -18.52m CD upto the maximum explored depth of -20.35m CD
- In BH-08 below the top SAND layer from an elevation of -19.50m CALCARENITE is encountered.
- Presence of shell fragments is also encountered.
- In BH-19 Quartzitic SANDSTONE is encountered. The Uniaxial compressive strength is over 100 MPa

BH-19 ROCK SAMPLE PHOTOGRAPH

The sub sea bed stratigraphy encountered in the "*Inner Harbour Basin*" depicts the following:

- The top layer mostly comprises of SAND / SILT followed by SANDSTONE / CALCARERNITE.
- However in boreholes, BH-32, BH-37, BH-39 and BH-40 the top layer comprises of CLAY.
- In BH-32 an elevation of -23.0m CD a 1.0m thick layer of MUDSTONE is encountered.

1. INTRODUCTION

V.O.Chidambaranar Port Trust (VOCPT/ Client) contracted **Horizon Survey Company India Pvt. Ltd.(Contractor)** to provide Geotechnical Investigation services in the inner harbour basin and approach channel of VOCPT

This report 'GT-VOCPT-088 - Geotechnical Report -V1_Rev 01' presents the data obtained from the field as well as laboratory investigation based on the findings of the Geotechnical Investigation for the boreholes drilled in the inner harbour basin and approach channel.

The Geotechnical Investigation field work was conducted from 22nd February 2018 to 20th May 2018.

1.1. Reference Documentation

1. **Contract Agreement No.62.CE/2017-18.**
2. **Tender No.E(C)/F. 79/PD/Boreholes/2017/D 2871**
3. **Client supplied reference Borehole Location drawing ref. 'RP008 (FIG 16)**

1.2. Scope of Work

The principal objectives of the investigation were to obtain adequate information on the sub sea bed stratigraphy, the type and strength of the soils / rocks below the seabed and other geotechnical details of relevance to enable arriving at the dredgeability of the soil/rock. The entire work was carried out under the supervision of VOCPT representatives, the client for this project.

In order to accomplish the above objectives the scope of work was to drill forty (40) Nos. of boreholes in the inner harbour basin and approach channel upto a level of -20.0m CD. However during the execution of the boreholes four (4) boreholes (BH-26, BH-29, BH-32 and BH-33) were drilled upto a level varying between -24.40m CD to -25.20m CD . The scope of work also includes carrying out standard penetration tests, collection of disturbed and undisturbed samples of soils, logging visually identifiable lithological and engineering characteristics of the soil and rock samples, testing the samples in laboratory for their classification, index and engineering properties and preparation and submission of Geotechnical Investigation report. The field test location drawing is presented in Plate-1.

The list of the geotechnical boreholes carried out at locations of various areas are presented in **Table 2**.

Sr. No.	Proposed Structure	Field Test
1	Approach Channel	BH-01 to BH-24
2	Inner Harbour Basin	BH-25 to BH-40

Table 2: Details of Borehole Locations w.r.t. various area

1.3. Schedule of Activities

Investigation Schedule, VOCPT, Tuticorin			
Sr. No.	Date		Detail of Activities
	From	To	
01	12-02-2018	21-02-2018	Mobilization and assembling of JUB, obtaining various permissions
02	22-02-2018	20-05-2018	Carrying out 40nos. of boreholes
03	21-05-2018	09-06-2018	Laboratory Testing, preparation and submission of report

Table 3: Schedule of Activities

2. FIELD INVESTIGATION

The field investigation involves mobilization of marine spread with drilling rigs and drilling accessories mounted on it, marking the borehole location, shifting the marine spread at the designated location, boring in soil, drilling in rock, carry out SPT and collection of UDS. A brief description of the various activities is given below. As detailed in Section 1.2 above, the work was carried in marine environment and to accomplish the work JUB was mobilized. The details of the JUB are given below.

2.1. Jack Up Barge – "Sangam-II"

The hydraulically elevated JUB "**Sangam – II**" having deck size of 15.0m x 12.0m with spuds of length 30.0m was mobilized at the site. A Percussion boring rig along with a hydraulically operated rig supported with water pumps was mounted on the deck. The JUB was assembled inside the port.

2.2. Positioning Services

The coordinates of the borehole locations were given by the client. To precisely position the JUB, Horizon used CSI Vector Pro DGPS system. The CSI Vector Pro is a DGPS Compass that provides both position and heading. The system also provides heading with better than 0.5 degree (rms) accuracy.

The dGPS calibration reports are presented on **APPENDIX E – DGPS CALIBIRATION** in this report.

A QINSy navigation screen onboard the JUB was loaded with a data base of known structures / hazards and borehole coordinates in the field as a background was provided for the site representative to observe. This aids the surveyor onboard to provide navigation and guidance information to manoeuvre the marine spread and to precisely align the moon-pool of the platform to the intended borehole location coordinate.

2.3. Setting up at Field Test Location

The borehole location was identified in the sea as described in Section 2.2 above and a marker buoy was dropped at the designated location from the advance boat.

The JUB was then towed to the location of the marker buoy using support boats and was positioned at that location by lowering the hydraulically operated spuds. After Jacking at the intended location, the location coordinates were again observed near the moon-pool using the DGPS.

The list of borehole locations and the SBL wrt CD is given in **Table 4**.

DETAILS OF BOREHOLES					
SL. NO.	**BH ID**	**EASTING (m)**	**NORTHING (m)**	**SBL w.r.t.CD (m)**	**Depth of BH below SBL (m)**
1	MBH-1	202246.206	961409.455	-16.00	4.00
2	MBH-2	201876.706	961746.307	-15.40	4.60
3	MBH-3	201690.878	961915.715	-15.30	4.70
4	MBH-4	201507.205	962083.159	-16.50	3.50
5	MBH-5	201137.704	962420.011	-16.60	3.40
6	MBH-6	200768.204	962756.863	-15.10	4.90
7	MBH-7	200398.703	963093.715	-15.40	4.60
8	MBH-8	200205.094	963270.218	-15.30	4.70
9	MBH-9	200029.202	963430.567	-15.30	4.70
10	MBH-10	199659.202	963767.419	-14.50	5.50
11	MBH-11	199290.201	964104.271	-15.70	4.30
12	MBH-12	198920.700	964441.123	-16.20	3.80
13	MBH-13	198551.200	964777.975	-16.10	3.90
14	MBH-14	198181.699	965114.827	-16.00	4.00
15	MBH-15	197812.199	965451.679	-15.60	4.40
16	MBH-16	197641.043	965615.519	-15.20	4.80
17	MBH-17	197442.698	965788.531	-15.30	4.70
18	MBH-18	197073.197	966125.383	-15.00	5.00
19	MBH-19	196703.697	966462.235	-15.80	4.20
20	MBH-20	196334.196	966799.087	-14.70	5.30
21	MBH-21	195964.695	967135.939	-15.00	5.00
22	MBH-22	195595.195	967472.791	-15.00	5.00
23	MBH-23	195225.853	967809.496	-14.90	5.10
24	MBH-24	194849.783	968145.581	-14.90	5.10
25	MBH-25	194580.707	968390.088	-15.10	4.90
26	MBH-26	194286.062	968208.737	-12.40	11.00
27	MBH-27	193942.694	968032.374	-12.40	7.60
28	MBH-28	193791.822	968001.773	-10.60	9.40
29	MBH-29	193677.107	967897.433	-10.40	14.10
30	MBH-30	193923.508	968284.282	-12.70	7.30
31	MBH-31	194097.758	968478.887	-14.60	5.40
32	MBH-32	194465.490	968588.934	-14.80	10.50
33	MBH-33	194119.145	968763.566	-14.90	10.30

DETAILS OF BOREHOLES					
SL. NO.	BH ID	EASTING (m)	NORTHING (m)	SBL w.r.t.CD (m)	Depth of BH below SBL (m)
34	MBH-34	193645.019	968642.393	-15.00	5.00
35	MBH-35	193322.213	968908.611	-13.80	6.20
36	MBH-36	193064.222	969062.029	-6.20	13.80
37	MBH-37	192840.530	968959.933	-5.50	14.50
38	MBH-38	192613.020	969001.701	-5.40	14.60
39	MBH-39	192392.010	968913.428	-5.00	15.00
40	MBH-40	192566.881	969227.760	-5.20	14.80

Table 4: Borehole Location Coordinates

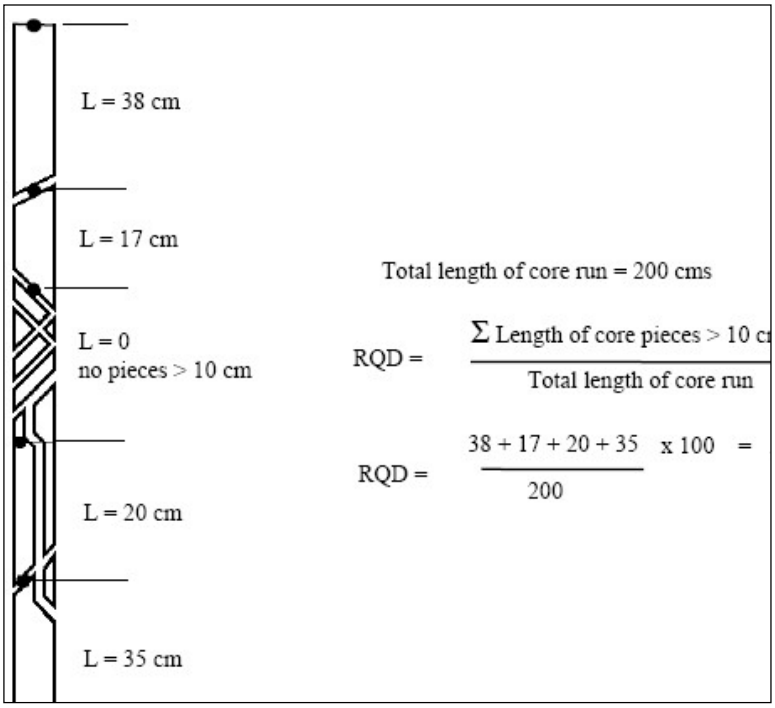
2.4. Boring in Soil

Boring was done in accordance with *IS: 1892 -1979*. The boreholes were advanced in the soil using wash boring technique with the help of rotary drilling rig. The nominal diameter of borehole in soil was 150mm.The boring was continued upto the top of hard stratum

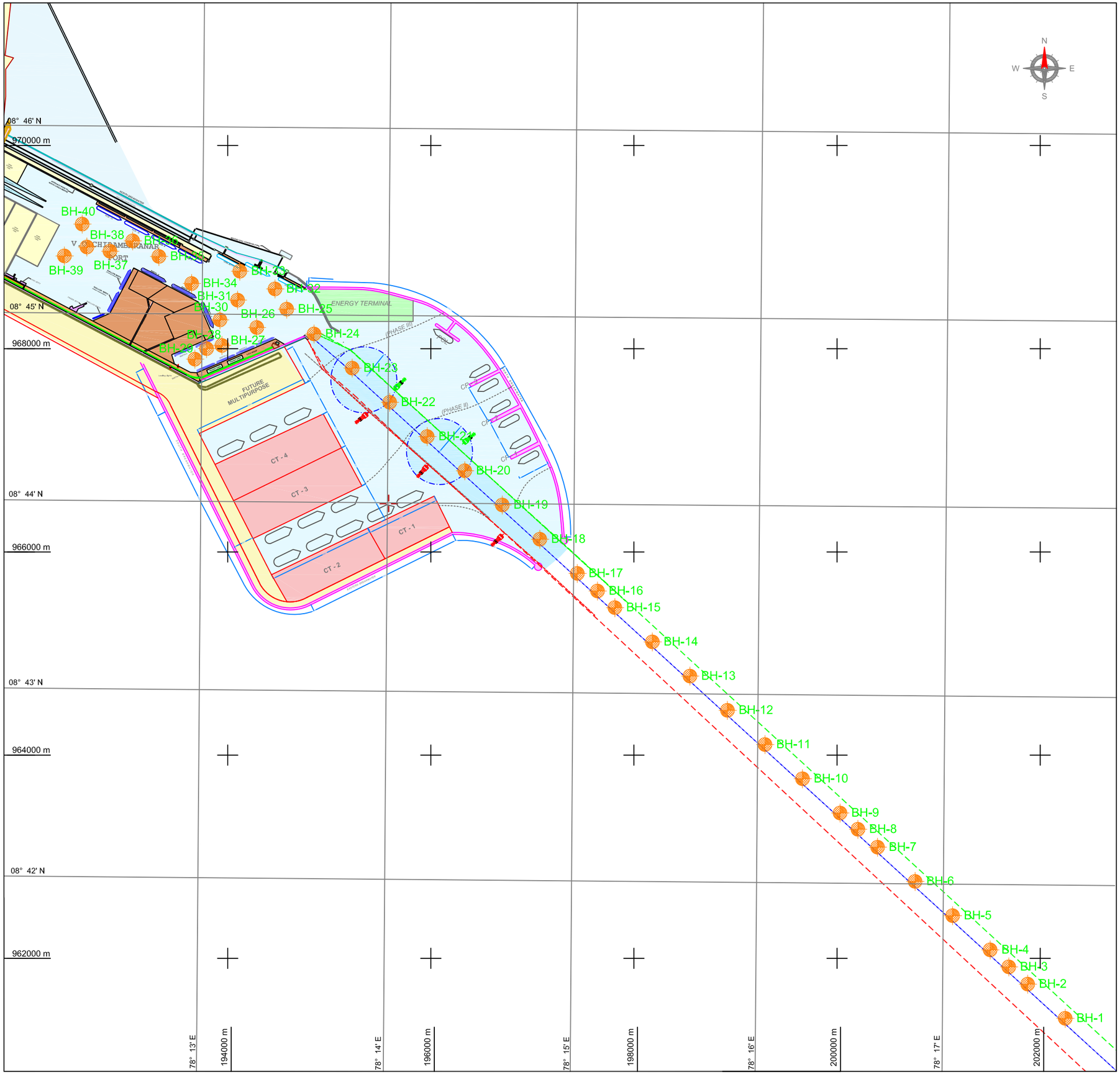
2.5. Drilling in Rock

Once the Hard stratum or rock surface was encountered the size of the bore hole was reduced to NX size (76mm). Top of the rock surface was confirmed, either by the refusal from standard penetration test N value or chiselling. In this hard stratum further work was carried out by using NX core drilling with triple tube/double tube core barrel fitted with TC/Diamond studded bits at its bottom.

The work was carried out as per *IS: 6926-1973.* The maximum length of the drill (run) was maintained as 1.50m or depends upon the site conditions during drilling. At the end of each run the drill rod string with core barrel was extracted from the bore hole and core was recovered from the core barrel. Recovered hard or rock cores were numbered and labelled serially and carefully transferred to in good quality, sturdy, wooden core boxes and preserved. The core recovery percentage was recorded. Core Recovery percentage = {C.R. % = (Length of Core / Length of run) x 100}. Rock Quality Designation (RQD) was also recorded. Rock Quality Designation (RQD) = (Total Length of core pieces of 100mm & above in Length / length of run) x 100}. Solid Core Recovery (SCR) = (Total Length of core pieces of full diameter in Length / length of run) x 100}. TCR, SCR and RQD were computed for every drilled run based on the length of cores retrieved.



ENGINEERING ILLUSTRATIONS



General:

LEGEND

BH-01 — BOREHOLE ID

BOREHOLE COORDINATES

BH ID	EASTING (m)	NORTHING (m)	BH ID	EASTING (m)	NORTHING (m)
BH-1	202246.206	961409.455	BH-21	195964.695	967135.939
BH-2	201876.706	961746.307	BH-22	195595.195	967472.791
BH-3	201690.878	961915.716	BH-23	195225.853	967809.498
BH-4	201507.205	962083.159	BH-24	194849.783	968145.581
BH-5	201137.704	962420.011	BH-25	194580.707	968390.088
BH-6	200768.204	962756.863	BH-26	194286.062	968208.737
BH-7	200398.703	963093.715	BH-27	193942.694	968032.374
BH-8	200205.094	963270.218	BH-28	193791.822	968001.773
BH-9	200029.202	963430.567	BH-29	193677.107	967897.433
BH-10	199559.702	963767.419	BH-30	193923.509	968284.282
BH-11	199290.201	964104.271	BH-31	194097.758	968478.887
BH-12	198920.700	964441.123	BH-32	194465.490	968588.934
BH-13	198551.200	964777.975	BH-33	194119.145	968763.566
BH-14	198181.699	965114.827	BH-34	193645.013	968642.393
BH-15	197812.199	965451.679	BH-35	193322.213	968908.611
BH-16	197541.043	965615.519	BH-36	193064.222	969062.029
BH-17	197442.698	965788.531	BH-37	192840.530	968959.933
BH-18	197073.197	966125.383	BH-38	192613.020	969001.701
BH-19	196703.697	966462.235	BH-39	192392.010	968913.428
BH-20	196334.196	966799.087	BH-40	192566.881	969227.460

CLIENT

V.O.CHIDAMBARANAR PORT TRUST
Engineer, Planning & Designing
Civil Engineering Department
Administrative Office, Tuticorin - 628004

CONTRACTOR

HORIZON GEOSCIENCES
Email: enquiries.India@horizon-geosciences.com

Horizon Survey Company India Pvt. Ltd.
Plot-A 732, T.T.C Ind Area, MIDC Khairne
Thane-Belapur Road, Navi Mumbai - 400 710

PROJECT TITLE

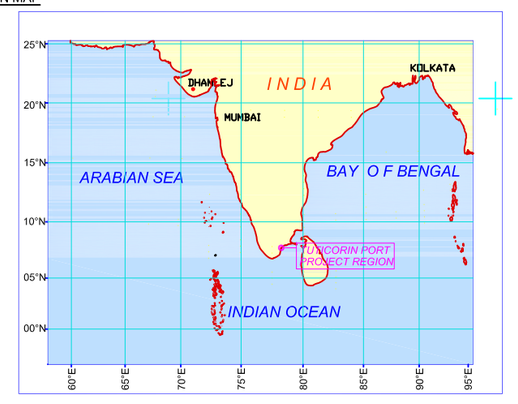
CONDUCTING BOREHOLE INVESTIGATION IN THE HARBOUR BASIN AND APPROCH CHANNEL AT V.O. CHIDAMBARANAR PORT

Rev No:	Date:	Description:	Interpr:	Drawn:	Chkd:	Appr:	P. Mng:
0	08.06.2018	For Approval	VN	TSJ	AM	KSN	ST
Drawing No.		GT-VOCPT-088-SSB-01	Chart No.		01 OF 07		

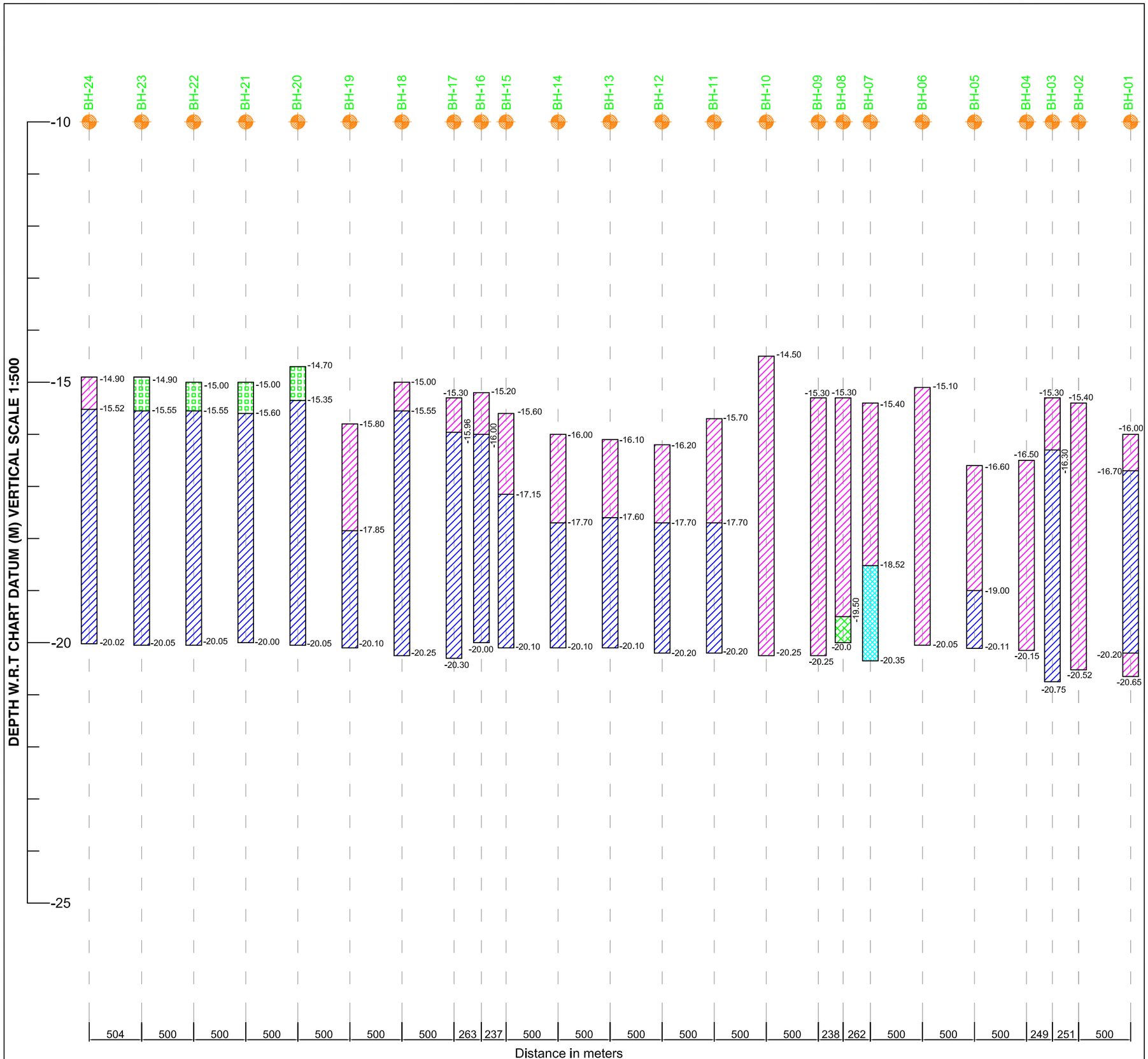
HORIZONTAL SCALE 1 : 37,500

0 375 750 1500 2250 3000 3750
0 750 3750 7500 11250 feet

LOCATION MAP



Paper Size: A3



General:

BH-01 BOREHOLE ID

Stratigraphy:

SAND | CLAY | CALCERNITE

SANDSTONE | GRAVELS / ROCK FRAGMENTS

LEGEND

BOREHOLE COORDINATES

BH ID	EASTING (m)	NORTHING (m)
BH-1	202246.206	961409.455
BH-2	201876.706	961746.307
BH-3	201690.878	961915.716
BH-4	201507.205	962083.159
BH-5	201137.704	962420.011
BH-6	200768.204	962756.863
BH-7	200398.703	963093.715
BH-8	200205.094	963270.218
BH-9	200029.202	963430.567
BH-10	199659.702	963767.419
BH-11	199290.201	964104.271
BH-12	198920.7	964441.123

BH ID	EASTING (m)	NORTHING (m)
BH-13	198551.2	964777.975
BH-14	198181.699	965114.827
BH-15	197812.199	965451.679
BH-16	197641.043	965615.519
BH-17	197442.698	965788.531
BH-18	197073.197	966125.383
BH-19	196703.697	966462.235
BH-20	196334.196	966799.087
BH-21	195964.695	967135.939
BH-22	195595.195	967472.791
BH-23	195225.853	967809.498
BH-24	194849.783	968145.581

CLIENT

V.O.CHIDAMBARANAR PORT TRUST
Engineer, Planning & Designing
Civil Engineering Department
Administrative Office, Tuticorin - 628004

CONTRACTOR

HORIZON GEOSCIENCES
Email: enquiries.India@horizon-geosciences.com

Horizon Survey Company India Pvt. Ltd.
Plot-A 732, T.T.C Ind Area, MIDC Khairne
Thane-Belapur Road, Navi Mumbai - 400 710

PROJECT TITLE

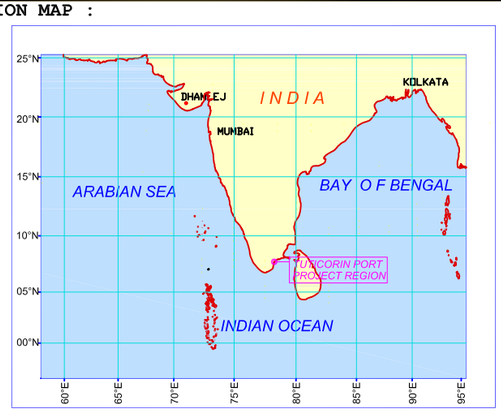
CONDUCTING BOREHOLE INVESTIGATION IN THE HARBOUR BASIN AND APPROCH CHANNEL AT V.O. CHIDAMBARANAR PORT

Rev No:	Date:	Description:	Interpr:	Drawn:	Chkd:	Appr:	P. Mng:
0	08.06.2018	For Approval	VN	TSJ	AM	KSN	ST
Drawing No.		GT-VOCPT-088-SSB-02	Chart No.		02 OF 07		

HORIZONTAL SCALE 1 : 37,500

0 375 750 1500 2250 3000 3750
0 750 3750 7500 11250 feet

LOCATION MAP :



Paper Size: A3

APPENDIX A – FIELD TEST RESULTS

BOREHOLE NO. : BH-01

Geotech By : Horizon Survey Company India Pvt. Ltd. | **Project No. : GT-VOCPT-088** | **Client :** V.O.CHIDAMBARANAR PORT TRUST | **SHEET 01 of 01**

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

WATER TABLE

T.D. (m)	: -20.65 CD	SBL (m) :	: -16.00 CD	Equipment Record	: SANGAM-II (JACKUP PLATFORM)
Date Commenced	: 13-04-2018	Circulation Fluid	: Sea Water	Type of Rig	: Hydraulic Rig
Date Completed	: 13-04-2018	Drilling Orientation	: Vertical	Details of Casing (m)	: SX : 0.70 HX : 4.20 NX : -
Co- Ordinates :	E : 202246.206	N : 961409.455		Core-Diameter (mm)	: 54.10

Date	Time	Mtrs.
13-04-2018	9.30	16.30

Sampling Details				Standard Penetration Test (SPT)				Details of Rock core					Symbol	Depth in (m) w.r.t.(CD)	Details of Stratum	Soil Clasiification (IS)	Grain Size Analysis (%)				Consistency Limits (%)			Strength Test (kPa)			Consolidation Test			Remarks
	TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.			Strata Description		GRAVEL	SAND	SILT	CLAY	LIQUID (w_L)	PLASTIC (w_P)	PLASTICITY INDEX (I_P)	UCS C_u	UU c,ϕ	CU c',ϕ'	PreConsolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e^0)	
0		-16.00	-16.50											-16.00	Yellwish brown, poorly graded, SAND with shell and gravels	SP	30	69	1											
		-16.70	-16.70	-	-	-	R																							
1		-16.70	-18.20					38	0	0	V	N.I.		-16.70	Moderately strong, highly weathered, yellowish brown SANDSTONE															
2		-18.20	-18.70					62	0	0	V	N.I.																		
		-18.70	-20.20					0	0	0																				
3																														
4		-20.20	-20.65	7	7	8	15							-20.20	Medium dense, brown medium to fine SAND															
5																														
6															**BOREHOLE TERMINATED AT -20.65 (m) BELOW CD**															
7																														
8																														
9																														
10																														

Abbreviations & Symbols :

- SPT, UDS
- W_L - Liquid Limit
- I_P - Plasticity Index
- MC - Moisture Content
- Rock Recovery, No Recovery
- TCR - Total Core Recovery
- SCR - Solid Core Recovery
- RQD - Rock Quality Designation
- Field Vane Shear, Sample Slipped
- W.I. - Weathering Grade F.I. Fractural Index

C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean Sea Level
SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced Level

Prepared By : V.N.
Checked By : S.D.
Approved By : S.T.

BOREHOLE NO. : BH-02

Geotech By : Horizon Survey Company India Pvt. Ltd. | **Project No. : GT-VOCPT-088** | **Client :** V.O.CHIDAMBARANAR PORT TRUST | **SHEET 01 of 01**

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

WATER TABLE

T.D. (m)	: -20.52 CD	SBL (m) :	: -15.40 CD	Equipment Record	: SANGAM-II (JACKUP PLATFORM)
Date Commenced	: 14-04-2018	Circulation Fluid	: Sea Water	Type of Rig	: Hydraulic Rig
Date Completed	: 14-04-2018	Drilling Orientation	: Vertical	Details of Casing (m)	: SX : 4.67 HX : 4.20 NX : -
Co- Ordinates :	E : 201876.706	N : 961746.307		Core-Diameter (mm)	: 54.10

Date	Time	Mtrs.
14-04-2018	5.40	15.88

Sampling Details				Standard Penetration Test (SPT)				Details of Rock core					Symbol	Depth in (m) w.r.t.(CD)	Details of Stratum	Soil Clasiification (IS)	Grain Size Analysis (%)				Consistency Limits (%)			Strength Test (kPa)			Consolidation Test			Remarks
	TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.			Strata Description		GRAVEL	SAND	SILT	CLAY	LIQUID (w_L)	PLASTIC (w_P)	PLASTICITY INDEX (I_P)	UCS C_u	UU c,ϕ	CU c',ϕ'	PreConsolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e^0)	
0		-15.40	-15.90											-15.40	Yellowish brown, poorly graded, SAND with shell fragments and gravels	SP	22	77		1										
1		-16.20	-16.69																											
		-16.69	-17.14	15	20	20	40							-16.69	Dense, yellowish brown, silty SAND with shell fragments and gravels	SM	8	79	10	3	-	NP	-							
2		-17.40	-17.90																											
3		-18.40	-18.85	5	6	15	21								- medium dense / loose below - 18.40 m CD															
		-18.40	-18.90																											
4		-19.05	-19.50	2	2	6	8																							
		-20.07	-20.52	5	7	12	19									SM	0	88	9	3	-	NP	-							
5																														
6															BOREHOLE TERMINATED AT -20.52 (m) BELOW CD														
7																														
8																														
9																														
10																														

Abbreviations & Symbols :

- SPT - UDS
- Rock Recovery - No Recovery
- Field Vane Shear - Sample Slipped

W_L - Liquid Limit I_P - Plasticity Index MC - Moisture Content

TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation

C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean Sea Level
SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced Level

W.I. - Weathering Grade F.I. Fractural Index

Prepared By : V.N.
Checked By : S.D.
Approved By : S.T.

BOREHOLE NO. : BH-03

Geotech By : Horizon Survey Company India Pvt. Ltd. | **Project No. : GT-VOCPT-088** | **Client :** V.O.CHIDAMBARANAR PORT TRUST | **SHEET 01 of 01**

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

WATER TABLE

T.D. (m) : -20.75 CD	SBL (m) : -15.30 CD	Equipment Record : SANGAM-II (JACKUP PLATFORM)			
Date Commenced : 14-04-2018	Circulation Fluid : Sea Water	Type of Rig : Hydraulic Rig			
Date Completed : 14-04-2018	Drilling Orientation : Vertical	Details of Casing (m) : SX : 9.00	HX : -	NX : -	
Co- Ordinates : E : 201690.878	N : 961915.715	Core-Diameter (mm) : 54.10			

Date	Time	Mtrs.
14-04-2018	18.20	16.00

Sampling Details				Standard Penetration Test (SPT)				Details of Rock core					Symbol	Depth in (m) w.r.t.(CD)	Details of Stratum	Soil Clasiification (IS)	Grain Size Analysis (%)				Consistency Limits (%)			Strength Test (kPa)			Consolidation Test			Remarks
	TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.			Strata Description		GRAVEL	SAND	SILT	CLAY	LIQUID (w_L)	PLASTIC (w_P)	PLASTICITY INDEX (I_P)	UCS C_u	UU c,ϕ	CU c',ϕ'	PreConsolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e^0)	
0		-15.30	-15.80											-15.30	Yellowish brown poorly graded, SAND with shell and gravels	SP	5	94	1											
		-15.80	-16.25	11	12	13	25							-15.80	Medium dense, yellowish brown SAND															
1		-16.30	-17.80					62	52	26	IV			-16.30	Weak, moderately weathered, yellowish brown, SANDSTONE															
2																														
3		-17.80	-19.30					33	23	NIL	IV																			
4																														
		-19.30	-20.30					19	9	NIL	V																			
5		-20.30	-20.75	8	12	12	24							-20.30	Medium dense, yellowish brown, SAND with gravels															
6															BOREHOLE TERMINATED AT -20.75 (m) BELOW CD															
7																														
8																														
9																														
10																														

Abbreviations & Symbols :

- SPT - UDS
- Rock Recovery - No Recovery
- Field Vane Shear - Sample Slipped

W_L - Liquid Limit I_P - Plasticity Index MC - Moisture Content

TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation

C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean Sea Level
SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced Level

W.I. - Weathering Grade F.I. Fractural Index

Prepared By : V.N.
Checked By : S.D.
Approved By : S.T.

BOREHOLE NO. : BH-04

Geotech By : Horizon Survey Company India Pvt. Ltd. | **Project No. : GT-VOCPT-088** | **Client :** V.O.CHIDAMBARANAR PORT TRUST | **SHEET 01 of 01**

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

WATER TABLE

T.D. (m)	: -20.15 CD	SBL (m) :	: -16.50 CD	Equipment Record	: SANGAM-II (JACKUP PLATFORM)
Date Commenced	: 12-04-2018	Circulation Fluid	: Sea Water	Type of Rig	: Hydraulic Rig
Date Completed	: 12-04-2018	Drilling Orientation	: Vertical	Details of Casing (m)	: SX : 3.00 HX : - NX : -
Co- Ordinates	: E : 201507.205	N : 962083.159		Core-Diameter (mm)	: 54.10

Date	Time	Mtrs.
12-04-2018	10.30	17.00

Sampling Details				Standard Penetration Test (SPT)				Details of Rock core					Symbol	Depth in (m) w.r.t.(CD)	Details of Stratum	Soil Clasiification (IS)	Grain Size Analysis (%)				Consistency Limits (%)			Strength Test (kPa)			Consolidation Test			Remarks
	TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.			Strata Description		GRAVEL	SAND	SILT	CLAY	LIQUID (w_L)	PLASTIC (w_P)	PLASTICITY INDEX (I_P)	UCS C_u	UU c,ϕ	CU c',ϕ'	PreConsolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e^0)	
0		-16.50	-17.00											-16.50	Yellowish brown, poorly graded SAND with shell fragments	SP	5	93	2											
1		-17.50	-18.00																											
		-18.00	-18.45	3	7	12	19							-18.00	Medium Dense, yellowish brown, poorly graded SAND with shell fragments	SP	5	93	2											
2		-19.00	-19.50																											
3		-19.50	-19.95	1	2	1	3							-19.50	Very loose, brownish grey, poorly graded SAND with shell fragments	SP	0	99	1											
		-19.95	-20.15																											
4															BOREHOLE TERMINATED AT -20.15 (m) BELOW CD														
5																														
6																														
7																														
8																														
9																														
10																														

Abbreviations & Symbols :

- SPT - UDS
- Rock Recovery - No Recovery
- Field Vane Shear - Sample Slipped

W_L - Liquid Limit I_P - Plasticity Index MC - Moisture Content

TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation

C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean Sea Level
SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced Level

W.I. - Weathering Grade F.I. Fractural Index

Prepared By : V.N.
Checked By : S.D.
Approved By : S.T.

BOREHOLE NO. : BH-05

Geotech By : Horizon Survey Company India Pvt. Ltd.	**Project No. : GT-VOCPT-088**	**Client :** V.O.CHIDAMBARANAR PORT TRUST
Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port		**SHEET 01 of 01**
		WATER TABLE

T.D. (m)	: -20.10 CD	SBL (m) :	: -16.60 CD	Equipment Record	: SANGAM-II (JACKUP PLATFORM)
Date Commenced	: 14-04-2018	Circulation Fluid	: Sea Water	Type of Rig	: Hydraulic Rig
Date Completed	: 14-04-2018	Drilling Orientation	: Vertical	Details of Casing (m)	: SX : 2.40 HX : 2.40 NX : -
Co- Ordinates :	E : 201137.704	N : 962420.011		Core-Diameter (mm)	: 54.10

Date	Time	Mtrs.
14-04-2018	18.00	17.10

Sampling Details				Standard Penetration Test (SPT)				Details of Rock core					Symbol	Depth in (m) w.r.t.(CD)	Details of Stratum	Soil Clasiification (IS)	Grain Size Analysis (%)				Consistency Limits (%)			Strength Test (kPa)			Consolidation Test			Remarks
	TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.			Strata Description		GRAVEL	SAND	SILT	CLAY	LIQUID (w_L)	PLASTIC (w_P)	PLASTICITY INDEX (I_P)	UCS C_u	UU c,ϕ	CU c',ϕ'	PreConsolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e^0)	
0		-16.60	-17.10											-16.60	Yellowish brown, poorly graded SAND wit shell fragments	SP	7	93	0											
1		-17.10	-17.60																											
		-18.10	-18.55	6	6	15	21							-18.10	Medium dense, yellowish brown, poorly graded SAND with shell fragments	SP	0	99	1											
2		-18.60	-18.95											-18.60	Very dense, yellowish brown, Residual Soil (SAND)															
		-18.95	-19.00	50	-	-	R																							
3		-19.00	-20.10					68	48	18	IV	5		-19.00	Moderately weak, moderately weathered, off white, SANDSTONE															
4															**BOREHOLE TERMINATED AT -20.10 (m) BELOW CD**															
5																														
6																														
7																														
8																														
9																														
10																														

Abbreviations & Symbols :

- SPT - UDS
- W_L - Liquid Limit I_P - Plasticity Index MC - Moisture Content
- Rock Recovery - No Recovery
- Field Vane Shear - Sample Slipped
- TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation
- W.I. - Weathering Grade F.I. Fractural Index

C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean Sea Level
SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced Level

Prepared By : V.N.
Checked By : S.D.
Approved By : S.T.

BOREHOLE NO. : BH-06

Geotech By : Horizon Survey Company India Pvt. Ltd. | **Project No. : GT-VOCPT-088** | **Client :** V.O.CHIDAMBARANAR PORT TRUST | **SHEET 01 of 01**

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

WATER TABLE

T.D. (m)	: -20.05 CD	SBL (m) :	: -15.10 CD	Equipment Record	: SANGAM-II (JACKUP PLATFORM)
Date Commenced	: 11-04-2018	Circulation Fluid	: Sea Water	Type of Rig	: Hydraulic Rig
Date Completed	: 11-04-2018	Drilling Orientation	: Vertical	Details of Casing (m)	: SX : 4.50 HX : - NX : -
Co- Ordinates :	E : 200768.204	N : 962756.863		Core-Diameter (mm)	: 54.10

Date	Time	Mtrs.
11-04-2018	10.10	16.00

Sampling Details				Standard Penetration Test (SPT)				Details of Rock core					Symbol	Depth in (m) w.r.t.(CD)	Details of Stratum	Soil Clasiification (IS)	Grain Size Analysis (%)				Consistency Limits (%)			Strength Test (kPa)			Consolidation Test			Remarks
	TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.			Strata Description		GRAVEL	SAND	SILT	CLAY	LIQUID (w_L)	PLASTIC (w_P)	PLASTICITY INDEX (I_P)	UCS C_u	UU c,ϕ	CU c',ϕ'	PreConsolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e^0)	
0		-15.10	-15.60											-15.10	Brownish black, poorly graded SAND with shell fragments	SP	2	96		2										
1		-16.10	-16.10																											
		-16.60	-17.05	17	16	9	25							-16.60	Medium dense, yellowish brown, SAND with shell fragments	SP	8	90		2										
2																														
3		-18.10	-18.55	6	4	3	7								- Loose to very loose below -18.10 m CD															
		-18.60	-19.10																											
4																														
		-19.60	-20.05	2	1	1	2								- Silty SAND	SM	1	76	20	3	-	NP	-							
5																														
6															**BOREHOLE TERMINATED AT -20.05 (m) BELOW CD**														
7																														
8																														
9																														
10																														

Abbreviations & Symbols :

- SPT - UDS
- Rock Recovery - No Recovery
- Field Vane Shear - Sample Slipped

W_L - Liquid Limit I_P - Plasticity Index MC - Moisture Content

TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation

C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean Sea Level
SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced Level

W.I. - Weathering Grade F.I. Fractural Index

Prepared By : V.N.
Checked By : S.D.
Approved By : S.T.

BOREHOLE NO. : BH-07

Geotech By : Horizon Survey Company India Pvt. Ltd. | **Project No. : GT-VOCPT-088** | **Client :** V.O.CHIDAMBARANAR PORT TRUST | **SHEET 01 of 01**

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

WATER TABLE

T.D. (m)	: -20.35 CD	SBL (m) :	: -15.40 CD	Equipment Record	: SANGAM-II (JACKUP PLATFORM)
Date Commenced	: 15-04-2018	Circulation Fluid	: Sea Water	Type of Rig	: Hydraulic Rig
Date Completed	: 15-04-2018	Drilling Orientation	: Vertical	Details of Casing (m)	: SX : 4.50 HX : 4.20 NX : -
Co- Ordinates :	E : 200398.703	N : 963093.715		Core-Diameter (mm)	: 54.10

Date	Time	Mtrs.
15-04-2018	11.46	16.30

Sampling Details				Standard Penetration Test (SPT)				Details of Rock core					Symbol	Depth in (m) w.r.t.(CD)	Details of Stratum	Soil Clasiification (IS)	Grain Size Analysis (%)				Consistency Limits (%)			Strength Test (kPa)			Consolidation Test			Remarks
	TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.			Strata Description		GRAVEL	SAND	SILT	CLAY	LIQUID (w_L)	PLASTIC (w_P)	PLASTICITY INDEX (I_P)	UCS C_u	UU c,ϕ	CU c',ϕ'	PreConsolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e^0)	
0		-15.40	-15.90											-15.40	Greyish, SAND with shell fragments															
1		-16.40	-16.90											-16.40	Dense, greyish, poorly graded SAND with shell fragments	SP	3	96	1											
		-16.90	-17.35	7	12	21	33																							
2		-17.40	-17.90											-17.40	Greyish, clayey SAND	SC	0	52	25	23	35	19	16							
3		-18.52	-18.97	6	14	16	30							-18.52	Very stiff to hard, greyish sandy CLAY	CI	4	31	34	31	45	20	25							
4		-19.40	-19.90													CI	2	24	36	38	45	21	24							
		-19.90	-20.35	35	19	23	42																							
5															BOREHOLE TERMINATED AT -20.35 (m) BELOW CD															
6																														
7																														
8																														
9																														
10																														

Abbreviations & Symbols :

□ - SPT ■ - UDS ◪ - Rock Recovery ▨ - No Recovery ⊗ - Field Vane Shear ● - Sample Slipped

W_L - Liquid Limit I_P - Plasticity Index MC - Moisture Content

TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation

C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean Sea Level
SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced Level

W.I. - Weathering Grade F.I. Fractural Index

Prepared By : V.N.
Checked By : S.D.
Approved By : S.T.

BOREHOLE NO. : BH-08

Geotech By : Horizon Survey Company India Pvt. Ltd. | **Project No. : GT-VOCPT-088** | **Client :** V.O.CHIDAMBARANAR PORT TRUST | **SHEET 01 of 01**

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

WATER TABLE

T.D. (m)	: -20.00 CD	SBL (m) :	: -15.30 CD	Equipment Record	: SANGAM-II (JACKUP PLATFORM)
Date Commenced	: 10-04-2018	Circulation Fluid	: Sea Water	Type of Rig	: Hydraulic Rig
Date Completed	: 10-04-2018	Drilling Orientation	: Vertical	Details of Casing (m)	: SX : 4.20 HX : 4.20 NX : -
Co- Ordinates :	E : 200205.094	N : 963270.218		Core-Diameter (mm)	: 54.10

Date	Time	Mtrs.
10-04-2018	18.00	15.80

Sampling Details				Standard Penetration Test (SPT)				Details of Rock core					Symbol	Depth in (m) w.r.t.(CD)	Details of Stratum	Soil Clasiification (IS)	Grain Size Analysis (%)				Consistency Limits (%)			Strength Test (kPa)			Consolidation Test			Remarks
	TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.			Strata Description		GRAVEL	SAND	SILT	CLAY	LIQUID (w_L)	PLASTIC (w_P)	PLASTICITY INDEX (I_P)	UCS C_u	UU c,ϕ	CU c',ϕ'	PreConsolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e^0)	
0		-15.30	-15.80											-15.30	Yellowish brown, poorly graded SAND with shell fragments	SP	2	98	0											
1		-15.80	-16.30																											
2		-16.80	-17.25	6	6	8	14							-16.80	Medium dense, yellowish brown, silty SAND	SM	0	75	21	4										
		-17.30	-17.80																											
		-18.05	-18.30																											
3		-18.30	-18.75	2	2	3	5								- Locally loose	SM	0	62	30	8	25	12	13							
4		-18.80	-19.30																											
		-19.50	-19.50				R																							
		-19.50	-20.00					100	86	20	IV	4		-19.50	Moderately strong to strong, moderately weathered, light greyish CALCARENITE															
5															BOREHOLE TERMINATED AT -20.00 (m) BELOW CD															
6																														
7																														
8																														
9																														
10																														

Abbreviations & Symbols :

- SPT - UDS
- W_L - Liquid Limit
- I_P - Plasticity Index
- MC - Moisture Content
- Rock Recovery - No Recovery
- Field Vane Shear - Sample Slipped
- TCR - Total Core Recovery
- SCR - Solid Core Recovery
- RQD - Rock Quality Designation
- W.I. - Weathering Grade F.I. Fractural Index

C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean Sea Level
SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced Level

Prepared By : V.N.
Checked By : S.D.
Approved By : S.T.

BOREHOLE NO. : BH-09

Geotech By : Horizon Survey Company India Pvt. Ltd. | **Project No. : GT-VOCPT-088** | **Client :** V.O.CHIDAMBARANAR PORT TRUST | **SHEET 01 of 01**

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

WATER TABLE

T.D. (m)	: -20.25 CD	SBL (m) :	: -15.30 CD	Equipment Record	: SANGAM-II (JACKUP PLATFORM)
Date Commenced	: 10-04-2018	Circulation Fluid	: Sea Water	Type of Rig	: Hydraulic Rig
Date Completed	: 10-04-2018	Drilling Orientation	: Vertical	Details of Casing (m)	: SX : 4.50 HX : - NX : -
Co- Ordinates	: E : 200029.202	N : 963430.567		Core-Diameter (mm)	: 54.10

Date	Time	Mtrs.
10-04-2018	8.45	15.80

Sampling Details				Standard Penetration Test (SPT)				Details of Rock core					Symbol	Depth in (m) w.r.t.(CD)	Details of Stratum	Soil Clasiification (IS)	Grain Size Analysis (%)				Consistency Limits (%)			Strength Test (kPa)			Consolidation Test			Remarks
	TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.			Strata Description		GRAVEL	SAND	SILT	CLAY	LIQUID (w_L)	PLASTIC (w_P)	PLASTICITY INDEX (I_P)	UCS C_u	UU c,ϕ	CU c',ϕ'	PreConsolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e^0)	
0		-15.30	-15.80											-15.30	Yellowish brown, poorly graded SAND with shell fragments	SP	10	89	1											
1		-16.30	-16.80											-16.30	Loose, yellowish brown, poorly graded SAND / silty SAND															
		-16.80	-17.25	3	3	4	7									SP	2	97	1											
2		-17.30	-17.80																											
3		-18.30	-18.75	4	4	5	9									SM	2	81	14	3										
4		-19.30	-19.80													SP	4	95	1											
		-19.80	-20.25	4	3	5	8																							
5															BOREHOLE TERMINATED AT -20.25 (m) BELOW CD															
6																														
7																														
8																														
9																														
10																														

Abbreviations & Symbols :

- SPT - UDS
- Rock Recovery - No Recovery
- Field Vane Shear - Sample Slipped

W_L - Liquid Limit I_P - Plasticity Index MC - Moisture Content

TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation

C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean Sea Level
SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced Level

W.I. - Weathering Grade F.I. Fractural Index

Prepared By : V.N.
Checked By : S.D.
Approved By : S.T.

BOREHOLE NO. : BH-10

Geotech By : Horizon Survey Company India Pvt. Ltd. | **Project No. : GT-VOCPT-088** | **Client :** V.O.CHIDAMBARANAR PORT TRUST | **SHEET 01 of 01**

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

WATER TABLE

T.D. (m)	: -20.45 CD	SBL (m) :	: -14.50 CD	Equipment Record	: SANGAM-II (JACKUP PLATFORM)
Date Commenced	: 08-04-2018	Circulation Fluid	: Sea Water	Type of Rig	: Hydraulic Rig
Date Completed	: 08-04-2018	Drilling Orientation	: Vertical	Details of Casing (m)	: SX : 5.50 HX : - NX : -
Co- Ordinates	: E : 199659.202	N : 963767.419		Core-Diameter (mm)	: 54.10

Date	Time	Mtrs.
08-04-2018	10.20	15.00

Sampling Details				Standard Penetration Test (SPT)				Details of Rock core					Symbol	Depth in (m) w.r.t.(CD)	Details of Stratum	Soil Clasiification (IS)	Grain Size Analysis (%)				Consistency Limits (%)			Strength Test (kPa)			Consolidation Test			Remarks
	TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.			Strata Description		GRAVEL	SAND	SILT	CLAY	LIQUID (w_L)	PLASTIC (w_P)	PLASTICITY INDEX (I_P)	UCS C_u	UU c,ϕ	CU c',ϕ'	PreConsolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e^0)	
0																														
		-14.50	-15.00											-14.50	Yellowish brown, poorly graded SAND with shell fragments	SP	5	94	1											
1																														
		-16.00	-16.45	13	9	10	19							-16.00	Medium dense, yellowish brown, poorly graded SAND with shell fragments	SP	6	84	7	3	-	NP	-							
2																														
3		-17.50	-17.95	3	4	11	15																							
4																														
		-19.00	-19.37	3	31	51	R							-19.00	Very dense to dense, yellowish brown clayey silty SAND	SM	6	66	25	3	-	NP	-							
5																														
		-20.00	-20.45	11	16	19	35									SM	7	73	17	3	-	NP	-							
6															BOREHOLE TERMINATED AT -20.45 (m) BELOW CD														
7																														
8																														
9																														
10																														

Abbreviations & Symbols :

- SPT - UDS
- W_L - Liquid Limit
- I_P - Plasticity Index
- MC - Moisture Content
- Rock Recovery - No Recovery
- TCR - Total Core Recovery
- SCR - Solid Core Recovery
- RQD - Rock Quality Designation
- Field Vane Shear - Sample Slipped
- W.I. - Weathering Grade F.I. Fractural Index

C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean Sea Level
SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced Level

Prepared By : V.N.
Checked By : S.D.
Approved By : S.T.

BOREHOLE NO. : BH-11

Geotech By : Horizon Survey Company India Pvt. Ltd. | **Project No. : GT-VOCPT-088** | **Client :** V.O.CHIDAMBARANAR PORT TRUST | **SHEET 01 of 01**

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

WATER TABLE

T.D. (m)	: -20.20 CD	SBL (m) :	: -15.70 CD	Equipment Record	: SANGAM-II (JACKUP PLATFORM)
Date Commenced	: 15-04-2018	Circulation Fluid	: Sea Water	Type of Rig	: Hydraulic Rig
Date Completed	: 15-04-2018	Drilling Orientation	: Vertical	Details of Casing (m)	: SX : 2.00 HX : - NX : 3.50
Co- Ordinates :	E : 199290.201	N : 964104.271		Core-Diameter (mm)	: 54.10

Date	Time	Mtrs.
-	-	-

Sampling Details				Standard Penetration Test (SPT)				Details of Rock core					Symbol	Depth in (m) w.r.t.(CD)	Details of Stratum	Soil Clasiification (IS)	Grain Size Analysis (%)				Consistency Limits (%)			Strength Test (kPa)			Consolidation Test			Remarks
	TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.			Strata Description		GRAVEL	SAND	SILT	CLAY	LIQUID (w_L)	PLASTIC (w_P)	PLASTICITY INDEX (I_P)	UCS C_u	UU c,ϕ	CU c',ϕ'	PreConsolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e^0)	
0		-15.70	-16.20											-15.70	Yellwish brown, poorly graded SAND with shell and gravels	SP	8	90		2										
		-16.20	-16.70																											
1																														
		-17.20	-17.60	9	9	50	R							-17.20	Very dense, yellowish brown fine SAND with gravels Greyish white weathered rock fragments at the bottom															
2																														
		-17.70	-19.20					59	44	17	III	4		-17.70	Moderately weak to moderatley strong, moderately weathered, yellowish brown, SANDSTONE															
3																														
		-19.20	-20.20					67	48	13	III	3			- Completely weathered and recovered as non intact between -17.70 m CD to -18.00 m CD, -18.45 m CD to 18.70 m CD, -19.20 m CD to -19.40 m CD and -19.40 m CD to -20.00 m CD																
4																														
5																														
6															**BOREHOLE TERMINATED AT -20.20 (m) BELOW CD**															
7																														
8																														
9																														
10																														

Abbreviations & Symbols :

- SPT, UDS
- W_L - Liquid Limit
- I_P - Plasticity Index
- MC - Moisture Content
- Rock Recovery, No Recovery
- TCR - Total Core Recovery
- SCR - Solid Core Recovery
- RQD - Rock Quality Designation
- Field Vane Shear, Sample Slipped
- W.I. - Weathering Grade F.I. Fractural Index

C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean Sea Level
SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced Level

Prepared By : V.N.
Checked By : S.D.
Approved By : S.T.

BOREHOLE NO. : BH-12

Geotech By : Horizon Survey Company India Pvt. Ltd. | **Project No. : GT-VOCPT-088** | **Client :** V.O.CHIDAMBARANAR PORT TRUST | **SHEET 01 of 01**

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

WATER TABLE

T.D. (m) : -20.20 CD	SBL (m) : -16.20 CD	Equipment Record : SANGAM-II (JACKUP PLATFORM)			
Date Commenced : 07-04-2018	Circulation Fluid : Sea Water	Type of Rig : Hydraulic Rig			
Date Completed : 07-04-2018	Drilling Orientation : Vertical	Details of Casing (m) : SX : 1.00	HX : 1.50	NX : 3.00	
Co- Ordinates : E : 198920.700	N : 964441.123	Core-Diameter (mm) : 54.10			

Date	Time	Mtrs.
07-04-2018	15.00	16.70

Sampling Details				Standard Penetration Test (SPT)				Details of Rock core					Symbol	Depth in (m) w.r.t.(CD)	Details of Stratum	Soil Clasiification (IS)	Grain Size Analysis (%)				Consistency Limits (%)			Strength Test (kPa)			Consolidation Test			Remarks
	TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.			Strata Description		GRAVEL	SAND	SILT	CLAY	LIQUID (w_L)	PLASTIC (w_P)	PLASTICITY INDEX (I_P)	UCS C_u	UU c,ϕ	CU c',ϕ'	PreConsolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e^0)	
0		-16.20	-16.70											-16.20	Browish white, poorly graded SAND wth shell fragments	SP	0	96	2	2										
1																														
		-17.70	-17.75	50	-	-	R							-17.70	Moderately weak to moderately strong, highly weathered, yellowish brown, SANDSTONE															
2		-17.75	-19.20					90	90	25	IV	>10																		
3																														
		-19.20	-20.20					100	77	26	IV	8																		
4																														
															BOREHOLE TERMINATED AT -20.20 (m) BELOW CD														
5																														
6																														
7																														
8																														
9																														
10																														

Abbreviations & Symbols :

- SPT - UDS
- W_L - Liquid Limit
- I_P - Plasticity Index
- MC - Moisture Content
- Rock Recovery - No Recovery
- TCR - Total Core Recovery
- SCR - Solid Core Recovery
- RQD - Rock Quality Designation
- Field Vane Shear - Sample Slipped
- W.I. - Weathering Grade F.I. Fractural Index

C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean Sea Level
SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced Level

Prepared By : V.N.
Checked By : S.D.
Approved By : S.T.

BOREHOLE NO. : BH-13

Geotech By : Horizon Survey Company India Pvt. Ltd. | **Project No. : GT-VOCPT-088** | **Client :** V.O.CHIDAMBARANAR PORT TRUST | **SHEET 01 of 01**

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

WATER TABLE

T.D. (m)	: -20.10 CD	SBL (m) :	: -16.10 CD	Equipment Record	: SANGAM-II (JACKUP PLATFORM)
Date Commenced	: 16-04-2018	Circulation Fluid	: Sea Water	Type of Rig	: Hydraulic Rig
Date Completed	: 16-04-2018	Drilling Orientation	: Vertical	Details of Casing (m)	: SX : 1.50 HX : - NX : -
Co- Ordinates :	E : 198551.200	N : 964777.975		Core-Diameter (mm)	: 54.10

Date	Time	Mtrs.
16-04-2018	9.40	16.58

Sampling Details				Standard Penetration Test (SPT)				Details of Rock core					Symbol	Depth in (m) w.r.t.(CD)	Details of Stratum	Soil Clasiification (IS)	Grain Size Analysis (%)				Consistency Limits (%)			Strength Test (kPa)			Consolidation Test			Remarks
	TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.			Strata Description		GRAVEL	SAND	SILT	CLAY	LIQUID (w_L)	PLASTIC (w_P)	PLASTICITY INDEX (I_P)	UCS C_u	UU c,ϕ	CU c',ϕ'	PreConsolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e^0)	
0		-16.10	-16.60											-16.10	Yellwish brown, poorly graded SAND with shell fragments	SP	0	99	1											
		-16.60	-17.10																											
1																														
		-17.60	-17.67	-	-	-	R																							
2		-17.60	-18.60					80	42	38	III	5		-17.60	Moderately strong, moderately weathered, light greyish, SANDSTONE															
		-18.60	-20.10					63	30	10	III	>10																		
3																														
4																														
5															BOREHOLE TERMINATED AT -20.10 (m) BELOW CD															
6																														
7																														
8																														
9																														
10																														

Abbreviations & Symbols :

□ - SPT ■ - UDS ◪ - Rock Recovery ◪ - No Recovery ⊗ - Field Vane Shear ● - Sample Slipped

W_L - Liquid Limit I_P - Plasticity Index MC - Moisture Content

TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation

C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean Sea Level
SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced Level

W.I. - Weathering Grade F.I. Fractural Index

Prepared By : V.N.
Checked By : S.D.
Approved By : S.T.

BOREHOLE NO. : BH-14

Geotech By : Horizon Survey Company India Pvt. Ltd. | **Project No. : GT-VOCPT-088** | **Client :** V.O.CHIDAMBARANAR PORT TRUST | **SHEET 01 of 01**

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

WATER TABLE

T.D. (m)	: -20.10 CD	SBL (m) :	: -16.00 CD	Equipment Record	: SANGAM-II (JACKUP PLATFORM)
Date Commenced	: 16-04-2018	Circulation Fluid	: Sea Water	Type of Rig	: Hydraulic Rig
Date Completed	: 16-04-2018	Drilling Orientation	: Vertical	Details of Casing (m)	: SX : 1.00 HX : - NX : 1.70
Co- Ordinates	: E : 198181.699	N : 965114.827		Core-Diameter (mm)	: 54.10

Date	Time	Mtrs.
16-04-2018	18.00	16.30

Sampling Details				Standard Penetration Test (SPT)				Details of Rock core					Symbol	Depth in (m) w.r.t.(CD)	Details of Stratum	Soil Clasiification (IS)	Grain Size Analysis (%)				Consistency Limits (%)			Strength Test (kPa)			Consolidation Test			Remarks
	TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.			Strata Description		GRAVEL	SAND	SILT	CLAY	LIQUID (w_L)	PLASTIC (w_P)	PLASTICITY INDEX (I_P)	UCS C_u	UU c,ϕ	CU c',ϕ'	PreConsolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e^0)	
0		-16.00	-16.50											-16.00	Yellowish brown, poorly graded SAND with shell fragments	SP	1	98		1										
1																														
		-17.50	-17.70	13	50	-	R							-17.50	Very dense, yellowish brown, fine SAND with shell fragments															
2		-17.70	-19.20					63	42	9	III	>10		-17.70	Moderately strong, highly weathered, light greyish SANDSTONE															
3																														
		-19.20	-20.10					64	59	0	III	7			- at places very weak															
4																														
5															**BOREHOLE TERMINATED AT -20.10 (m) BELOW CD**															
6																														
7																														
8																														
9																														
10																														

Abbreviations & Symbols :

- SPT - UDS
- W_L - Liquid Limit
- I_P - Plasticity Index
- MC - Moisture Content
- Rock Recovery - No Recovery
- TCR - Total Core Recovery
- SCR - Solid Core Recovery
- RQD - Rock Quality Designation
- Field Vane Shear - Sample Slipped
- W.I. - Weathering Grade F.I. Fractural Index

C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean Sea Level
SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced Level

Prepared By : V.N.
Checked By : S.D.
Approved By : S.T.

BOREHOLE NO. : BH-15

Geotech By : Horizon Survey Company India Pvt. Ltd. | **Project No. : GT-VOCPT-088** | **Client :** V.O.CHIDAMBARANAR PORT TRUST | **SHEET 01 of 01**

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

WATER TABLE

T.D. (m)	: -20.10 CD	SBL (m) :	: -15.60 CD	Equipment Record	: SANGAM-II (JACKUP PLATFORM)
Date Commenced	: 17-04-2018	Circulation Fluid	: Sea Water	Type of Rig	: Hydraulic Rig
Date Completed	: 17-04-2018	Drilling Orientation	: Vertical	Details of Casing (m)	: SX : 1.40 HX : - NX : 3.00
Co- Ordinates	: E : 197812.199	N : 965451.679		Core-Diameter (mm)	: 54.10

Date	Time	Mtrs.
17-04-2018	17.40	16.00

Sampling Details				Standard Penetration Test (SPT)				Details of Rock core					Symbol	Depth in (m) w.r.t.(CD)	Details of Stratum	Soil Clasiification (IS)	Grain Size Analysis (%)				Consistency Limits (%)			Strength Test (kPa)			Consolidation Test			Remarks
	TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.			Strata Description		GRAVEL	SAND	SILT	CLAY	LIQUID (w_L)	PLASTIC (w_P)	PLASTICITY INDEX (I_P)	UCS C_u	UU c,ϕ	CU c',ϕ'	PreConsolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e^0)	
0		-15.60	-16.10											-15.60	Yellowish brown, poorly graded SAND with shell fragments	SP	1	98	1											
		-16.10	-16.60													SP	2	96	2											
1																														
		-17.00	-17.10	50	-	-	R							-17.00	Very dense, yellowish grey weathered rock fragments															
2		-17.10	-18.60					58	28	NIL	IV	N.I.		-17.10	Moderately strong to strong, highly weathered,light greyish non intact SANDSTONE															
3																														
		-18.60	-20.10					43	13	NIL	IV	N.I.																		
4																														
5															BOREHOLE TERMINATED AT -20.10 (m) BELOW CD														
6																														
7																														
8																														
9																														
10																														

Abbreviations & Symbols :

- SPT - UDS
- Rock Recovery - No Recovery
- Field Vane Shear - Sample Slipped

W_L - Liquid Limit I_P - Plasticity Index MC - Moisture Content

TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation

C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean Sea Level
SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced Level

W.I. - Weathering Grade F.I. Fractural Index

Prepared By : V.N.
Checked By : S.D.
Approved By : S.T.

BOREHOLE NO. : BH-16

Geotech By : Horizon Survey Company India Pvt. Ltd. | **Project No. : GT-VOCPT-088** | **Client :** V.O.CHIDAMBARANAR PORT TRUST | **SHEET 01 of 01**

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

WATER TABLE

T.D. (m)	: -20.00 CD	SBL (m) :	: -15.20 CD	Equipment Record	: SANGAM-II (JACKUP PLATFORM)
Date Commenced	: 18-04-2018	Circulation Fluid	: Sea Water	Type of Rig	: Hydraulic Rig
Date Completed	: 18-04-2018	Drilling Orientation	: Vertical	Details of Casing (m)	: SX : 0.80 HX : - NX : 2.10
Co- Ordinates	: E : 197641.043	N : 965615.519		Core-Diameter (mm)	: 54.10

Date	Time	Mtrs.
18-04-2018	8.30	15.10

Sampling Details				Standard Penetration Test (SPT)				Details of Rock core					Symbol	Depth in (m) w.r.t.(CD)	Details of Stratum	Soil Clasiification (IS)	Grain Size Analysis (%)				Consistency Limits (%)			Strength Test (kPa)			Consolidation Test			Remarks
	TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.			Strata Description		GRAVEL	SAND	SILT	CLAY	LIQUID (w_L)	PLASTIC (w_P)	PLASTICITY INDEX (I_P)	UCS C_u	UU $c_u\phi$	CU $c'\phi'$	PreConsolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e^0)	
0		-15.20	-15.70											-15.20	Greyish brown, medium to coarse SAND with shell fragements															
		-16.00	-16.00	50	-	-	R																							
1		-16.00	-17.30					100	75	54	III	4		-16.00	Moderately strong, slightly weathered, yellowish brown SANDSTONE															
2		-17.30	-18.80					53	35	22	IV	7		-17.30	Moderately weak, moderately weathered, lihgt greyish SANDSTONE															
3		-18.80	-20.00					35	6	0	IV	N.I		-18.80	Moderately weak, completely weathered, light greyish non intact SANDSTONE															
4																														
5															BOREHOLE TERMINATED AT -20.00 (m) BELOW CD														
6																														
7																														
8																														
9																														
10																														

Abbreviations & Symbols :

- SPT - UDS
- Rock Recovery - No Recovery
- Field Vane Shear - Sample Slipped

W_L - Liquid Limit I_P - Plasticity Index MC - Moisture Content

TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation

C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean Sea Level
SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced Level

W.I. - Weathering Grade F.I. Fractural Index

Prepared By : V.N.
Checked By : S.D.
Approved By : S.T.

BOREHOLE NO. : BH-17

Geotech By : Horizon Survey Company India Pvt. Ltd. | **Project No. : GT-VOCPT-088** | **Client :** V.O.CHIDAMBARANAR PORT TRUST | **SHEET 01 of 01**

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

WATER TABLE

T.D. (m)	: -20.30 CD	SBL (m) :	: -15.30 CD	Equipment Record	: SANGAM-II (JACKUP PLATFORM)
Date Commenced	: 18-04-2018	Circulation Fluid	: Sea Water	Type of Rig	: Hydraulic Rig
Date Completed	: 18-04-2018	Drilling Orientation	: Vertical	Details of Casing (m)	: SX : 0.60 HX : - NX : 0.70
Co- Ordinates :	E : 197442.698	N : 965788.531		Core-Diameter (mm)	: 54.10

Date	Time	Mtrs.
18-04-2018	18.30	15.90

Sampling Details				Standard Penetration Test (SPT)				Details of Rock core					Symbol	Depth in (m) w.r.t.(CD)	Details of Stratum	Soil Clasiification (IS)	Grain Size Analysis (%)				Consistency Limits (%)			Strength Test (kPa)			Consolidation Test			Remarks
	TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.			Strata Description		GRAVEL	SAND	SILT	CLAY	LIQUID (w_L)	PLASTIC (w_P)	PLASTICITY INDEX (I_P)	UCS C_u	UU c,ϕ	CU c',ϕ'	PreConsolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e^0)	
0		-15.30	-15.80											-15.30	Greyish brown, poorly graded SAND with shell fragments	SP	12	87	1											
		-15.90	-15.96	50	-	-	R																							
1		-15.96	-17.30					72	61	28	III	6		-15.96	Moderately strong, moderately weathered, light greyish, SANDSTONE															
2																														
		-17.30	-18.80					34	17	NIL	IV	N.I.		-17.30	Moderately weak, highly weathered, light greyish non intact SANDSTONE															
3																														
		-18.80	-18.90	50	-	-	R																							
4		-18.90	-20.30					57	17	NIL	IV	N.I.																		
5																														
6															**BOREHOLE TERMINATED AT -20.30 (m) BELOW CD**															
7																														
8																														
9																														
10																														

Abbreviations & Symbols :

- SPT - UDS
- Rock Recovery - No Recovery
- Field Vane Shear - Sample Slipped

W_L - Liquid Limit I_P - Plasticity Index MC - Moisture Content

TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation

C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean Sea Level
SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced Level

W.I. - Weathering Grade F.I. Fractural Index

Prepared By : V.N.
Checked By : S.D.
Approved By : S.T.

BOREHOLE NO. : BH-18

Geotech By : Horizon Survey Company India Pvt. Ltd. | **Project No. : GT-VOCPT-088** | **Client :** V.O.CHIDAMBARANAR PORT TRUST | **SHEET 01 of 01**

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

WATER TABLE

T.D. (m)	: -20.25 CD	SBL (m) :	: -15.00 CD	Equipment Record	: SANGAM-II (JACKUP PLATFORM)
Date Commenced	: 19-04-2018	Circulation Fluid	: Sea Water	Type of Rig	: Hydraulic Rig
Date Completed	: 19-04-2018	Drilling Orientation	: Vertical	Details of Casing (m)	: SX : 0.55 HX : - NX : 2.05
Co- Ordinates :	E : 197073.197	N : 966125.383		Core-Diameter (mm)	: 54.10

Date	Time	Mtrs.
19-04-2018	9.40	15.62

Sampling Details				Standard Penetration Test (SPT)				Details of Rock core					Symbol	Depth in (m) w.r.t.(CD)	Details of Stratum	Soil Clasiification (IS)	Grain Size Analysis (%)				Consistency Limits (%)			Strength Test (kPa)			Consolidation Test			Remarks
	TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.			Strata Description		GRAVEL	SAND	SILT	CLAY	LIQUID (w_L)	PLASTIC (w_P)	PLASTICITY INDEX (I_P)	UCS C_u	UU c,ϕ	CU c',ϕ'	PreConsolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e^0)	
0		-15.00	-15.50											-15.00	Yellowish brown, poorly graded SAND with shell and gravels	SP	8	91		1										
		-15.55	-15.55	50	-	-	R																							
1		-15.55	-17.05					83	76	60	III	4		-15.55	Moderately strong, slightly weathered, light brownish SANDSTONE															
2		-17.05	-18.55					31	6	NIL	IV	N.I.																		
3																														
4		-18.55	-20.05					12	NIL	NIL	V	N.I.		-18.55	Moderately strong, highly weathered, light greyish, non intact SANDSTONE															
5		-20.05	-20.25	17	50	-	R							-20.05	Very dense, yellowish grey, weathered rock fragments															
6															BOREHOLE TERMINATED AT -20.25 (m) BELOW CD															
7																														
8																														
9																														
10																														

Abbreviations & Symbols :

- SPT - UDS
- W_L - Liquid Limit
- I_P - Plasticity Index
- MC - Moisture Content
- Rock Recovery - No Recovery
- TCR - Total Core Recovery
- SCR - Solid Core Recovery
- RQD - Rock Quality Designation
- Field Vane Shear - Sample Slipped
- W.I. - Weathering Grade F.I. Fractural Index

C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean Sea Level
SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced Level

Prepared By : V.N.
Checked By : S.D.
Approved By : S.T.

BOREHOLE NO. : BH-19

Geotech By : Horizon Survey Company India Pvt. Ltd. | **Project No. : GT-VOCPT-088** | **Client :** V.O.CHIDAMBARANAR PORT TRUST | **SHEET 01 of 01**

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

WATER TABLE

T.D. (m)	: -20.10 CD	SBL (m) :	: -15.80 CD	Equipment Record	: SANGAM-II (JACKUP PLATFORM)
Date Commenced	: 21-04-2018	Circulation Fluid	: Sea Water	Type of Rig	: Hydraulic Rig
Date Completed	: 21-04-2018	Drilling Orientation	: Vertical	Details of Casing (m)	: SX : 2.05 HX : - NX : 3.00
Co- Ordinates :	E : 196703.697	N : 966462.235		Core-Diameter (mm)	: 54.10

Date	Time	Mtrs.
21-04-2018	9.30	16.25

Sampling Details				Standard Penetration Test (SPT)				Details of Rock core					Symbol	Depth in (m) w.r.t.(CD)	Details of Stratum	Soil Clasiification (IS)	Grain Size Analysis (%)				Consistency Limits (%)			Strength Test (kPa)			Consolidation Test			Remarks
	TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.			Strata Description		GRAVEL	SAND	SILT	CLAY	LIQUID (w_L)	PLASTIC (w_P)	PLASTICITY INDEX (I_P)	UCS C_u	UU c,ϕ	CU c',ϕ'	PreConsolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e^0)	
0		-15.80	-16.30											-15.80	Yellowish brown, poorly graded SAND with shell fragments and gravels	SP	35	64	1											
		-16.30	-16.80																											
1																														
		-17.40	-17.85	8	9	8	17							-17.40	Medium dense, greyish silty SAND with shell fragments and gravels	SM	5	76	15	4	-	NP	-							
2		-17.85	-18.80					25	NIL	NIL	V	N.I		-17.85	Very strong, highly weathered, light greyish non - intact QUARTZITIC SANDSTONE															
3		-18.80	-20.10					35	2	NIL	V	N.I																		
4																														
5															BOREHOLE TERMINATED AT -20.10 (m) BELOW CD														
6																														
7																														
8																														
9																														
10																														

Abbreviations & Symbols :

- SPT - UDS
- Rock Recovery - No Recovery
- Field Vane Shear - Sample Slipped

W_L - Liquid Limit I_P - Plasticity Index MC - Moisture Content

TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation

C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean Sea Level
SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced Level

W.I. - Weathering Grade F.I. Fractural Index

Prepared By : V.N.
Checked By : S.D.
Approved By : S.T.

BOREHOLE NO. : BH-20

Geotech By : Horizon Survey Company India Pvt. Ltd. | **Project No. : GT-VOCPT-088** | **Client :** V.O.CHIDAMBARANAR PORT TRUST | **SHEET 01 of 01**

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

WATER TABLE

T.D. (m)	: -20.05 CD	SBL (m) :	: -14.70 CD	Equipment Record	: SANGAM-II (JACKUP PLATFORM)
Date Commenced	: 20-05-2018	Circulation Fluid	: Sea Water	Type of Rig	: Hydraulic Rig
Date Completed	: 20-05-2018	Drilling Orientation	: Vertical	Details of Casing (m)	: SX : 0.65 HX : - NX : 0.65
Co- Ordinates	: E : 196334.196	N : 966799.087		Core-Diameter (mm)	: 54.10

Date	Time	Mtrs.
20-05-2018	18.70	15.00

Sampling Details				Standard Penetration Test (SPT)				Details of Rock core					Symbol	Depth in (m) w.r.t.(CD)	Details of Stratum	Soil Clasiification (IS)	Grain Size Analysis (%)				Consistency Limits (%)			Strength Test (kPa)			Consolidation Test			Remarks
	TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.			Strata Description		GRAVEL	SAND	SILT	CLAY	LIQUID (w_L)	PLASTIC (w_P)	PLASTICITY INDEX (I_P)	UCS C_u	UU c,ϕ	CU c',ϕ'	PreConsolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e^0)	
0		-14.70	-15.20											-14.70	Yellowish brown, gravels with weathered rock fragments	SM	24	70	3	3	-	NP	-							
1		-15.35	-16.85					56	36	24	IV	7		-15.35	Moderately strong, moderately weathered, light brownish SANDSTONE															
2		-16.85	-17.55					100	60	NIL	IV	>10																		
3		-17.55	-18.55					80	60	NIL	IV	>10																		
4		-18.55	-20.05					65	17	NIL	IV	N.I.																		
5																														
6															BOREHOLE TERMINATED AT -20.05 (m) BELOW CD														
7																														
8																														
9																														
10																														

Abbreviations & Symbols :

- SPT - UDS
- Rock Recovery - No Recovery
- Field Vane Shear - Sample Slipped

W_L - Liquid Limit I_P - Plasticity Index MC - Moisture Content

TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation

C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean Sea Level
SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced Level

W.I. - Weathering Grade F.I. Fractural Index

Prepared By : V.N.
Checked By : S.D.
Approved By : S.T.

BOREHOLE NO. : BH-21

Geotech By : Horizon Survey Company India Pvt. Ltd. | **Project No. : GT-VOCPT-088** | **Client :** V.O.CHIDAMBARANAR PORT TRUST | **SHEET 01 of 01**

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

WATER TABLE

T.D. (m)	: -20.00 CD	SBL (m) :	: -15.00 CD	Equipment Record	: SANGAM-II (JACKUP PLATFORM)
Date Commenced	: 20-05-2018	Circulation Fluid	: Sea Water	Type of Rig	: Hydraulic Rig
Date Completed	: 20-05-2018	Drilling Orientation	: Vertical	Details of Casing (m)	: SX : 0.60 HX : - NX : 0.60
Co- Ordinates :	E : 195964.695	N : 967135.939		Core-Diameter (mm)	: 54.10

Date	Time	Mtrs.
20-05-2018	9.20	14.30

Sampling Details				Standard Penetration Test (SPT)				Details of Rock core					Symbol	Depth in (m) w.r.t.(CD)	Details of Stratum	Soil Clasiification (IS)	Grain Size Analysis (%)				Consistency Limits (%)			Strength Test (kPa)			Consolidation Test			Remarks
	TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.			Strata Description		GRAVEL	SAND	SILT	CLAY	LIQUID (w_L)	PLASTIC (w_P)	PLASTICITY INDEX (I_P)	UCS C_u	UU c,ϕ	CU c',ϕ'	PreConsolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e^0)	
0		-15.00	-15.50											-15.00	Yellowish brown gravels with weathered rock fragments	SM	28	68	1	3	-	NP	-							
		-15.60	-15.60	50			R																							
1		-15.60	-17.10					87	47	43	IV	6		-15.60	Moderately weak, highly weathered, brownish SANDSTONE															
2		-17.10	-18.60					50	7	7	V	>10																		
3																														
4		-18.60	-20.00					60	60	29	IV	7			- Slightly weathered, light brownish below -18.60 m CD															
5																														
6															BOREHOLE TERMINATED AT -20.00 (m) BELOW CD														
7																														
8																														
9																														
10																														

Abbreviations & Symbols :

- SPT - UDS
- Rock Recovery - No Recovery
- Field Vane Shear - Sample Slipped

W_L - Liquid Limit I_P - Plasticity Index MC - Moisture Content

TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation

C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean Sea Level
SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced Level

W.I. - Weathering Grade F.I. Fractural Index

Prepared By : V.N.
Checked By : S.D.
Approved By : S.T.

BOREHOLE NO. : BH-22

Geotech By : Horizon Survey Company India Pvt. Ltd. | **Project No. : GT-VOCPT-088** | **Client :** V.O.CHIDAMBARANAR PORT TRUST | **SHEET 01 of 01**

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

WATER TABLE

T.D. (m)	: -20.05 CD	SBL (m) :	: -15.00 CD	Equipment Record	: SANGAM-II (JACKUP PLATFORM)
Date Commenced	: 15-05-2018	Circulation Fluid	: Sea Water	Type of Rig	: Hydraulic Rig
Date Completed	: 15-05-2018	Drilling Orientation	: Vertical	Details of Casing (m)	: SX : 0.55 HX : - NX : 1.55
Co- Ordinates :	E : 195595.195	N : 967472.791		Core-Diameter (mm)	: 54.10

Date	Time	Mtrs.
15-05-2018	9.35	13.00

Sampling Details				Standard Penetration Test (SPT)				Details of Rock core					Symbol	Depth in (m) w.r.t.(CD)	Details of Stratum	Soil Clasiification (IS)	Grain Size Analysis (%)				Consistency Limits (%)			Strength Test (kPa)			Consolidation Test			Remarks
	TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.			Strata Description		GRAVEL	SAND	SILT	CLAY	LIQUID (w_L)	PLASTIC (w_P)	PLASTICITY INDEX (I_P)	UCS C_u	UU c,ϕ	CU c',ϕ'	PreConsolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e^0)	
0		-15.00	-15.50											-15.00	Yelowish brown, gravels with weathered rock fragments	SP	66	33		1										
		-15.55	-16.55					26	14	NIL	V	N.I.		-15.55	Weak, highly weathered, light greyish / yellowish SANDSTONE, recovered mostly as non intact															
1																														
		-16.55	-17.55					52	NIL	NIL	V	N.I.																		
2																														
		-17.55	-19.05					52	NIL	NIL	V	N.I.																		
3																														
4																														
		-19.05	-20.05					100	57	57	IV	5																		
5																														
6															BOREHOLE TERMINATED AT -20.05 (m) BELOW CD														
7																														
8																														
9																														
10																														

Abbreviations & Symbols :

- SPT - UDS
- W_L - Liquid Limit
- I_P - Plasticity Index
- MC - Moisture Content
- Rock Recovery - No Recovery
- TCR - Total Core Recovery
- SCR - Solid Core Recovery
- RQD - Rock Quality Designation
- Field Vane Shear - Sample Slipped
- W.I. - Weathering Grade F.I. Fractural Index

C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean Sea Level
SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced Level

Prepared By : V.N.
Checked By : S.D.
Approved By : S.T.

BOREHOLE NO. : BH-23

Geotech By : Horizon Survey Company India Pvt. Ltd. | **Project No. : GT-VOCPT-088** | **Client :** V.O.CHIDAMBARANAR PORT TRUST | **SHEET 01 of 01**

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

WATER TABLE

T.D. (m)	: -20.05 CD	SBL (m) :	: -14.90 CD	Equipment Record	: SANGAM-II (JACKUP PLATFORM)
Date Commenced	: 09-05-2018	Circulation Fluid	: Sea Water	Type of Rig	: Hydraulic Rig
Date Completed	: 09-05-2018	Drilling Orientation	: Vertical	Details of Casing (m)	: SX : 0.60 HX : - NX : 0.65
Co- Ordinates	: E : 195225.853	N : 967809.496		Core-Diameter (mm)	: 54.10

Date	Time	Mtrs.
09-05-2018	9.40	15.90

Sampling Details				Standard Penetration Test (SPT)				Details of Rock core					Symbol	Depth in (m) w.r.t.(CD)	Details of Stratum	Soil Clasiification (IS)	Grain Size Analysis (%)				Consistency Limits (%)			Strength Test (kPa)			Consolidation Test			Remarks
	TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.			Strata Description		GRAVEL	SAND	SILT	CLAY	LIQUID (w_L)	PLASTIC (w_P)	PLASTICITY INDEX (I_P)	UCS C_u	UU c,ϕ	CU c',ϕ'	PreConsolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e^0)	
0		-14.90	-15.40											-14.90	Yellowish brown gravels with weathered rock fragments															
		-15.50	-15.55	50			R																							
1		-15.55	-16.65					85	50	30	IV	7		-15.55	Weak, highly weathered, light brownish, SANDSTONE															
2		-16.65	-17.15					100	NIL	NIL	IV	N.I.																		
3		-17.15	-18.65					72	32	27	IV	>10																		
4		-18.65	-20.05					60	20	20	IV	>10																		
5																														
6															BOREHOLE TERMINATED AT -20.05 (m) BELOW CD														
7																														
8																														
9																														
10																														

Abbreviations & Symbols :

- SPT - UDS
- Rock Recovery - No Recovery
- Field Vane Shear - Sample Slipped

W_L - Liquid Limit I_P - Plasticity Index MC - Moisture Content

TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation

C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean Sea Level
SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced Level

W.I. - Weathering Grade F.I. Fractural Index

Prepared By : V.N.
Checked By : S.D.
Approved By : S.T.

BOREHOLE NO. : BH-24

Geotech By : Horizon Survey Company India Pvt. Ltd. | **Project No. : GT-VOCPT-088** | **Client :** V.O.CHIDAMBARANAR PORT TRUST | **SHEET 01 of 01**

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

WATER TABLE

T.D. (m)	: -20.02 CD	SBL (m) :	: -14.90 CD	Equipment Record	: SANGAM-II (JACKUP PLATFORM)
Date Commenced	: 05-05-2018	Circulation Fluid	: Sea Water	Type of Rig	: Hydraulic Rig
Date Completed	: 05-05-2018	Drilling Orientation	: Vertical	Details of Casing (m)	: SX : 0.57 HX : - NX : 1.62
Co- Ordinates :	E : 194849.783	N : 968145.581		Core-Diameter (mm)	: 54.10

Date	Time	Mtrs.
05-05-2018	9	15.70

Sampling Details				Standard Penetration Test (SPT)				Details of Rock core					Symbol	Depth in (m) w.r.t.(CD)	Details of Stratum	Soil Clasiification (IS)	Grain Size Analysis (%)				Consistency Limits (%)			Strength Test (kPa)			Consolidation Test			Remarks
	TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.			Strata Description		GRAVEL	SAND	SILT	CLAY	LIQUID (w_L)	PLASTIC (w_P)	PLASTICITY INDEX (I_P)	UCS C_u	UU c,ϕ	CU c',ϕ'	PreConsolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e^0)	
0		-14.90	-15.40											-14.90	Yellowish brown, poorly graded SAND with gravel rock fragments	SP	8	91	1											
		-15.47	-15.52	50	-	-	R																							
1		-15.52	-16.52					52	NIL	NIL	V	N.I.		-15.52	Weak, highly weathered, light yellowish non intact SANDSTONE															
2		-16.52	-17.52					58	12	NIL	V	N.I.																		
3		-17.52	-18.02					100	NIL	NIL	V	N.I.																		
4		-18.02	-19.52					87	80	80	IV	5		-18.02	Weak, moderately weathered, light greyish SANDSTONE															
5		-19.52	-20.02					100	14	NIL	IV	>10																		
6															BOREHOLE TERMINATED AT -20.02 (m) BELOW CD														
7																														
8																														
9																														
10																														

Abbreviations & Symbols :

- SPT - UDS
- Rock Recovery - No Recovery
- Field Vane Shear - Sample Slipped

W_L - Liquid Limit I_P - Plasticity Index MC - Moisture Content

TCR - Total Core Recovery SCR - Solid Core Recovery RQD - Rock Quality Designation

C.D. Chart Datum, T.D. : Termination Depth, MSL : Mean Sea Level
SBL : Sea Bed Level, EGL : Existing Ground Level, R.L. : Reduced Level

W.I. - Weathering Grade F.I. Fractural Index

Prepared By : V.N.
Checked By : S.D.
Approved By : S.T.

APPENDIX B – SUMMARY OF LAB TEST RESULTS

SUMMARY OF LABORATORY TEST RESULTS ON SOIL SAMPLES

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Project No. : GT-VOCPT-088

Client : V.O.CHIDAMBARANAR PORT TRUST

BOREHOLE - NO.	TestDepth (m)		Sample Type (D/S/SPT/ UDS)	DENSITY & MOISTURE CONTENT			Soil Clasification (IS)	CLASSIFICATION TESTS									STRENGTH TESTS (kPa)							CONSOLIDATION TEST		
				Moisture Content (%)	Density (Kg/cm^3)			Sp. Gravity	Atterberg Limits(%)			Particle Size Distribution(%)					UCS	UU		CU		DIRECT SHEAR TEST		Pre-Consolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e^0)
	From	To			Wet	Dry			W_L	W_P	I_P	Gravel	Sand	Silt	Clay		C_u	c	ϕ	c'	ϕ'	c	ϕ			
BH-01	-16.00	-16.50	D/S				SP					30	69	1												
BH-02	-15.40	-15.90	D/S				SP					22	77	1												
	-16.69	-17.14	SPT				SM	2.66	-	NP	-	8	79	10	3											
	-20.07	-20.52	SPT				SM	2.68	-	NP	-	0	88	9	3											
BH-03	-15.30	-15.80	D/S				SP					5	94	1												
BH-04	-16.50	-17.00	D/S				SP					5	93	2												
	-18.00	-18.45	SPT				SP					5	93	2												
	-19.50	-19.95	SPT				SP					0	99	1												

LEGENDS : CL : Low Plastic CLAY, CI : Medium Plastic CLAY, CH : Highly Plastic CLAY, ML : SILT, SC : Clayey SAND, SM : Silty SAND, SP : Poorly Graded SAND, SW : Well Graded SAND, GC : Clayey GRAVEL, GM : Silty GRAVELS, GP : Poorly Graded GRAVEL, GW : Well Graded GRAVEL, NP : Non Plastic, D/S : Disturbed Sample, SPT : Standard Penetration Test, UDS : Undisturbed Sample

PREPARED BY : **V.N.** CHECKED BY : **S.D** APPROVED BY : **S.T.**

SUMMARY OF LABORATORY TEST RESULTS ON SOIL SAMPLES

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Project No. : GT-VOCPT-088

Client : V.O.CHIDAMBARANAR PORT TRUST

BOREHOLE - NO.	TestDepth (m)		Sample Type (D/S/SPT/ UDS)	DENSITY & MOISTURE CONTENT			Soil Clasification (IS)	CLASSIFICATION TESTS								STRENGTH TESTS (kPa)								CONSOLIDATION TEST		
				Moisture Content (%)	Density (Kg/cm^3)			Sp. Gravity	Atterberg Limits(%)			Particle Size Distribution(%)				UCS	UU		CU		DIRECT SHEAR TEST		Pre-Consolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e^0)
	From	To			Wet	Dry			W_L	W_P	I_P	Gravel	Sand	Silt	Clay	C_u	c	ϕ	c'	ϕ'	c	ϕ			
BH-05	-16.60	-17.10	D/S				SP					7	93	0											
	-18.10	-18.55	SPT				SP					0	99	1											
BH-06	-15.10	-15.60	D/S				SP					2	96	2											
	-16.60	-17.05	SPT				SP					8	90	2											
	-19.60	-20.05	SPT				SM		-	NP	-	1	76	20	3										
BH-07	-16.40	-16.90	D/S				SP					3	96	1											
	-17.40	-17.90	D/S				SC	2.67	35	19	16	0	52	25	23										
	-18.52	-18.97	SPT				CI	2.69	45	20	25	4	31	34	31										
	-19.40	-19.90	D/S				CI	2.68	45	21	24	2	24	36	38										

LEGENDS : CL : Low Plastic CLAY, CI : Medium Plastic CLAY, CH : Highly Plastic CLAY, ML : SILT, SC : Clayey SAND, SM : Silty SAND, SP : Poorly Graded SAND, SW : Well Graded SAND, GC : Clayey GRAVEL, GM : Silty GRAVELS, GP : Poorly Graded GRAVEL, GW : Well Graded GRAVEL, NP : Non Plastic, D/S : Disturbed Sample, SPT : Standard Penetration Test, UDS : Undisturbed Sample

PREPARED BY : **V.N.** CHECKED BY : **S.D** APPROVED BY : **S.T.**

SUMMARY OF LABORATORY TEST RESULTS ON SOIL SAMPLES

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Project No. : GT-VOCPT-088

Client : V.O.CHIDAMBARANAR PORT TRUST

BOREHOLE - NO.	TestDepth (m)		Sample Type (D/S/SPT/ UDS)	DENSITY & MOISTURE CONTENT			Soil Clasification (IS)	CLASSIFICATION TESTS								STRENGTH TESTS (kPa)								CONSOLIDATION TEST		
				Moisture Content (%)	Density (Kg/cm^3)			Sp. Gravity	Atterberg Limits(%)			Particle Size Distribution(%)				UCS	UU		CU		DIRECT SHEAR TEST		Pre-Consolidation Pressure (kPa)	Compression Index (Cc)	Initial Void Ratio (e^0)
	From	To			Wet	Dry			W_L	W_P	I_P	Gravel	Sand	Silt	Clay	C_u	c	ϕ	c'	ϕ'	c	ϕ			
BH-08	-15.30	-15.80	D/S				SP					2	98	0											
	-16.80	-17.25	SPT				SM	2.67	-	NP	-	0	75	21	4										
	-18.30	-18.75	SPT				SM	2.66	25	12	13	0	62	30	8										
BH-09	-15.30	-15.80	D/S				SP					10	89	1											
	-16.80	-17.25	SPT				SP					2	97	1											
	-18.30	-18.75	SPT				SM	2.67	-	NP	-	2	81	14	3										
	-19.30	-19.80	SPT				SP					4	95	1											
BH-10	-14.50	-15.00	D/S				SP					5	94	1											
	-16.00	-16.45	SPT				SP	2.66	-	NP	-	6	84	7	3										
	-19.00	-19.37	SPT				SM	2.67	-	NP	-	6	66	25	3										
	-20.00	-20.45	SPT				SM	2.68	-	NP	-	7	73	17	3										

LEGENDS CL : Low Plastic CLAY, CI : Medium Plastic CLAY, CH : Highly Plastic CLAY, ML : SILT, SC : Clayey SAND, SM : Silty SAND, SP : Poorly Graded SAND, SW : Well Graded SAND, GC : Clayey GRAVEL, GM : Silty GRAVELS, GP : Poorly Graded GRAVEL, GW : Well Graded GRAVEL, NP : Non Plastic, D/S : Disturbed Sample, SPT : Standard Penetration Test, UDS : Undisturbed Sample

PREPARED BY : **V.N.** CHECKED BY : **S.D** APPROVED BY : **S.T.**

SUMMARY OF LABORATORY TEST RESULTS ON SOIL SAMPLES

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Project No. : GT-VOCPT-088

Client : V.O.CHIDAMBARANAR PORT TRUST

BOREHOLE - NO.	TestDepth (m)		Sample Type (D/S/SPT/ UDS)	DENSITY & MOISTURE CONTENT			Soil Clasification (IS)	CLASSIFICATION TESTS									STRENGTH TESTS (kPa)							CONSOLIDATION TEST		
				Moisture Content (%)	Density (Kg/cm^3)			Sp. Gravity	Atterberg Limits(%)			Particle Size Distribution(%)					UCS	UU		CU		DIRECT SHEAR TEST		Pre-Consolidation Pressure (kPa)	Commpression Index (Cc)	Initial Void Ratio (e^0)
	From	To			Wet	Dry			W_L	W_P	I_P	Gravel	Sand	Silt	Clay		C_u	c	ϕ	c'	ϕ'	c	ϕ			
BH-11	-16.20	-16.70	D/S				SP					8	90	2												
BH-12	-16.20	-16.70	D/S				SP	2.69	-	NP	-	0	96	2	2											
BH-13	-16.10	-16.60	D/S				SP					0	99	1												
BH-14	-16.00	-16.50	D/S				SP					1	98	1												
BH-15	-15.60	-16.10	D/S				SP					1	98	1												
	-16.10	-16.60	D/S				SP					2	96	2												
BH-17	-15.30	-15.80	D/S				SP					12	87	1												
BH-18	-15.00	-15.50	D/S				SP					8	91	1												
BH-19	-15.80	-16.30	D/S				SP					35	64	1												
	-17.40	-17.85	SPT				SM	2.66	-	NP	-	5	76	15	4											
BH-20	--14.70	--15.20	D/S				SM	2.68	-	NP	-	24	70	3	3											
BH-21	-15.00	-15.50	D/S				SM	2.67	-	NP	-	28	68	1	3											
BH-22	-15.00	-15.50	D/S				SP					66	33	1												
BH-25	-15.62	-15.85	D/S				SM	2.67				39	38	20	3											
BH-26	--12.40	--12.90	D/S				SC	2.67	33	14	19	6	58	29	7											
BH-28	-10.60	-11.10	D/S				SP					38	62	0												
BH-30	-12.70	-13.20	D/S				SP	2.69	-	NP	-	42	50	5	3											

LEGENDS : CL : Low Plastic CLAY, CI : Medium Plastic CLAY, CH : Highly Plastic CLAY, ML : SILT, SC : Clayey SAND, SM : Silty SAND, SP : Poorly Graded SAND, SW : Well Graded SAND, GC : Clayey GRAVEL, GM : Silty GRAVELS, GP : Poorly Graded GRAVEL, GW : Well Graded GRAVEL, NP : Non Plastic, D/S : Disturbed Sample, SPT : Standard Penetration Test, UDS : Undisturbed Sample

PREPARED BY : **V.N.** CHECKED BY : **S.D** APPROVED BY : **S.T.**

SUMMARY OF LABORATORY TEST RESULTS ON ROCK SAMPLES

Project : Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O.Chidambaranar Port

Project No. : GT - VOCPT - 088

Client: V.O. Chidambaranar Port

TEST DATE : 03/05/2018

BH No.	Depth(m)	Length (cm)	Diameter (cm)	Test Condition	Moisture Absorption (%)	Porosity (%)	Natural Water Content (%)	In- situ Unit Weight (kN/m^2)	Dry Unit Weight (kN/m^2)	Specific Gravity	Point Load Index Strength (Mpa) I_S 50	Uniaxial Compressive Strength (MPa)	Corrected Uniaxial Compressive Strength (MPa)	Modulus of Elasticity	Poisson's Ratio	Hammer Rebound Number "N"	Brazilian Test	Remarks
BH - 1	-16.70 - -18.30	4.290	5.12	SOAKED	3.98	8.38	0.59	21.18	21.06	2.33	2.43	-	53.50	-	-		-	
BH - 3	-16.30 - -17.80	8.550	5.06	SOAKED	10.66	18.67	6.77	18.71	17.52	1.88	-	3.13	3.06	-	-		-	
	-17.80 - -19.30	3.240	5.15	SOAKED	9.41	17.19	6.49	19.45	18.27	2.06	-	-	-	-	-		1.30	
BH - 5	-19.00 - -20.10	10.298	5.14	SOAKED	1.23	2.90	1.25	23.95	23.66	2.41		10.51	10.51	-	-	14.00	-	
BH - 8	-19.50 - -20.00	10.500	5.14	SOAKED	2.05	4.91	0.75	24.11	23.93	2.48	2.61		57.41	-	-		-	
BH - 11	-17.70 - -19.20	11.140	5.12	SOAKED	1.00	2.44	0.98	24.59	24.35	2.54		30.84	30.84	-	-	29.00	-	
	-19.20 - -19.70	11.170	5.06	SOAKED	7.53	14.34	5.38	20.05	19.03	1.94		7.36	7.36	-	-		-	
BH - 12	-17.75 - -19.20	11.104	5.14	SOAKED	3.12	6.51	2.29	21.33	20.85	2.29	-	10.51	10.51	-	-	12.00		
	-19.20 - -20.20	9.040	5.16	SOAKED	0.69	1.69	0.69	24.83	24.66	2.59	-	39.24	38.56	-	-		-	
	-19.20 - -20.20	3.060	5.14	SOAKED	1.86	4.25	1.86	23.28	22.85	2.07	-			-	-		3.73	

Prepared By : V.N. **Checked By: S.D** **Approved by : ST**

SUMMARY OF LABORATORY TEST RESULTS ON ROCK SAMPLES

Project : Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O.Chidambaranar Port

Project No. : GT - VOCPT - 088

Client: V.O. Chidambaranar Port

TEST DATE : 03/05/2018

BH No.	Depth(m)	Length (cm)	Diameter (cm)	Test Condition	Moisture Absorption (%)	Porosity (%)	Natural Water Content (%)	In- situ Unit Weight (kN/m^2)	Dry Unit Weight (kN/m^2)	Specific Gravity	Point Load Index Strength (Mpa) I_S 50	Uniaxial Compressive Strength (MPa)	Corrected Uniaxial Compressive Strength (MPa)	Modulus of Elasticity	Poisson's Ratio	Hammer Rebound Number "N"	Brazilian Test	Remarks
BH - 13	-17.60 - -18.60	11.130	5.17	SOAKED	1.31	3.21	1.09	24.70	24.44	2.48		29.11	29.11	-	-	29.00	-	
	-17.60 - -18.60	3.240	5.15	SOAKED	1.54	3.85	0.77	25.23	25.04	2.42	-			-	-		5.38	
	-18.60 - -20.10	4.540	5.16	SOAKED	5.58	12.11	1.60	22.06	21.71	2.29	0.92	-	20.15	-	-			
	-18.60 - -20.10	3.280	5.15	SOAKED	5.92	13.18	2.11	22.72	22.25	2.17	-	-	-	-	-		1.40	
BH - 14	-17.70 - -19.20	4.770	5.16	SOAKED	1.20	3.01	0.64	25.32	25.16	2.51	1.64		36.11	-	-		-	
	-19.20 - -20.60	7.540	5.15	SOAKED	6.84	13.75	1.90	20.50	20.12	2.11	0.08	-	1.68	-	-			
BH - 15	-17.10 - -18.60	8.000	5.18	SOAKED	0.41	1.07	0.44	26.02	25.91	2.57	5.31	-	116.90	-	-		-	
	-18.60 - -20.10	5.380	5.17	SOAKED	1.32	3.10	0.64	23.68	23.53	2.66	2.36	-	51.89	-	-	42.00		
BH - 16	-16.00 - -17.30	11.130	5.19	SOAKED	0.61	1.53	0.61	25.22	25.07	2.57		36.68	36.68	-	-	34.00	-	
	-17.30 - -18.80	8.310	5.17	SOAKED	2.22	5.27	1.04	24.04	23.79	2.31		9.24	8.97	-	-			
BH - 17	-15.96 - -17.30	11.150	5.16	SOAKED	1.46	3.65	1.05	25.17	24.91	2.42	-	30.22	30.22	-	-			
	-15.96 - -17.30	5.390	5.17	SOAKED	1.12	2.82	0.77	25.38	25.18	2.59	-			-	-		3.70	
	-18.90 - -20.30	7.290	5.24	SOAKED	6.64	12.91	1.80	19.80	19.45	2.04	0.56	-	12.30	-	-			

Prepared By : V.N. **Checked By: S.D** **Approved by : ST**

SUMMARY OF LABORATORY TEST RESULTS ON ROCK SAMPLES

Project : Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O.Chidambaranar Port

Project No. : GT - VOCPT - 088

Client: V.O. Chidambaranar Port

TEST DATE : 03/05/2018

BH No.	Depth(m)	Length (cm)	Diameter (cm)	Test Condition	Moisture Absorption (%)	Porosity (%)	Natural Water Content (%)	In- situ Unit Weight (kN/m^2)	Dry Unit Weight (kN/m^2)	Specific Gravity	Point Load Index Strength (Mpa) I_S 50	Uniaxial Compressive Strength (MPa)	Corrected Uniaxial Compressive Strength (MPa)	Modulus of Elasticity	Poisson's Ratio	Hammer Rebound Number "N"	Brazilian Test	Remarks
BH - 18	-15.55 - -17.05	11.176	5.18	SOAKED	0.49	1.27	0.34	26.09	26.00	2.66		34.07	34.07	-	-	32.00	-	
	-15.55 - -17.05	3.210	5.18	SOAKED	0.39	1.03	0.28	26.36	26.28	2.54	-			-	-		8.81	
	-17.05 - -18.55	4.340	5.20	SOAKED	2.28	4.99	1.44	22.21	21.89	2.52	1.17	-	25.72	-	-			
BH - 19	-17.90 - -18.80	4.153	5.33	SOAKED	0.31	0.86	0.43	27.66	27.54	2.55	3.89		85.55	-	-		-	
	-18.80 - -20.10	4.722	5.14	SOAKED	0.46	1.22	0.46	26.98	26.86	2.39	4.80	-	105.54	-	-			

Prepared By : V.N. **Checked By: S.D** **Approved by : ST**

SUMMARY OF LABORATORY TEST RESULTS ON ROCK SAMPLES

Project : Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O.Chidambaranar Port

Project No. : GT - VOCPT - 088

Client: V.O. Chidambaranar Port

TEST DATE : 05/06/2018

BH No.	Depth(m)	Length (cm)	Diameter (cm)	Test Condition	Moisture Absorption (%)	Porosity (%)	Natural Water Content (%)	In- situ Unit Weight (kN/m^3)	Dry Unit Weight (kN/m^3)	Specific Gravity	Point Load Index Strength (MPa) I_S 50	Uniaxial Compressive Strength (MPa)	Corrected Uniaxial Compressive Strength (MPa)	Modulus of Elasticity	Poisson's Ratio	Hammer Rebound Number "N"	Brazilian Test(Mpa)	Remarks
BH - 20	-15.35 - -16.85	11.210	5.21	SOAKED	0.93	2.39	0.39	25.75	25.65	2.55	-	23.69	23.69	-	-	26.00	-	
	-16.85 - -17.55	9.840	5.16	UNSOAKED	-	-	3.03	19.47	18.90	-	0.65	-	14.27	-	-		-	
BH-21	-15.60 - -17.10	11.280	5.23	SOAKED	0.88	2.15	0.54	24.67	24.54	2.47	-	8.16	8.16	-	-		-	
	-18.60 - -20.00	10.790	5.15	UNSOAKED	-	-	1.22	18.50	18.28	-	0.54	-	11.79	-	-		-	
	-18.60 - -20.00	3.800	5.24	UNSOAKED	-	-	1.88	17.84	17.51	-	-	-	-	-	-		0.29	
BH-22	-19.05 - -20.05	11.140	5.23	UNSOAKED	-	-	1.20	19.36	19.13	-	-	4.79	4.79	-	-		-	
BH-23	-15.65 - -16.65	7.630	5.20	SOAKED	0.78	2.04	0.16	26.23	26.18	2.50	2.83	-	62.23	-	-	51.00	-	
	-17.15 - -18.65	8.680	5.29	UNSOAKED	-	-	2.05	18.26	17.89	-	0.11	-	2.43	-	-		-	
	-18.65 - -20.05	11.190	5.31	UNSOAKED	-	-	3.61	19.22	18.55	-	-	1.45	1.45	-	-		-	
BH-24	-18.02 - -19.52	8.460	5.18	UNSOAKED	-	-	1.62	19.31	19.00	-	0.19	-	4.17	-	-		-	
BH-25	-17.10 - -18.10	9.000	5.18	UNSOAKED	-	-	1.23	20.02	19.78	-	0.04	-	0.83	-	-		-	
	-19.10 - -20.20	10.690	5.17	UNSOAKED	-	-	3.30	18.41	17.82	-	-	2.52	2.52	-	-		-	

Prepared By : V.N. **Checked By: S.D** **Approved by : ST**

APPENDIX C – CLASSIFICATION TEST RESULTS

PARTICLE SIZE DISTRIBUTION

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

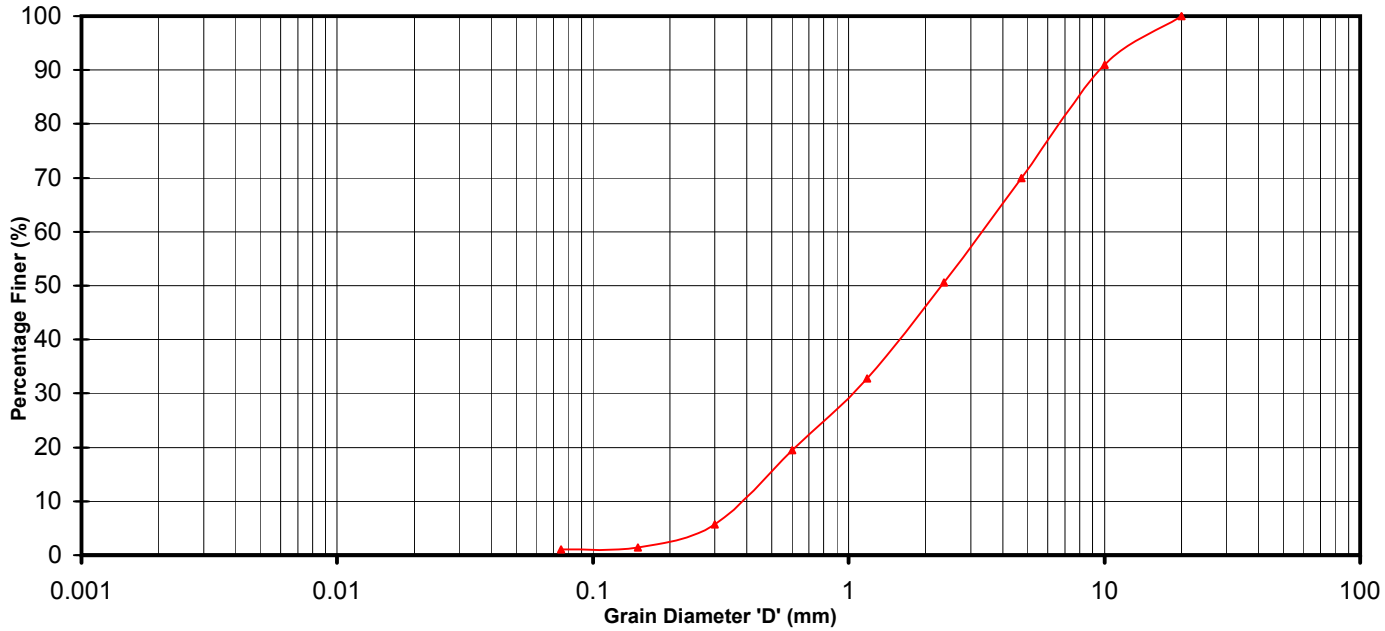
Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

As Per IS:2720

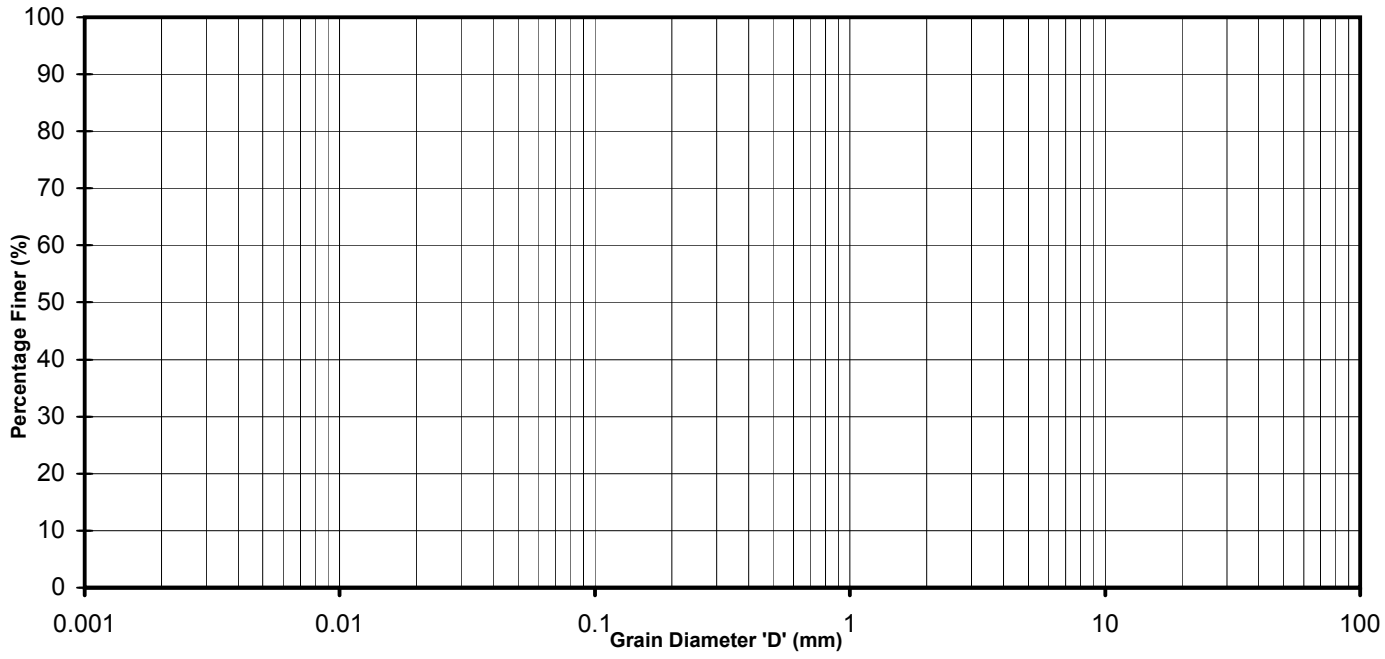
BH NO.:	BH-01	Depth (m) :	-16.00 - -16.50

CLAY & SILT	SAND			GRAVEL
	FINE	MEDIUM	COARSE	
1	10	34	25	30



BH NO.:		Depth (m) :			

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



Tested By : P.M. Prepared By : V.N. Checked By : S.D. Approved By : S.T.

PARTICLE SIZE DISTRIBUTION

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

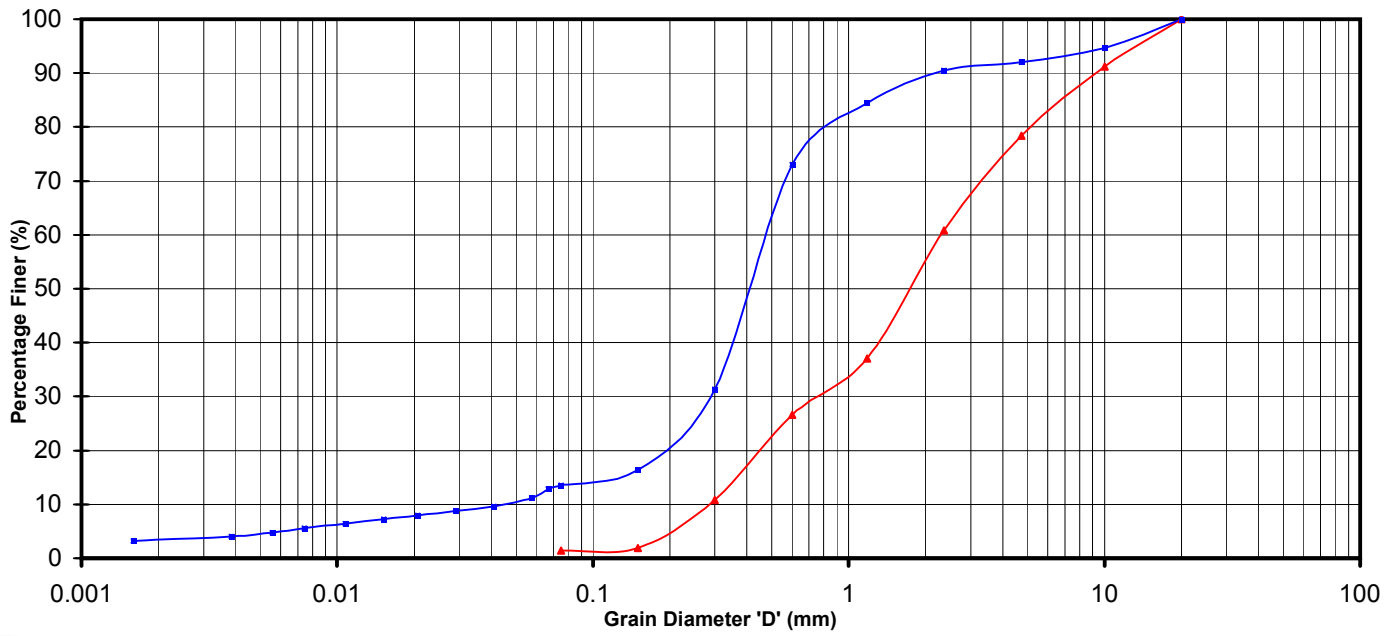
Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

As Per IS:2720

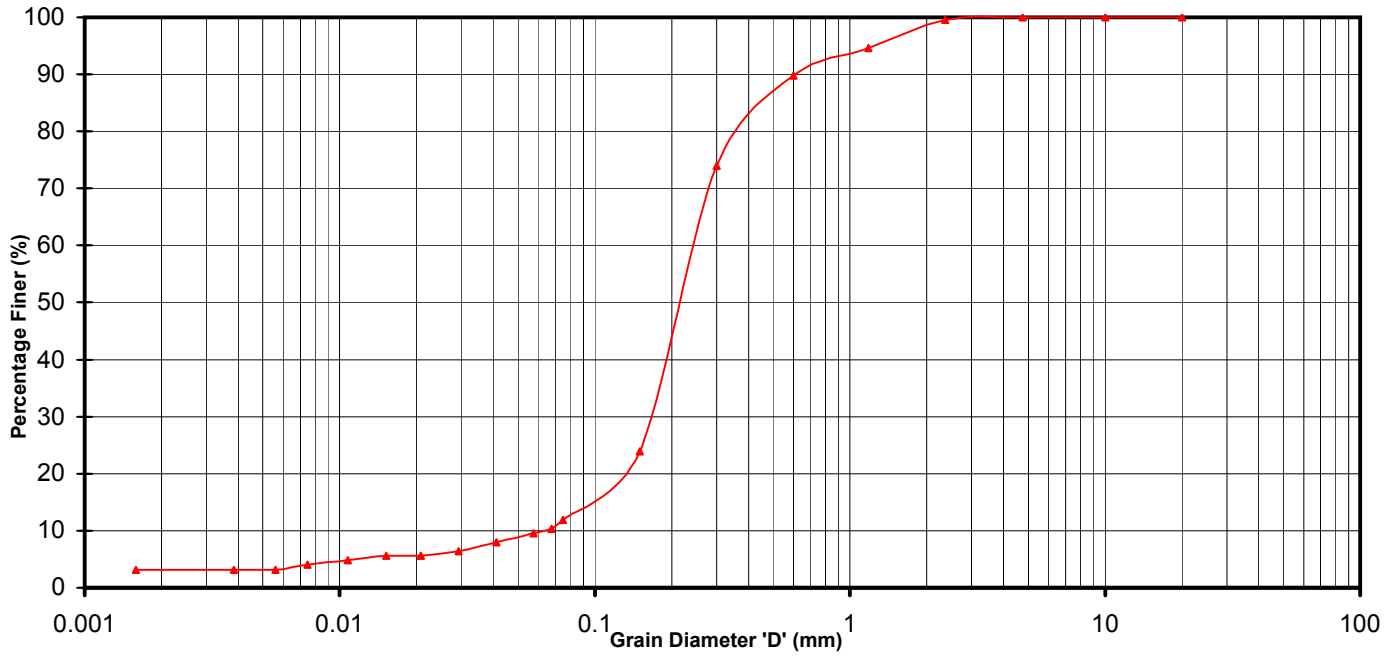
BH NO.:	Depth (m) :		
BH-02	▲ -15.40 - -15.90	■ -16.69 - -17.14	

	CLAY	SILT	SAND			GRAVEL
			FINE	MEDIUM	COARSE	
▲	1	16	37	24	22	
■	3	10	36	40	3	8



BH NO.:	Depth (m) :		
BH-02	▲ -20.07 - -20.52	■	

	CLAY	SILT	SAND			GRAVEL
			FINE	MEDIUM	COARSE	
▲	3	9	69	17	2	0
■						



Tested By : P.M. Prepared By : V.N. Checked By : S.D. Approved By : S.T.

PARTICLE SIZE DISTRIBUTION

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

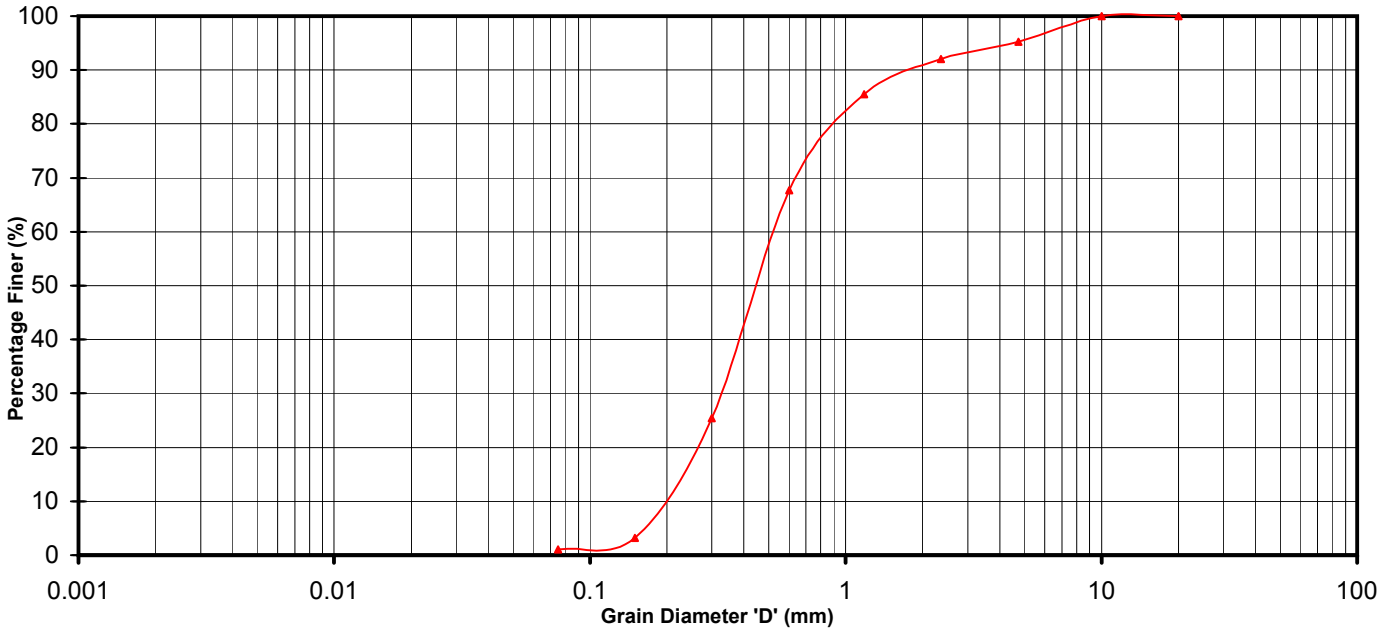
Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

As Per IS:2720

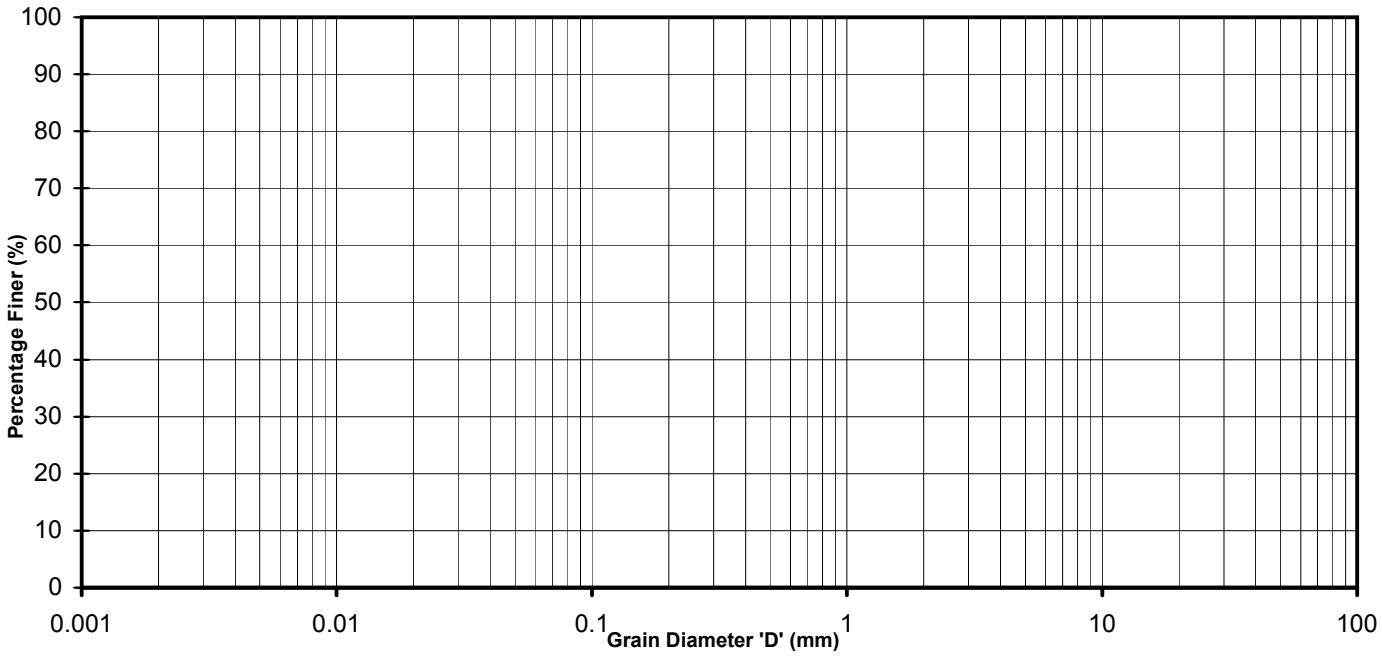
BH NO.:	BH-03	Depth (m) :	-15.30 - -15.80

CLAY & SILT	SAND			GRAVEL
	FINE	MEDIUM	COARSE	
1	42	47	5	5



BH NO.:		Depth (m) :			

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



Tested By : P.M. Prepared By : V.N. Checked By : S.D. Approved By : S.T.

PARTICLE SIZE DISTRIBUTION

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

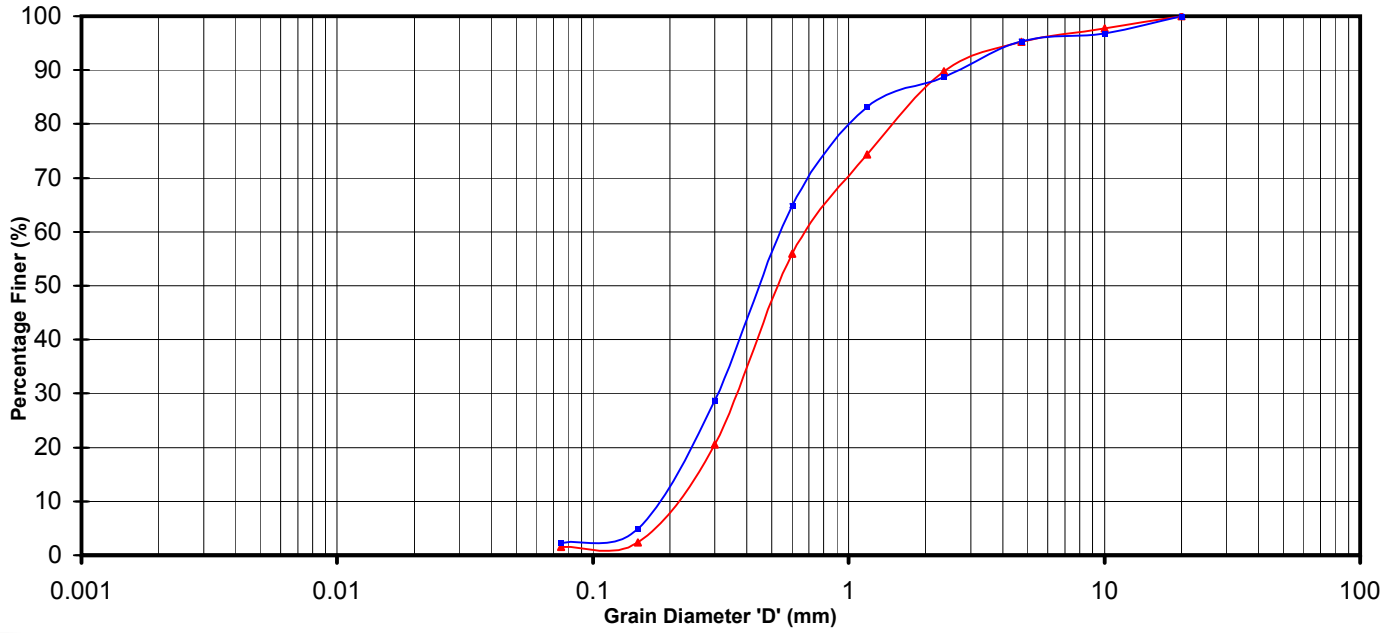
Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

As Per IS:2720

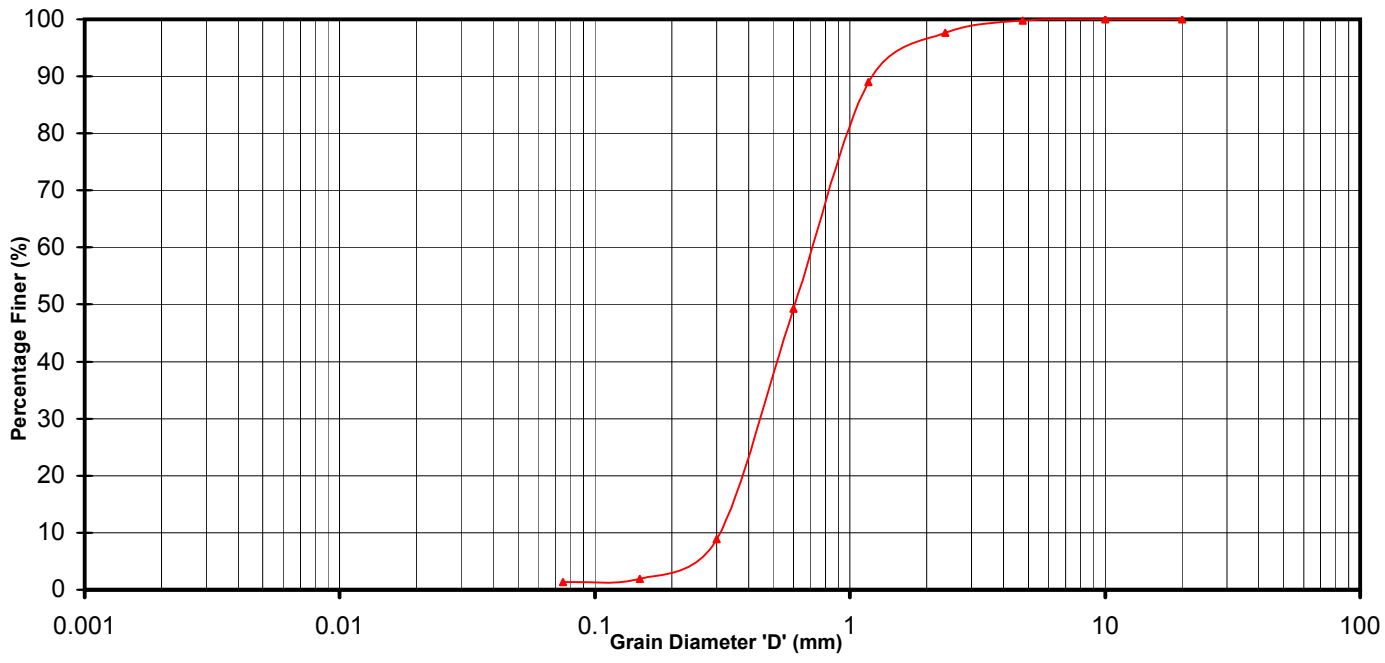
BH NO.:	Depth (m) :		
BH-04	-16.50- -17.00	-18.00 - -18.45	

	CLAY & SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	
▲	2	33	50	10	5
■	2	42	43	8	5



BH NO.:	Depth (m) :		
BH-04	-19.50 - -19.95	0.00	

	CLAY & SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	
▲	1	25	69	5	0
■					



Tested By : P.M. Prepared By : V.N. Checked By : S.D. Approved By : S.T.

PARTICLE SIZE DISTRIBUTION

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

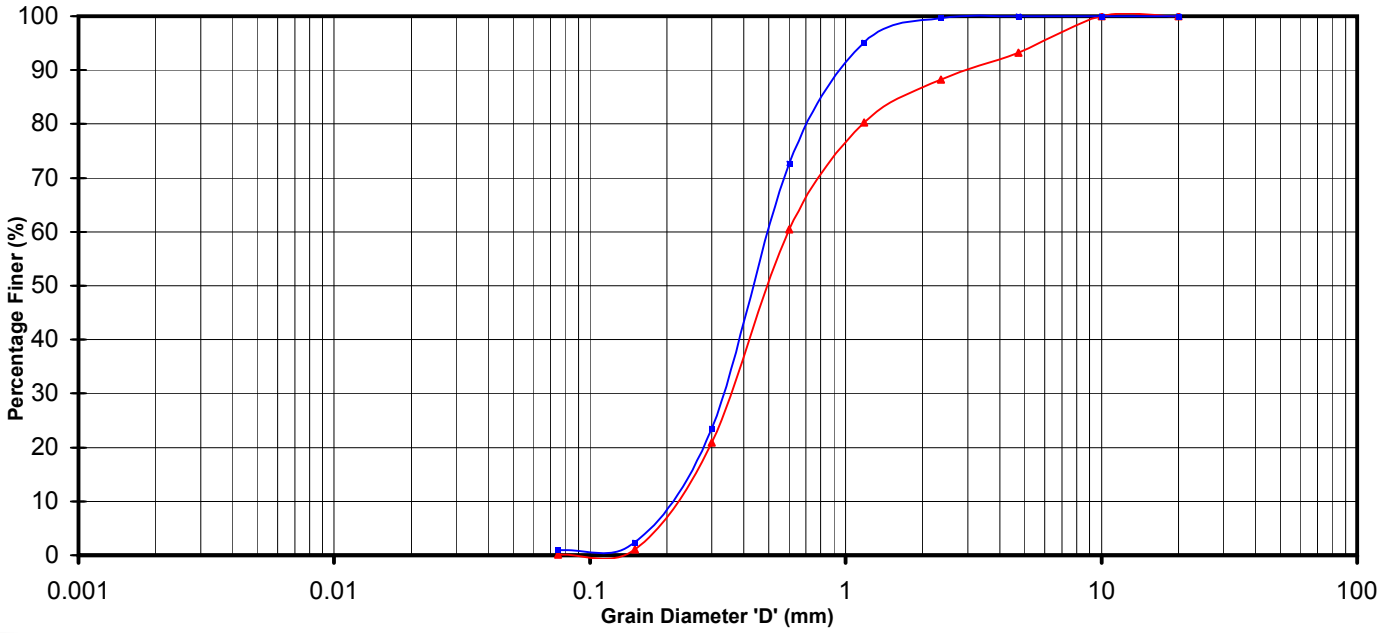
Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

As Per IS:2720

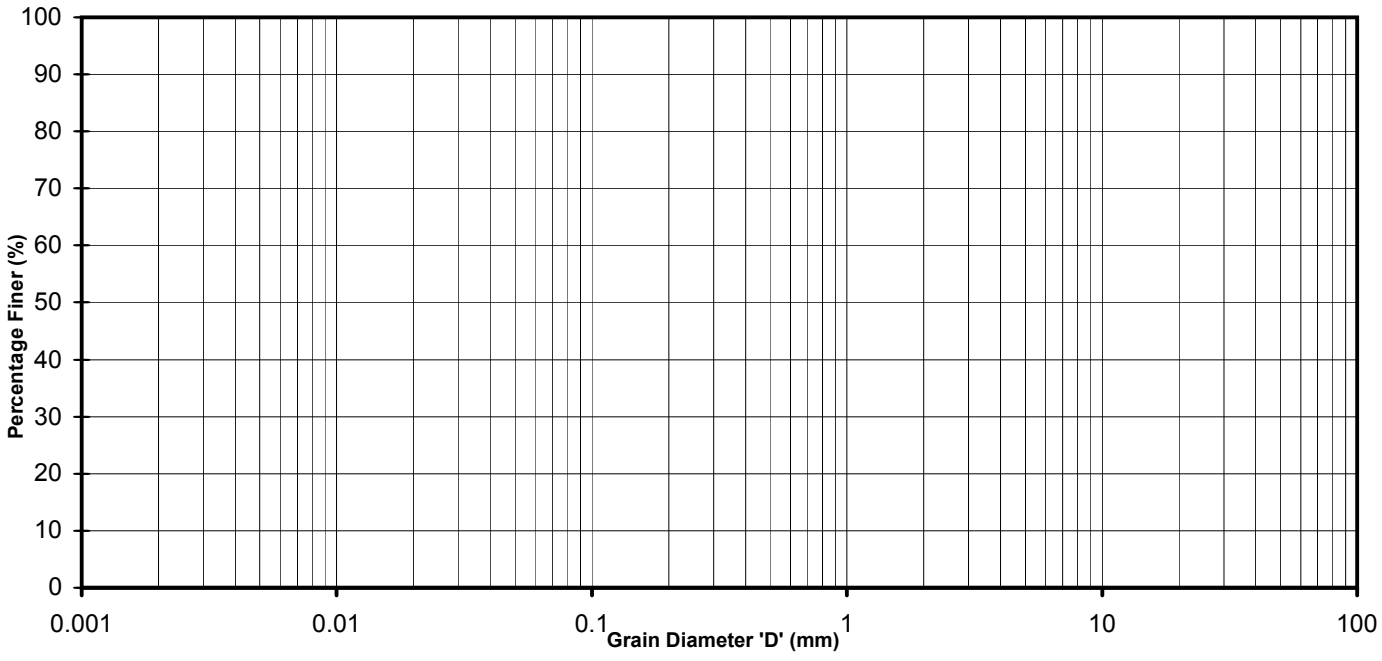
BH NO.:	Depth (m) :	-16.60 - -17.10	-18.10 - -18.55
BH-05			

	CLAY & SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	
-16.60 - -17.10	0	37	49	7	7
-18.10 - -18.55	1	43	54	2	0



BH NO.:	Depth (m) :		

	CLAY & SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



Tested By : P.M. Prepared By : V.N. Checked By : S.D. Approved By : S.T.

PARTICLE SIZE DISTRIBUTION

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

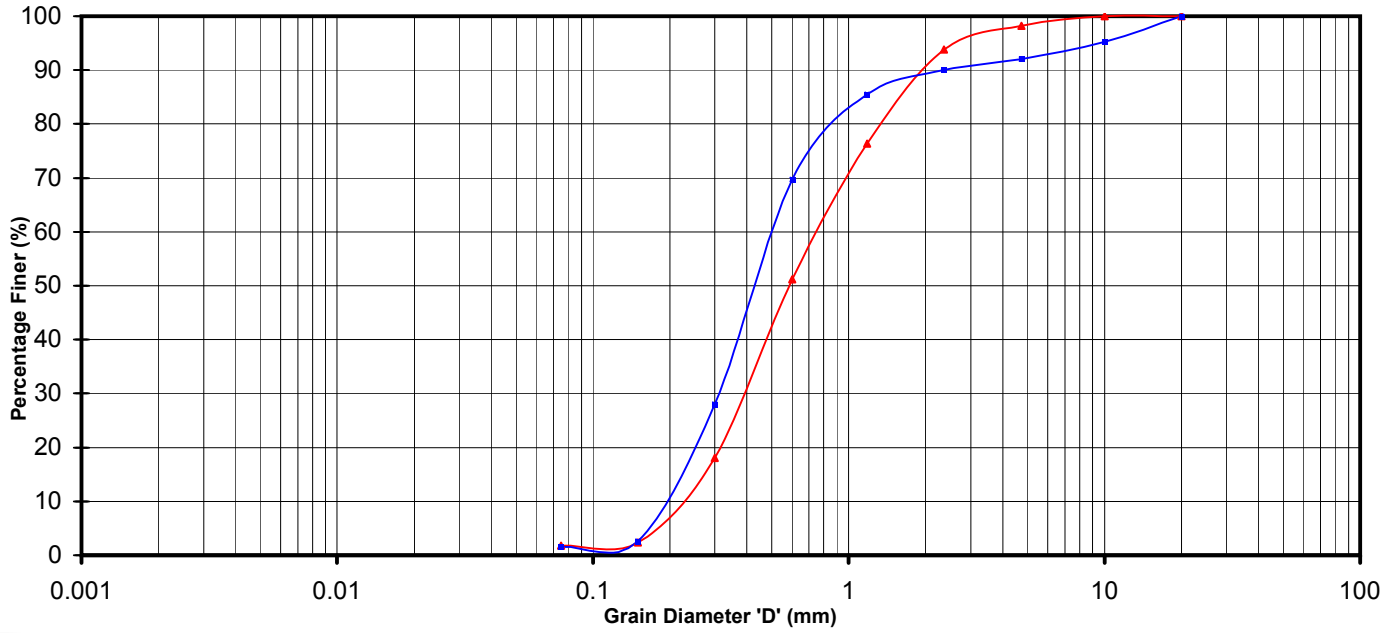
Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

As Per IS:2720

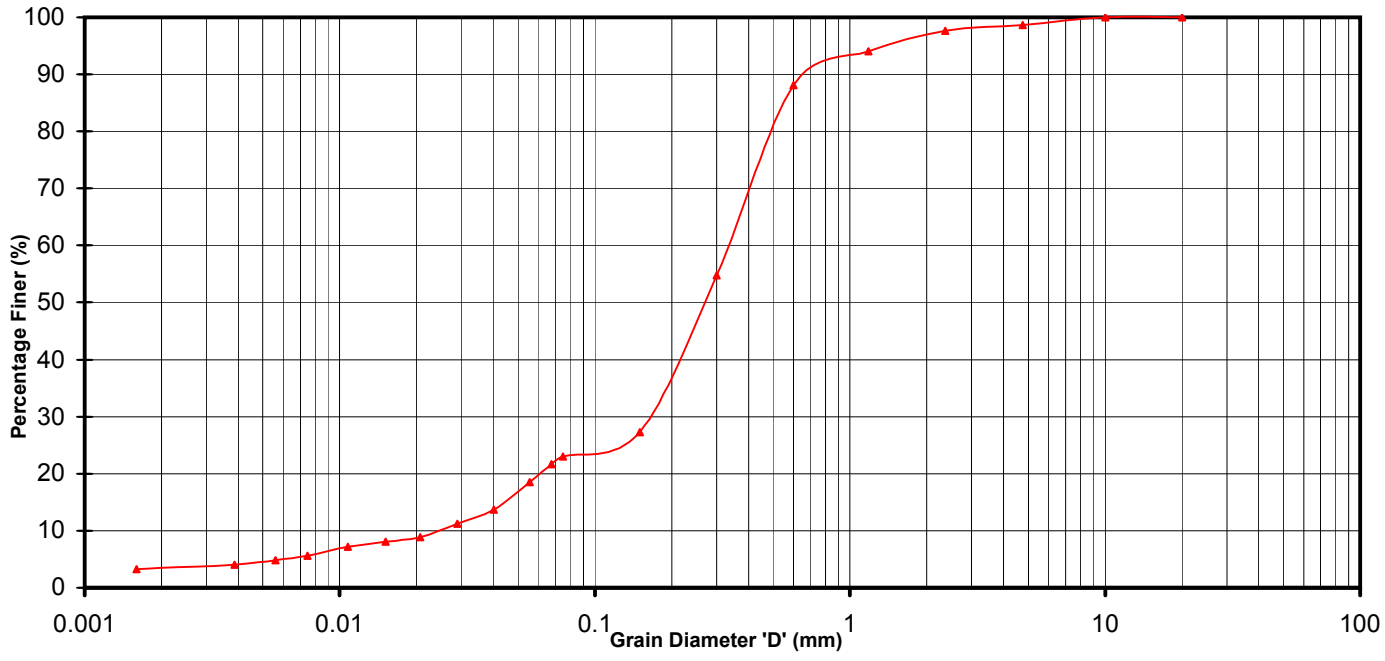
BH NO.: BH-06	Depth (m) :	-15.10 - -15.60	-16.60 - -17.05

	CLAY & SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	
▲	2	30	56	10	2
■	2	43	44	3	8



BH NO.: BH-06	Depth (m) :	-19.60 - -20.05	

	CLAY	SILT	SAND			GRAVEL
			FINE	MEDIUM	COARSE	
▲	3	20	46	28	2	1
■						



Tested By : P.M. Prepared By : V.N. Checked By : S.D. Approved By : S.T.

PARTICLE SIZE DISTRIBUTION

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

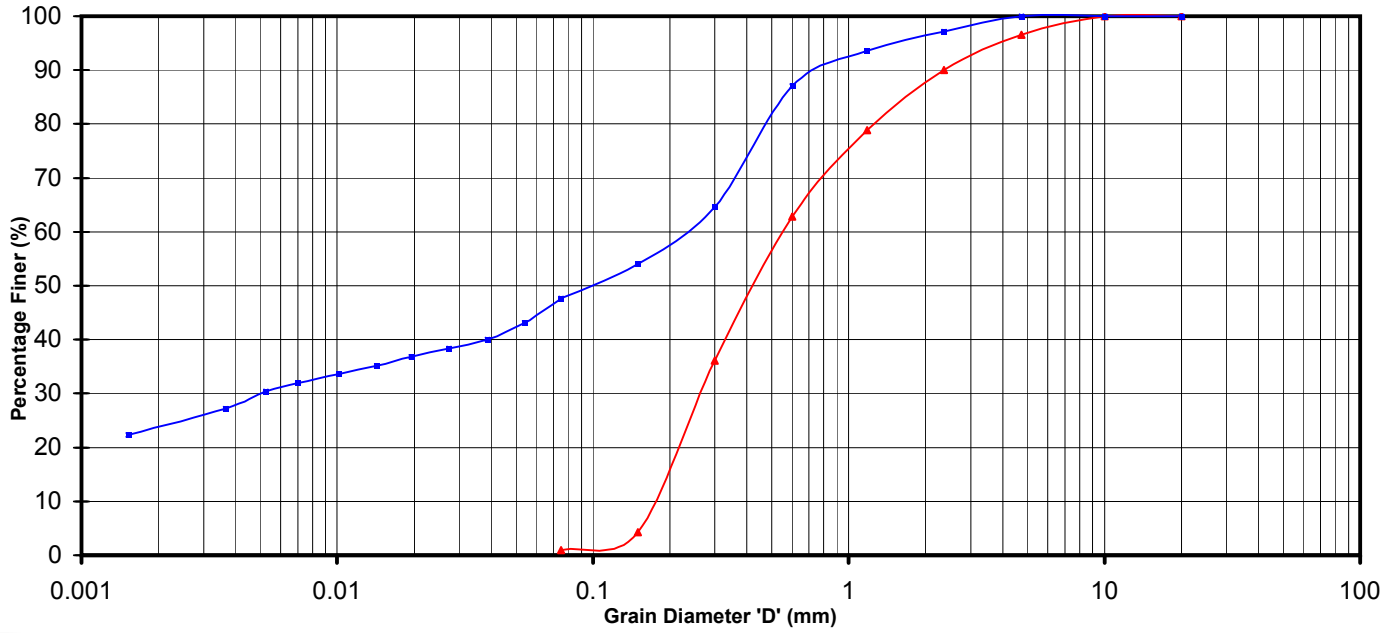
Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

As Per IS:2720

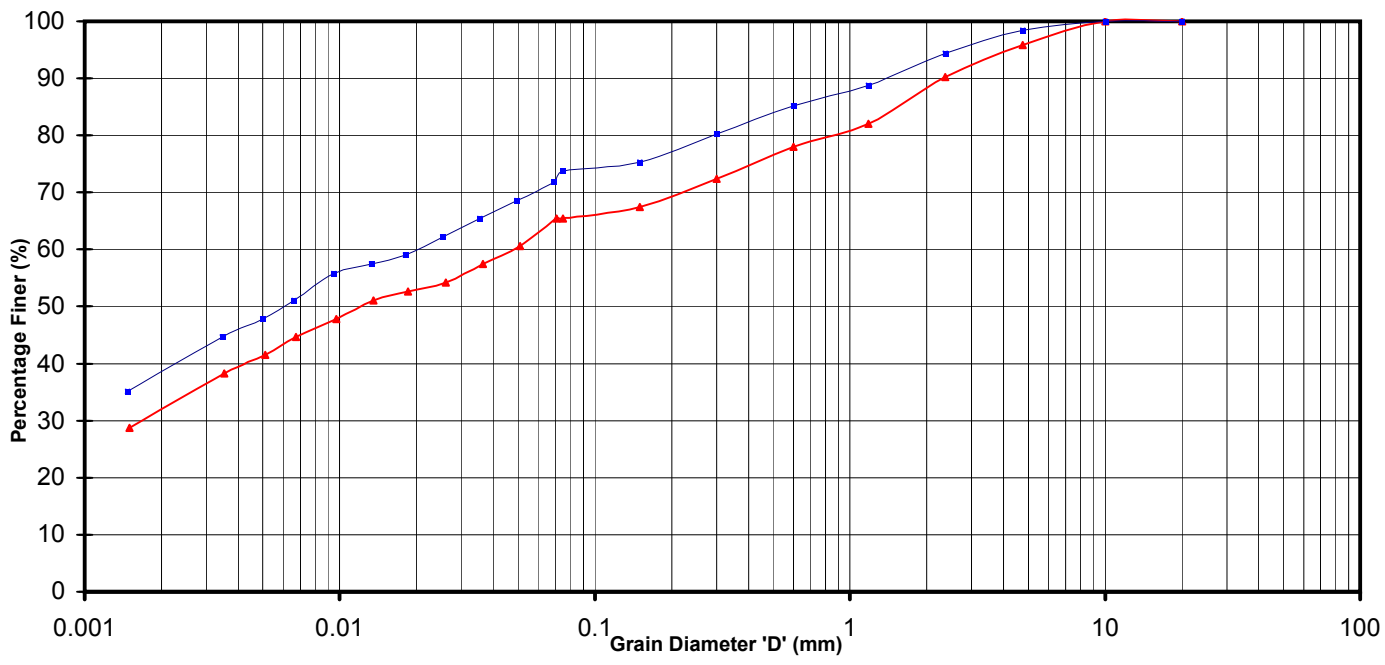
BH NO.: **BH-07** | Depth (m) : **-16.40 - -16.90** | **-17.40 - -17.90**

	CLAY	SILT	SAND FINE	SAND MEDIUM	SAND COARSE	GRAVEL
-16.40 - -16.90	1		46	40	10	3
-17.40 - -17.90	23	25	26	22	4	0



BH NO.: **BH-07** | Depth (m) : **-18.52 - -18.97** | **-19.40 - -19.90**

	CLAY	SILT	SAND FINE	SAND MEDIUM	SAND COARSE	GRAVEL
-18.52 - -18.97	31	34	10	13	8	4
-19.40 - -19.90	38	36	8	11	5	2



Tested By : P.M. | Prepared By : V.N. | Checked By : S.D. | Approved By : S.T.

PARTICLE SIZE DISTRIBUTION

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

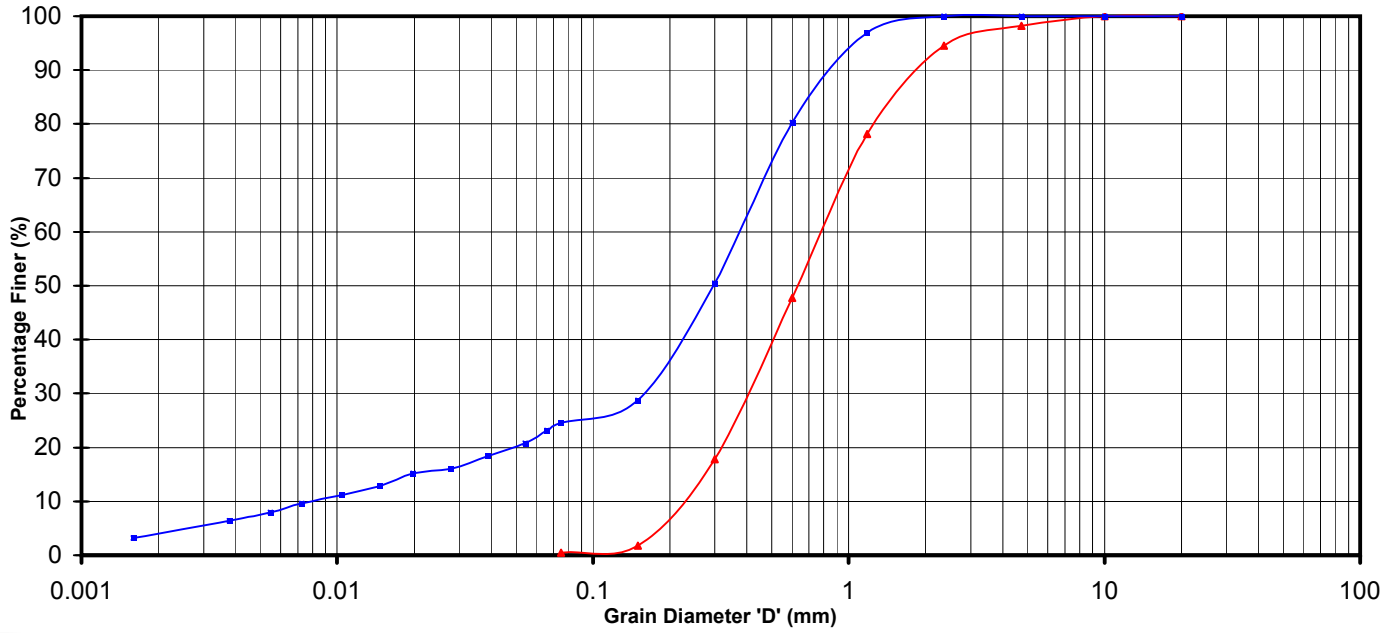
Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

As Per IS:2720

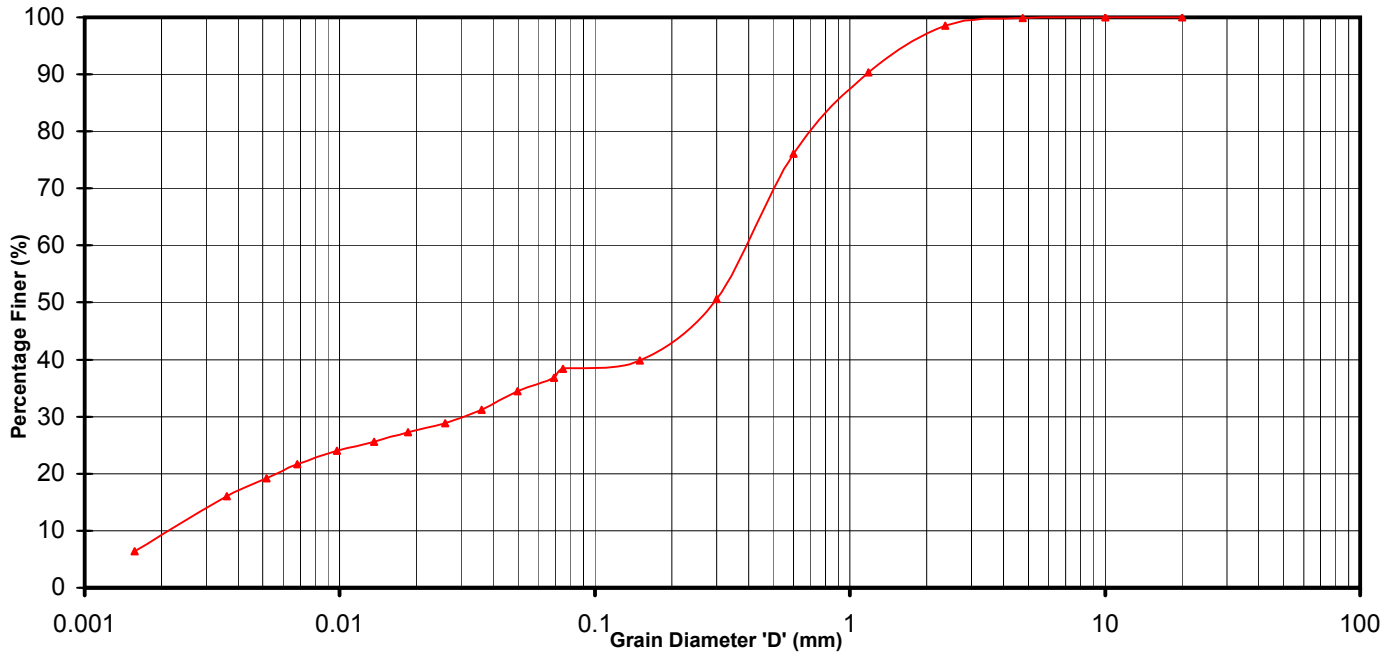
BH NO.: **BH-08** | Depth (m) : **-15.30 - -15.80** | **-16.80 - -17.25**

	CLAY	SILT	SAND FINE	SAND MEDIUM	SAND COARSE	GRAVEL
-15.30 - -15.80	0		30	60	8	2
-16.80 - -17.25	4	21	38	36	1	0



BH NO.: **BH-08** | Depth (m) : **-18.30 - -18.75**

	CLAY	SILT	SAND FINE	SAND MEDIUM	SAND COARSE	GRAVEL
-18.30 - -18.75	8	30	23	35	4	0



Tested By : P.M. | Prepared By : V.N. | Checked By : S.D. | Approved By : S.T.

PARTICLE SIZE DISTRIBUTION

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

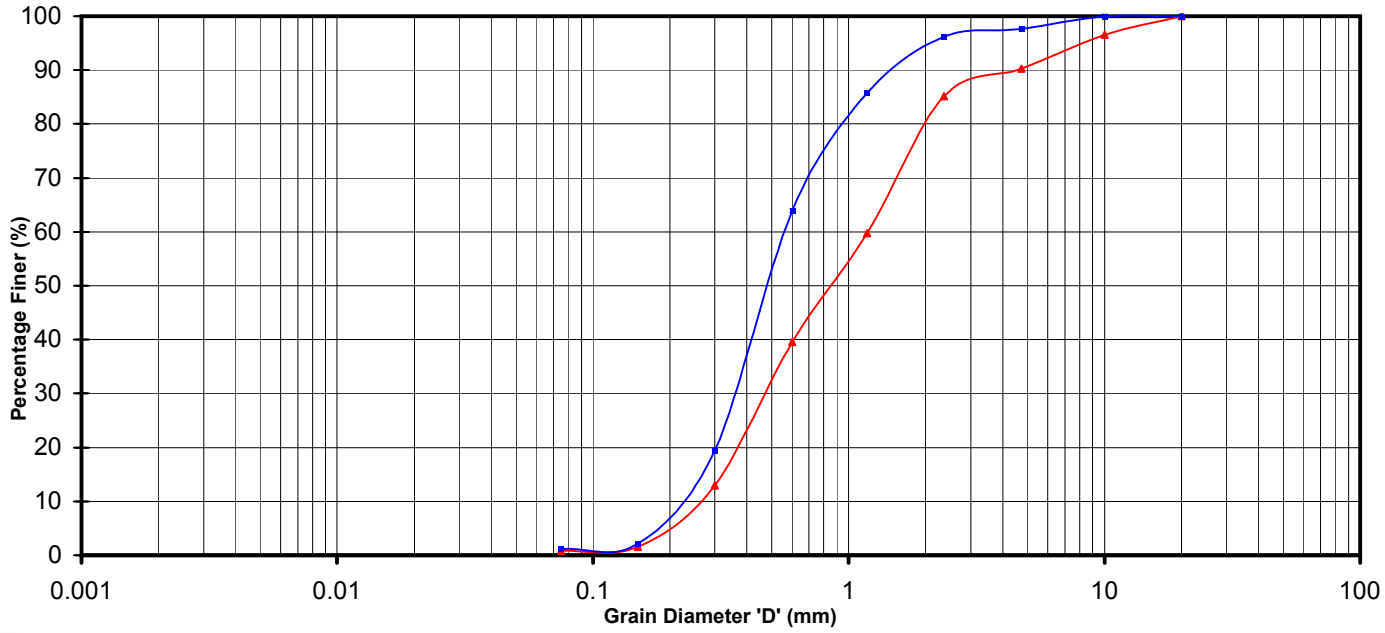
Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

As Per IS:2720

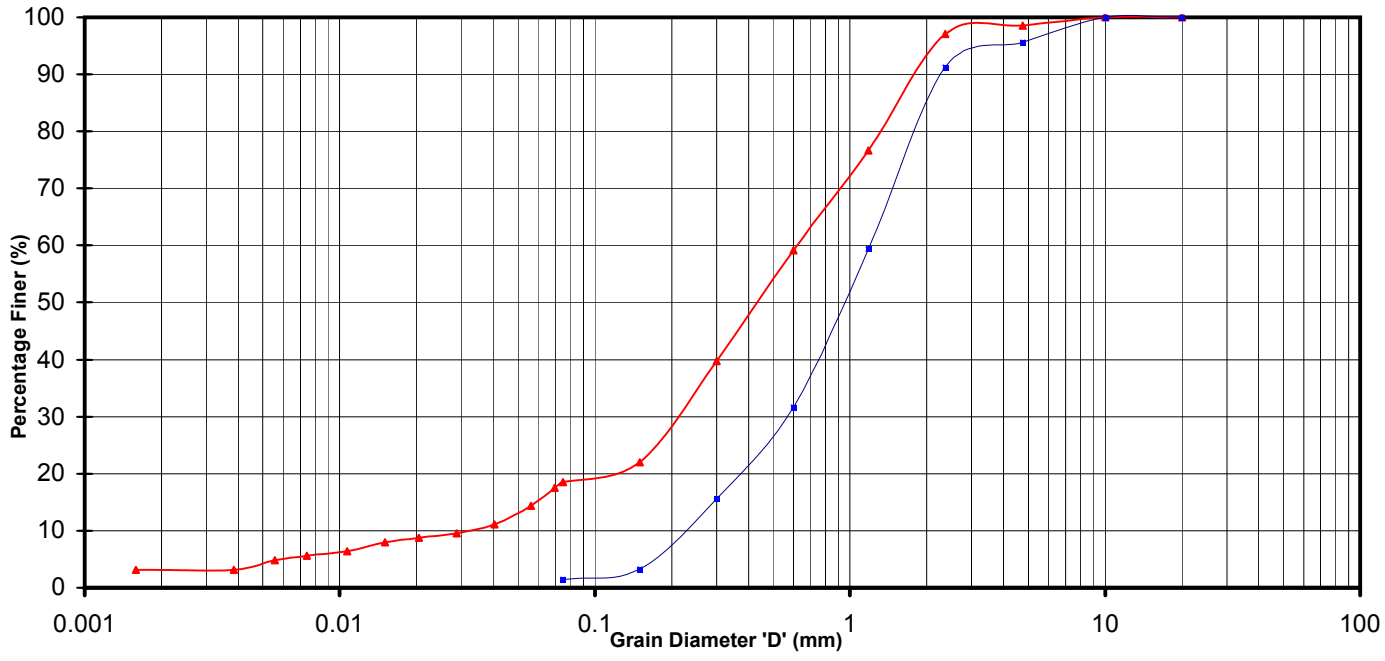
BH NO.: **BH-09** | Depth (m) : ▲ **-15.30 - -15.80** | ■ **-16.80 - -17.25**

	CLAY & SILT	SAND FINE	SAND MEDIUM	SAND COARSE	GRAVEL
▲	1	23	53	13	10
■	1	37	55	5	2



BH NO.: **BH-09** | Depth (m) : ▲ **-18.30 - -18.75** | ■ **-19.30 - -19.80**

	CLAY	SILT	SAND FINE	SAND MEDIUM	SAND COARSE	GRAVEL
▲	3	14	30	43	8	2
■	1		21	59	15	4



Tested By : P.M. | Prepared By : V.N. | Checked By : S.D. | Approved By : S.T.

PARTICLE SIZE DISTRIBUTION

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

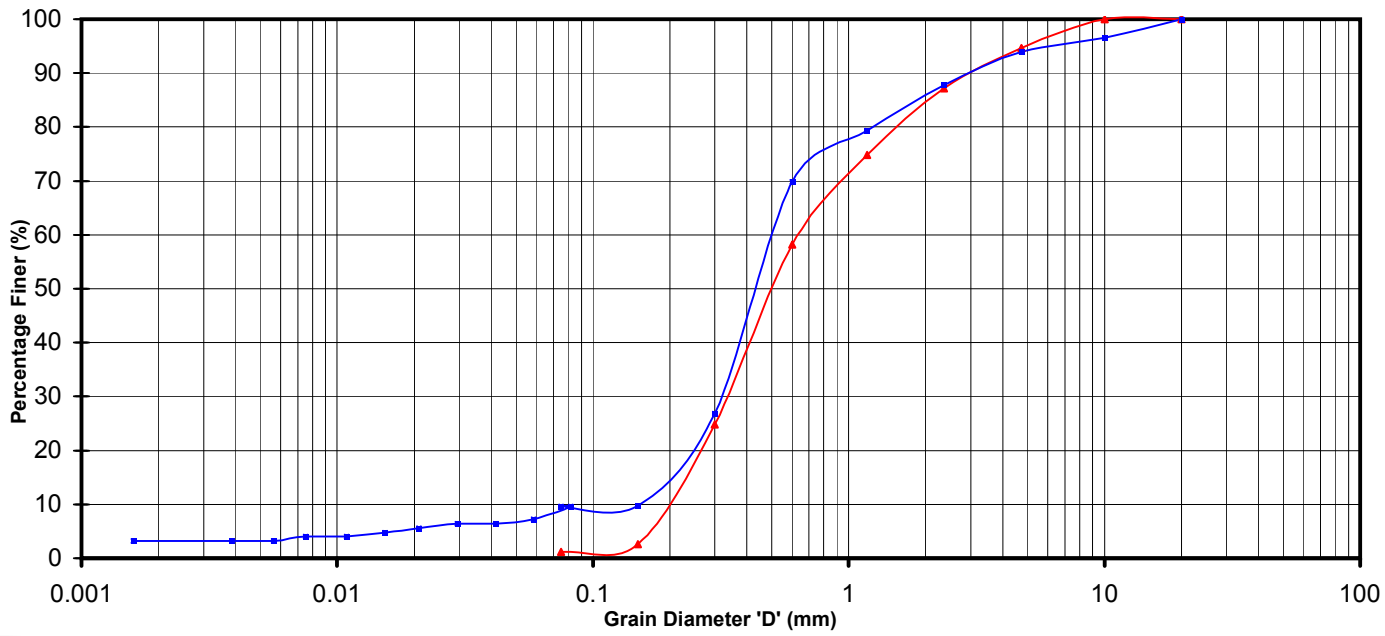
Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

As Per IS:2720

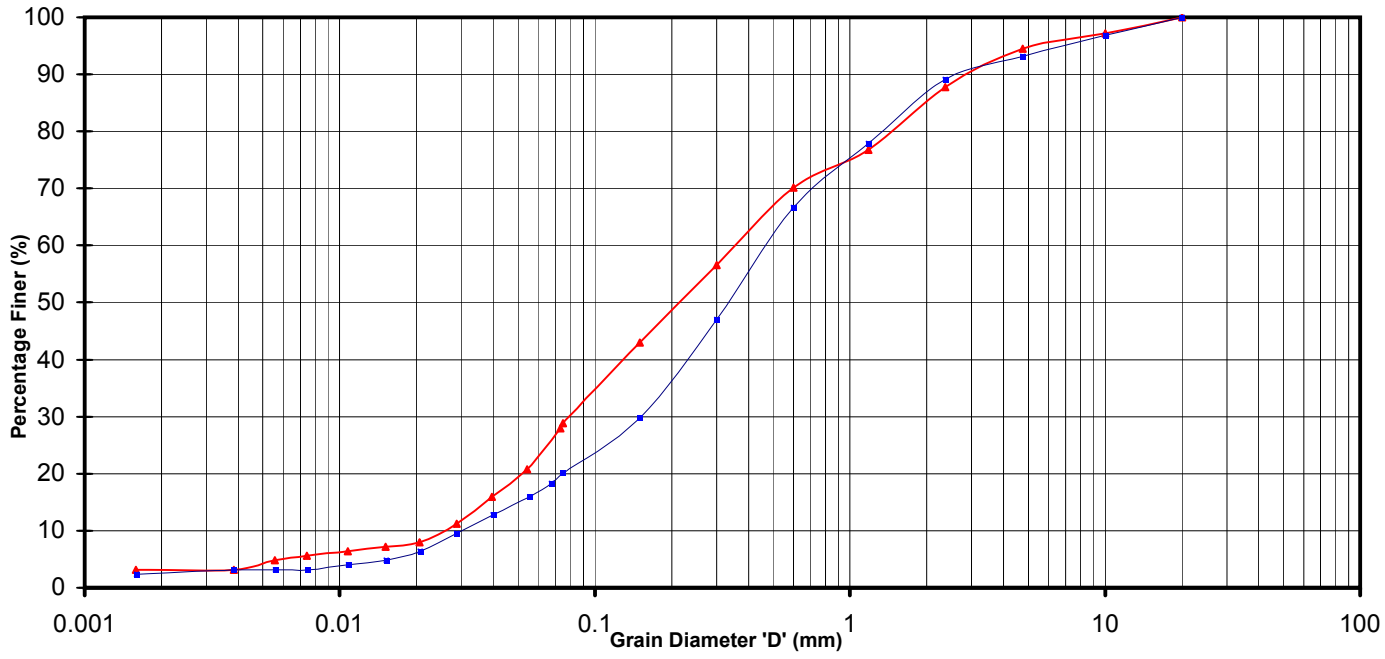
BH NO.: **BH-10** | Depth (m) : **-14.50 - -15.00** | **-16.00 - -16.45**

	CLAY	SILT	SAND FINE	SAND MEDIUM	SAND COARSE	GRAVEL
▲	1		38	44	12	5
■	3	7	35	40	9	6



BH NO.: **BH-10** | Depth (m) : **-19.00 - -19.37** | **-20.00 - -20.45**

	CLAY	SILT	SAND FINE	SAND MEDIUM	SAND COARSE	GRAVEL
▲	3	25	33	22	11	6
■	3	17	35	31	7	7



Tested By : P.M. | Prepared By : V.N. | Checked By : S.D. | Approved By : S.T.

PARTICLE SIZE DISTRIBUTION

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

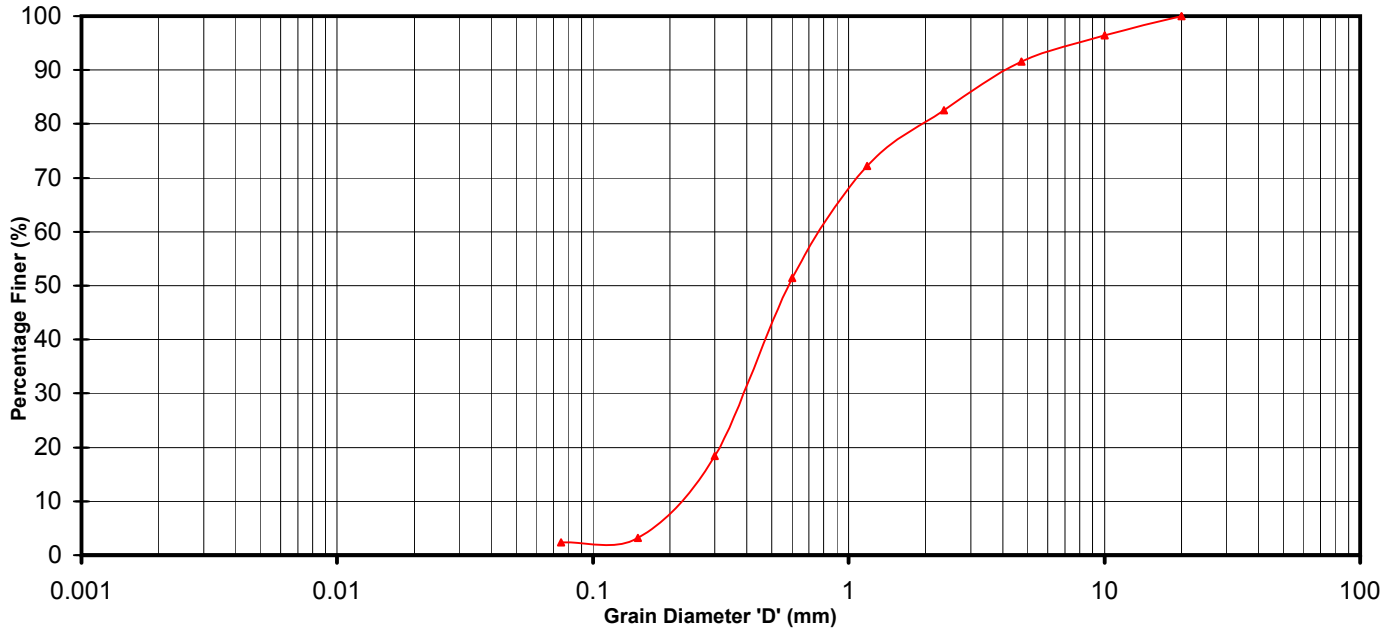
Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

As Per IS:2720

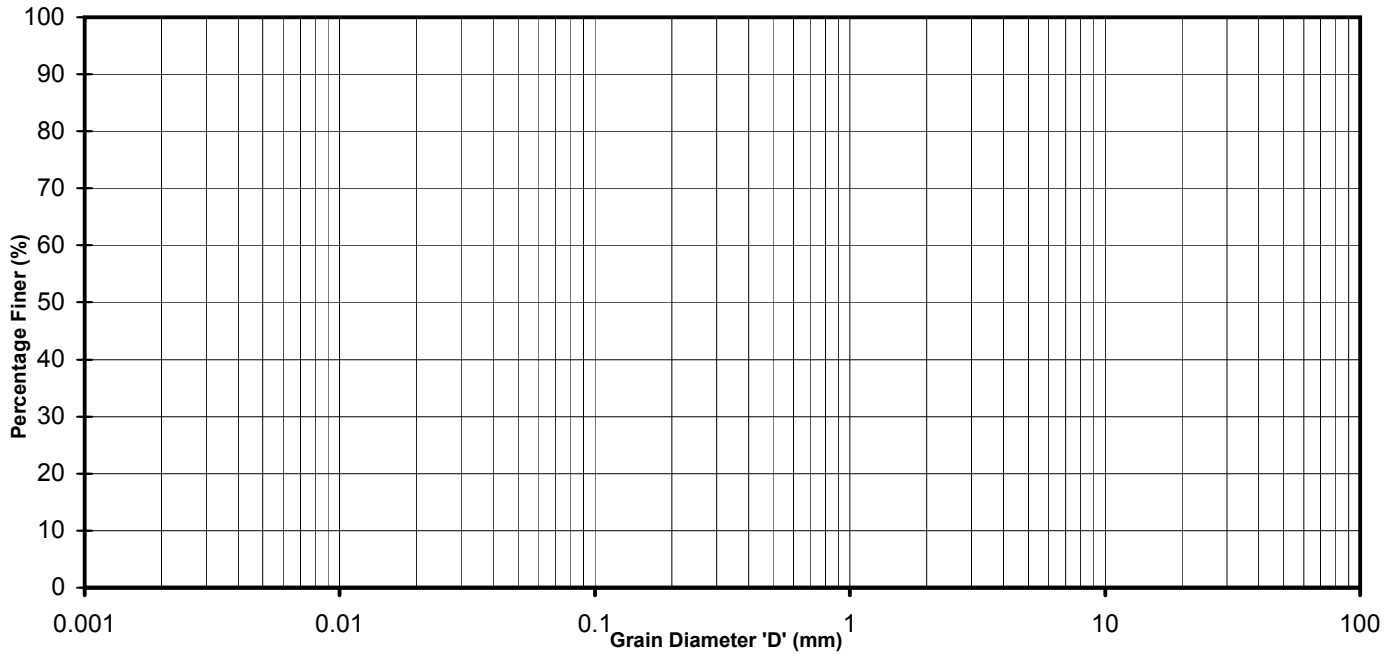
BH NO.:	BH-11	Depth (m) :	-16.20 - -16.70

CLAY & SILT	SAND			GRAVEL
	FINE	MEDIUM	COARSE	
2	30	47	13	8



BH NO.:		Depth (m) :			

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



Tested By : P.M. Prepared By : V.N. Checked By : S.D. Approved By : S.T.

PARTICLE SIZE DISTRIBUTION

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

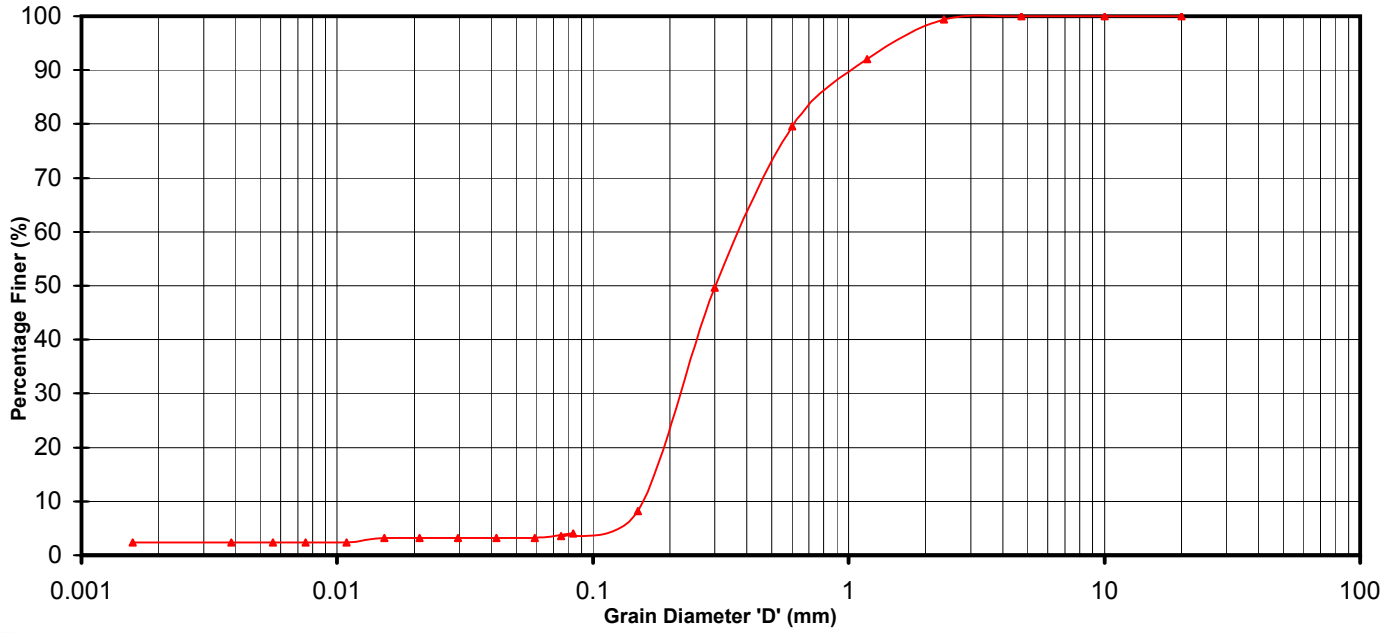
Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

As Per IS:2720

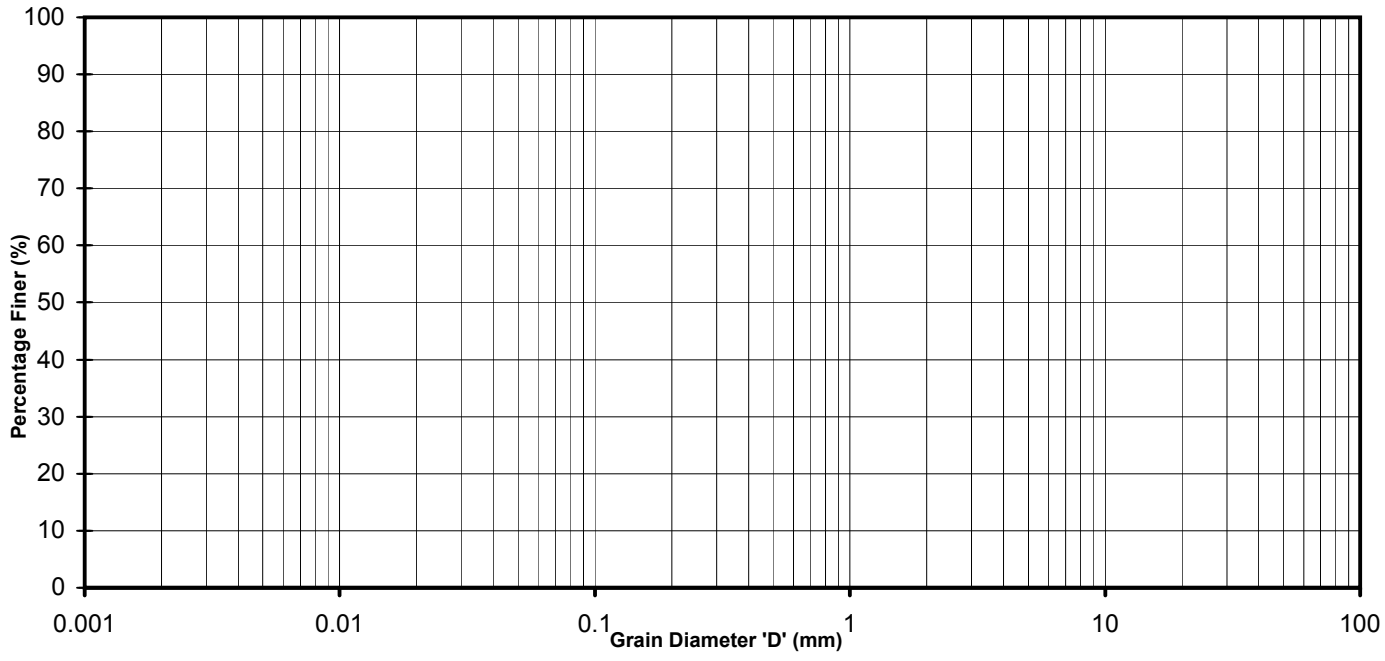
BH NO.: **BH-12** | Depth (m) : **-16.20 - -16.70**

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	
2	2	58	35	3	0



BH NO.: | Depth (m) :

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



Tested By : P.M. | Prepared By : V.N. | Checked By : S.D. | Approved By : S.T.

PARTICLE SIZE DISTRIBUTION

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

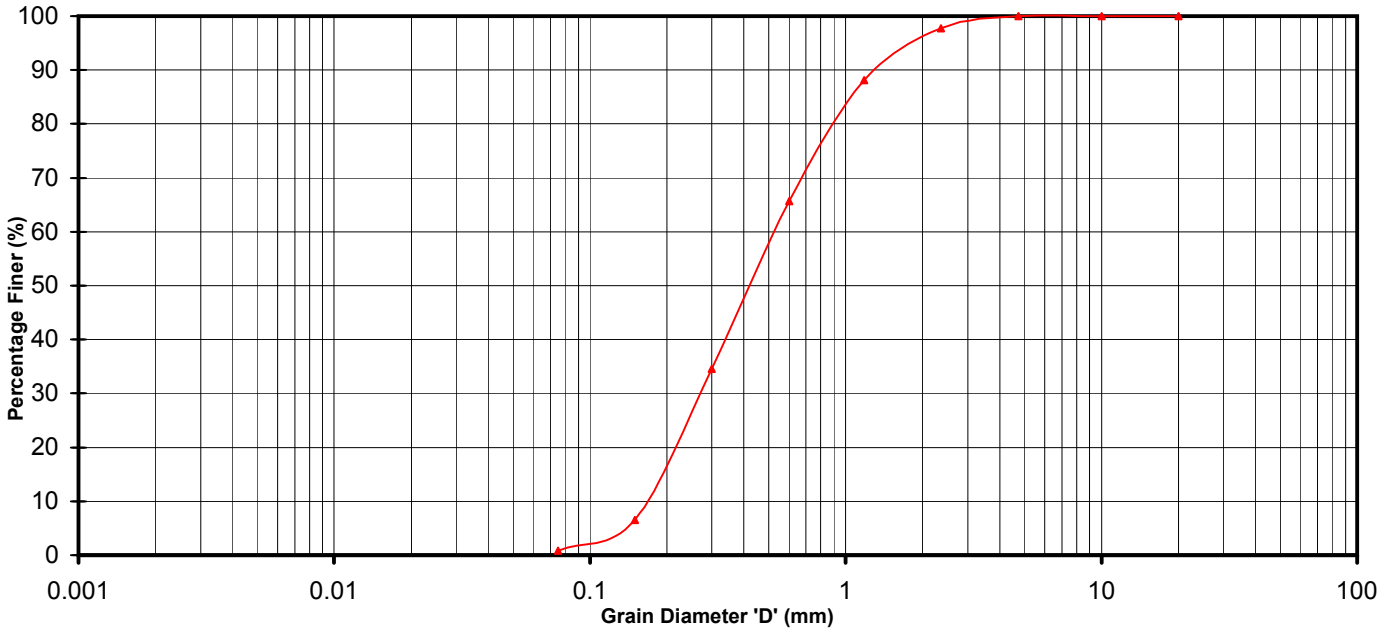
Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

As Per IS:2720

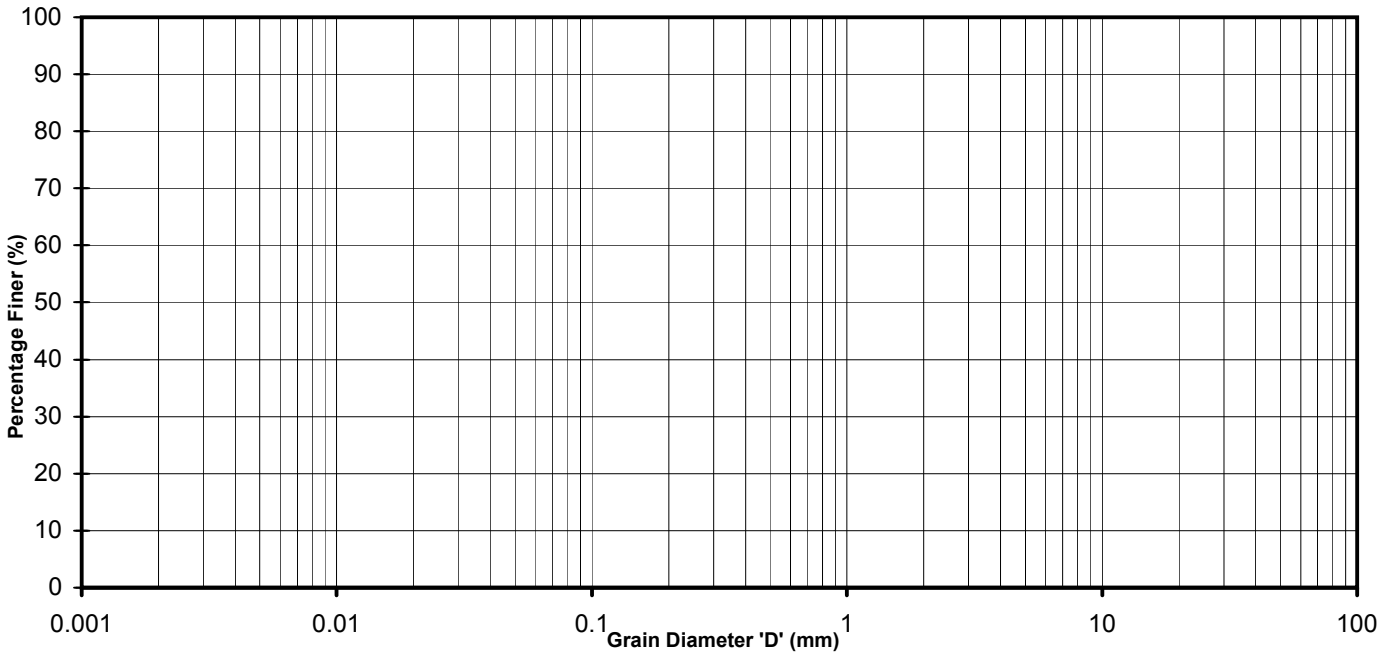
BH NO.:	BH-13	Depth (m) :	-16.10 - -16.60

CLAY & SILT	SAND			GRAVEL
	FINE	MEDIUM	COARSE	
1	47	47	5	0



BH NO.:		Depth (m) :			

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



Tested By : P.M. Prepared By : V.N. Checked By : S.D. Approved By : S.T.

PARTICLE SIZE DISTRIBUTION

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

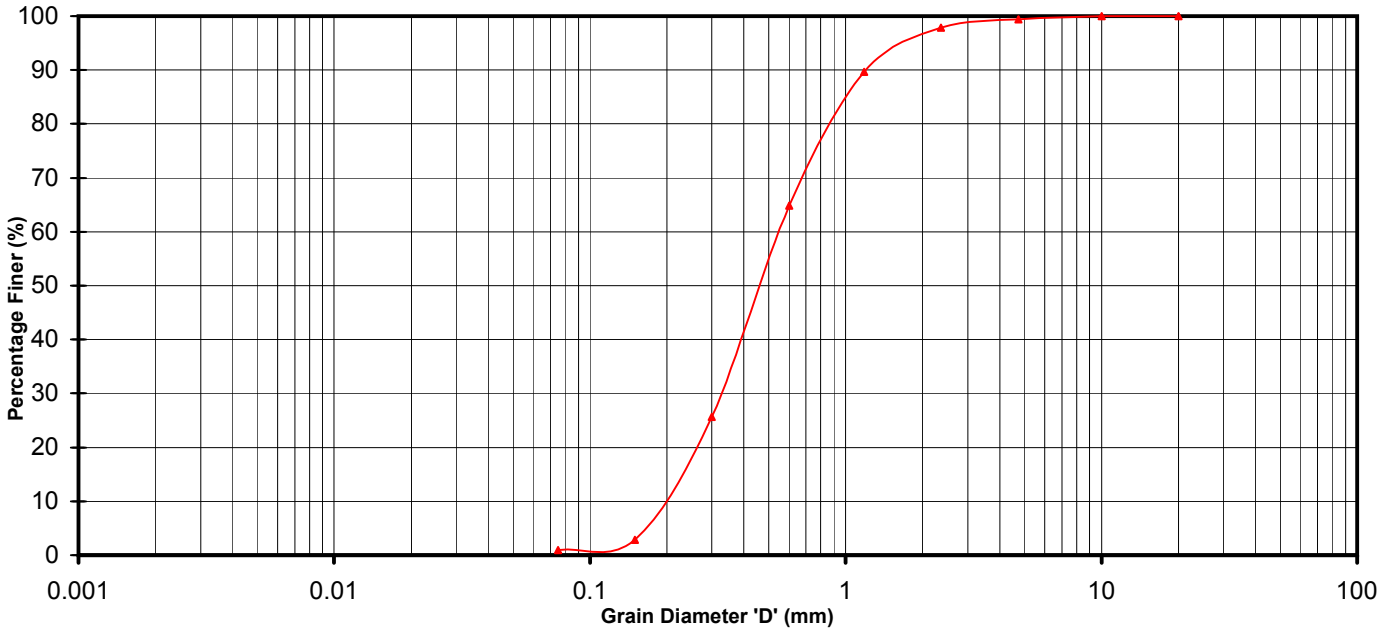
Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

As Per IS:2720

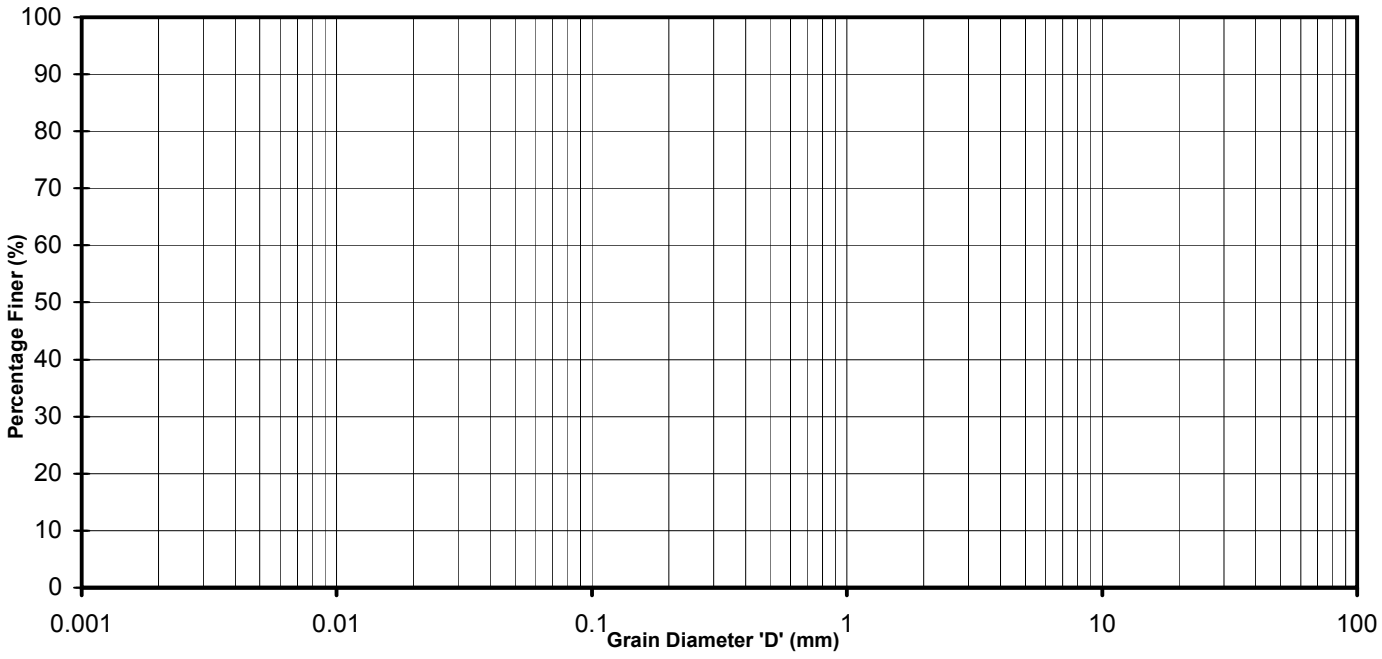
BH NO.:	BH-14	Depth (m) :	-16.00 - -16.50

CLAY & SILT	SAND			GRAVEL
	FINE	MEDIUM	COARSE	
1	41	53	4	1



BH NO.:		Depth (m) :			

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



Tested By : P.M. Prepared By : V.N. Checked By : S.D. Approved By : S.T.

PARTICLE SIZE DISTRIBUTION

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

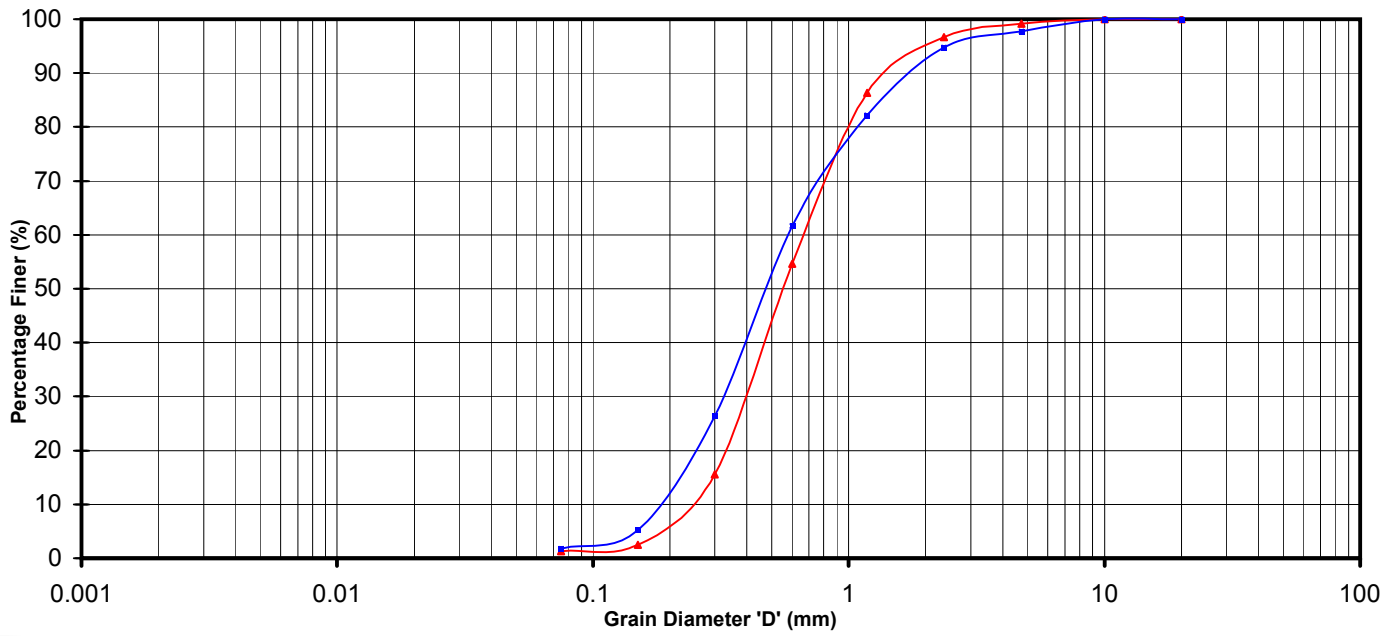
Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

As Per IS:2720

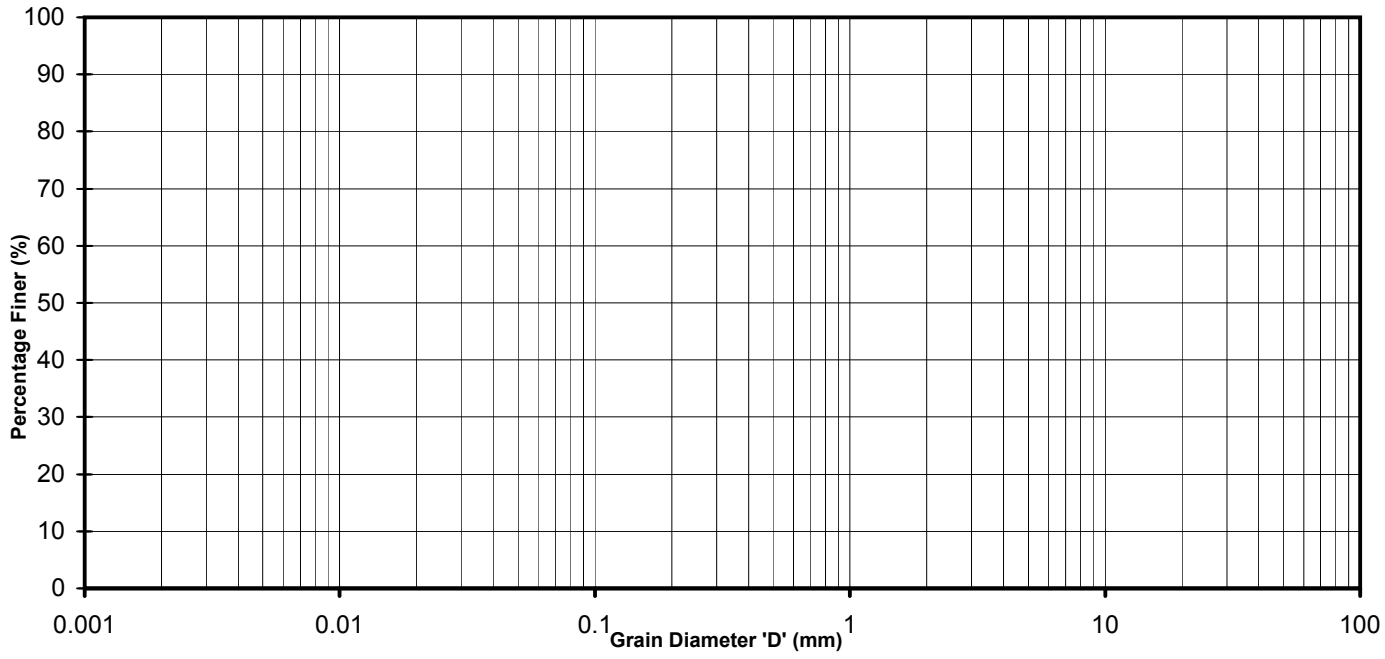
BH NO.:	Depth (m) :	-15.60 - -16.50	-16.10 - -16.60
BH-15			

	CLAY & SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	
1	1	31	62	5	1
2	2	39	50	7	2



BH NO.:	Depth (m) :		

	CLAY & SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



Tested By : P.M. Prepared By : V.N. Checked By : S.D. Approved By : S.T.

PARTICLE SIZE DISTRIBUTION

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

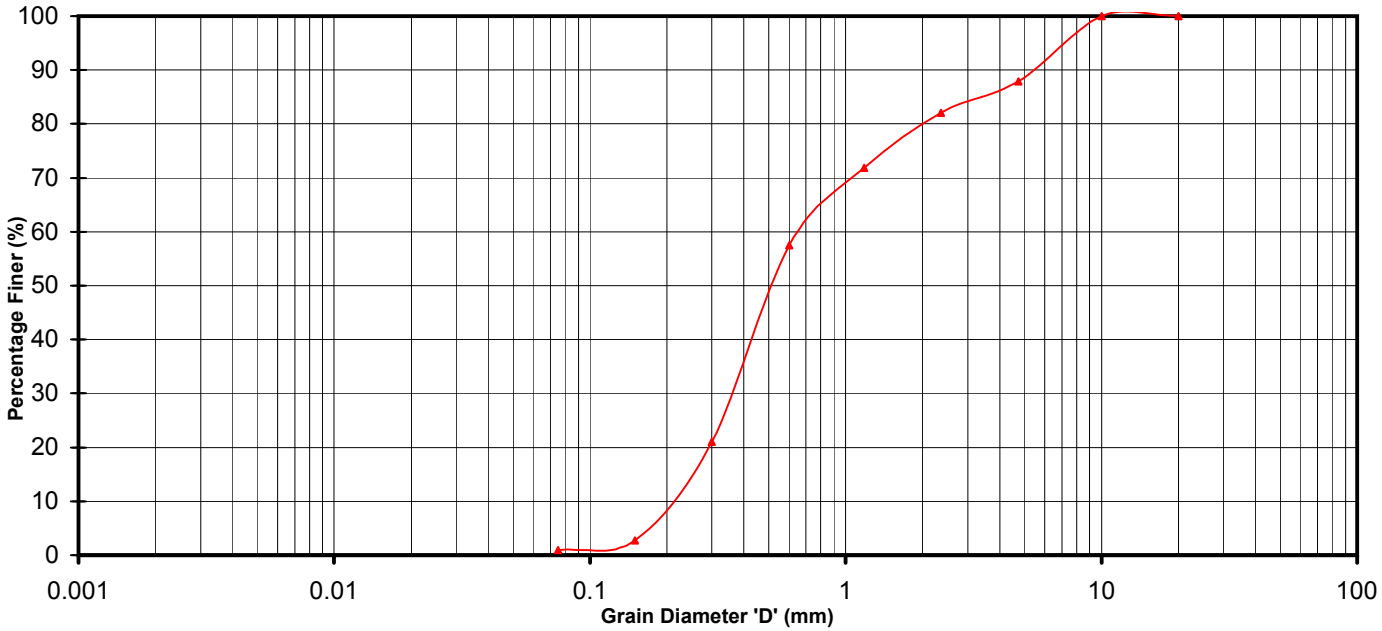
Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

As Per IS:2720

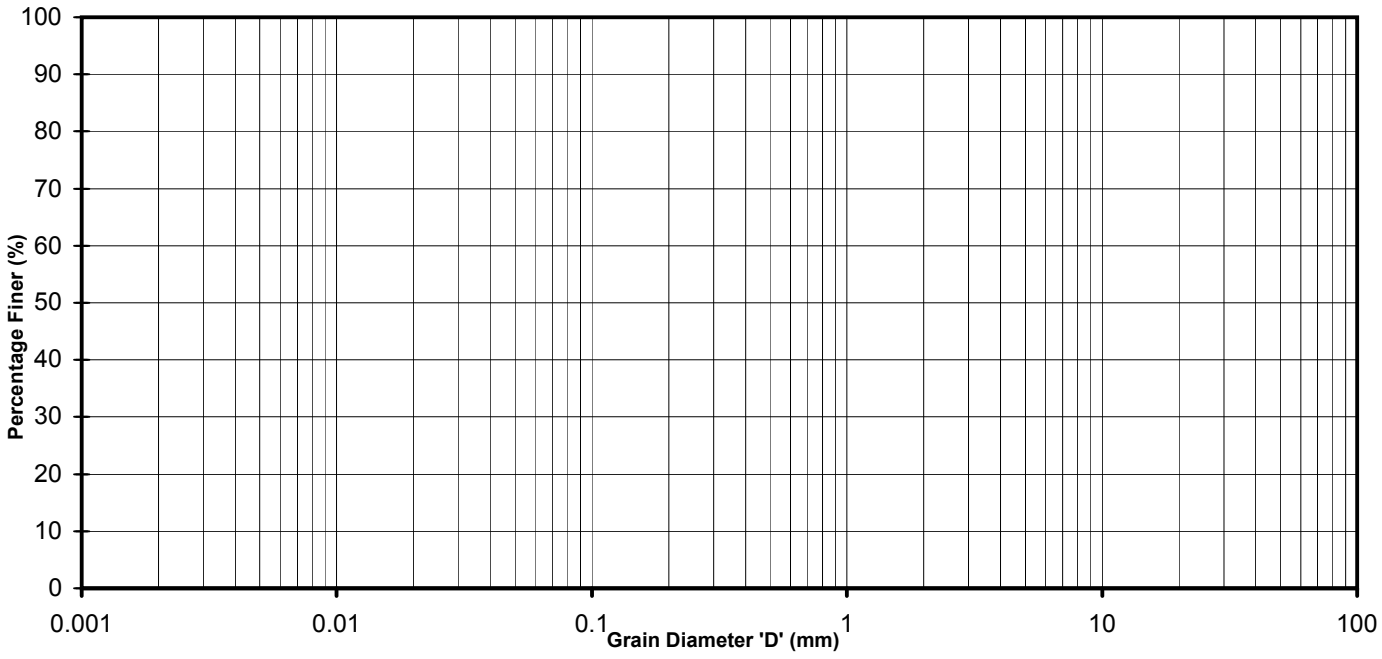
BH NO.:	BH-17	Depth (m) :	-15.30 - -15.80

CLAY & SILT	SAND			GRAVEL
	FINE	MEDIUM	COARSE	
1	35	43	9	12



BH NO.:		Depth (m) :			

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



Tested By : P.M. Prepared By : V.N. Checked By : S.D. Approved By : S.T.

PARTICLE SIZE DISTRIBUTION

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

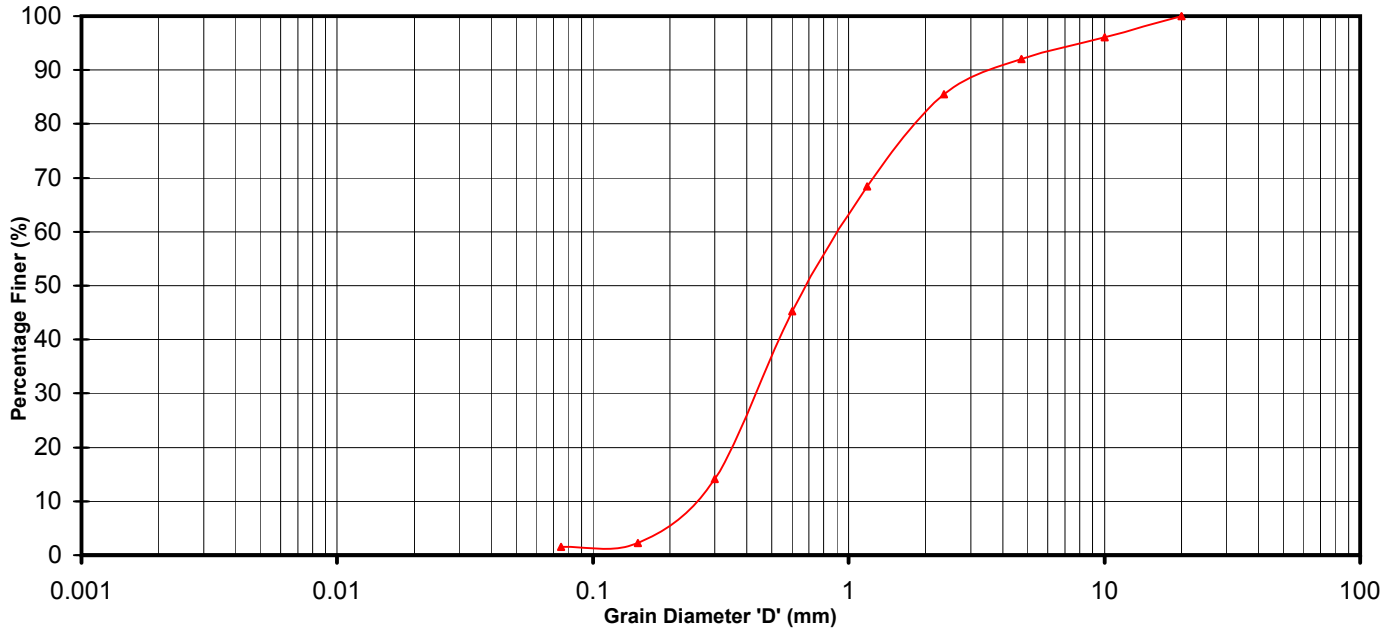
Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

As Per IS:2720

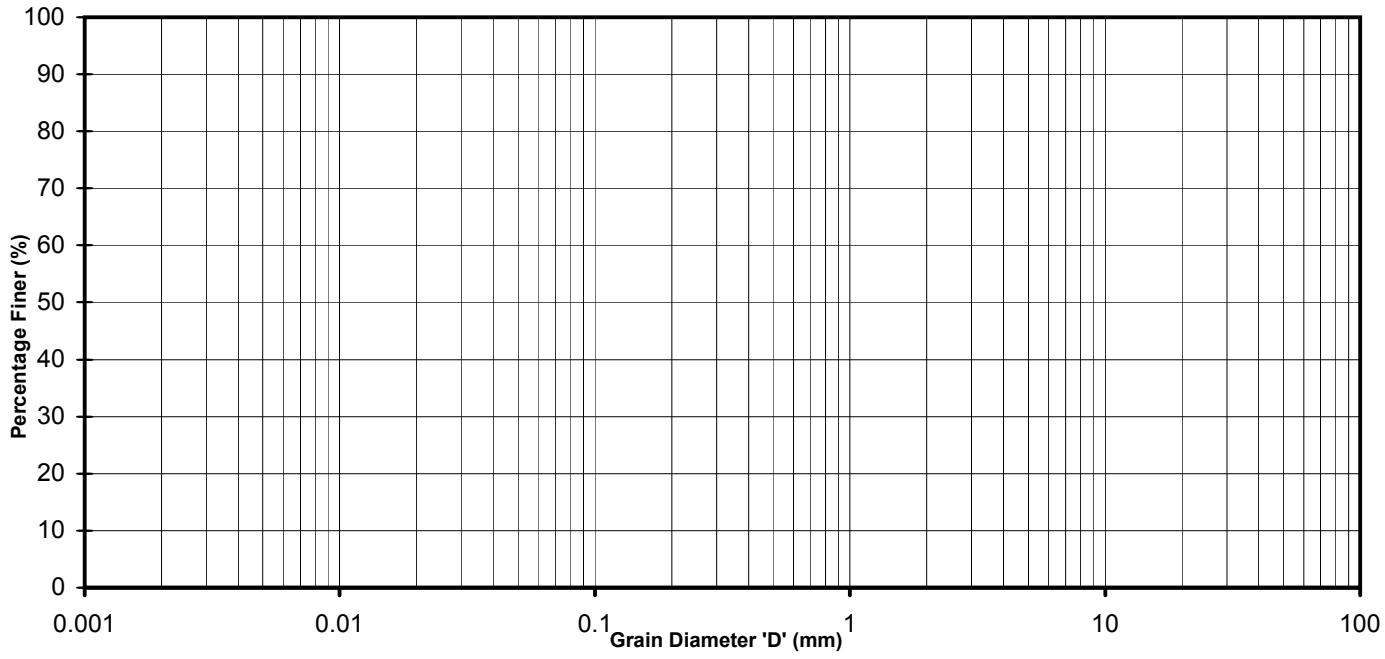
BH NO.:	BH-18	Depth (m) :	-15.00 - -15.50

CLAY & SILT	SAND			GRAVEL
	FINE	MEDIUM	COARSE	
1	26	53	12	8



BH NO.:		Depth (m) :			

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



Tested By : P.M. Prepared By : V.N. Checked By : S.D. Approved By : S.T.

PARTICLE SIZE DISTRIBUTION

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

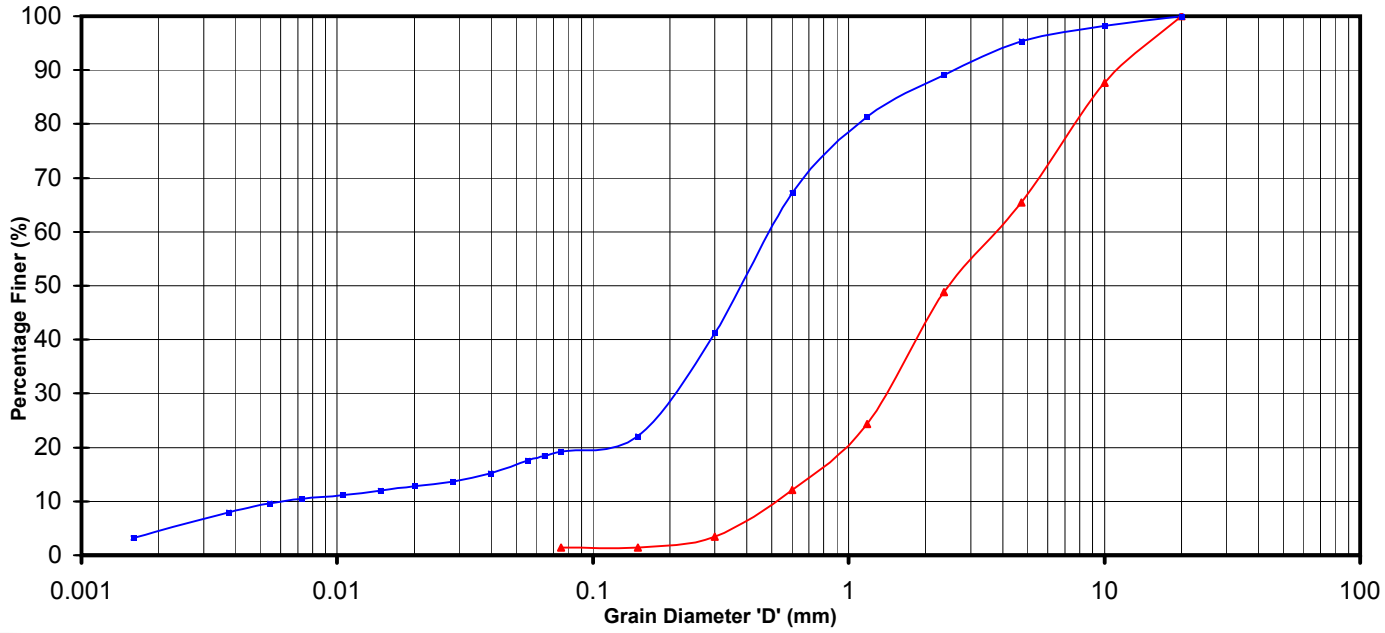
Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

As Per IS:2720

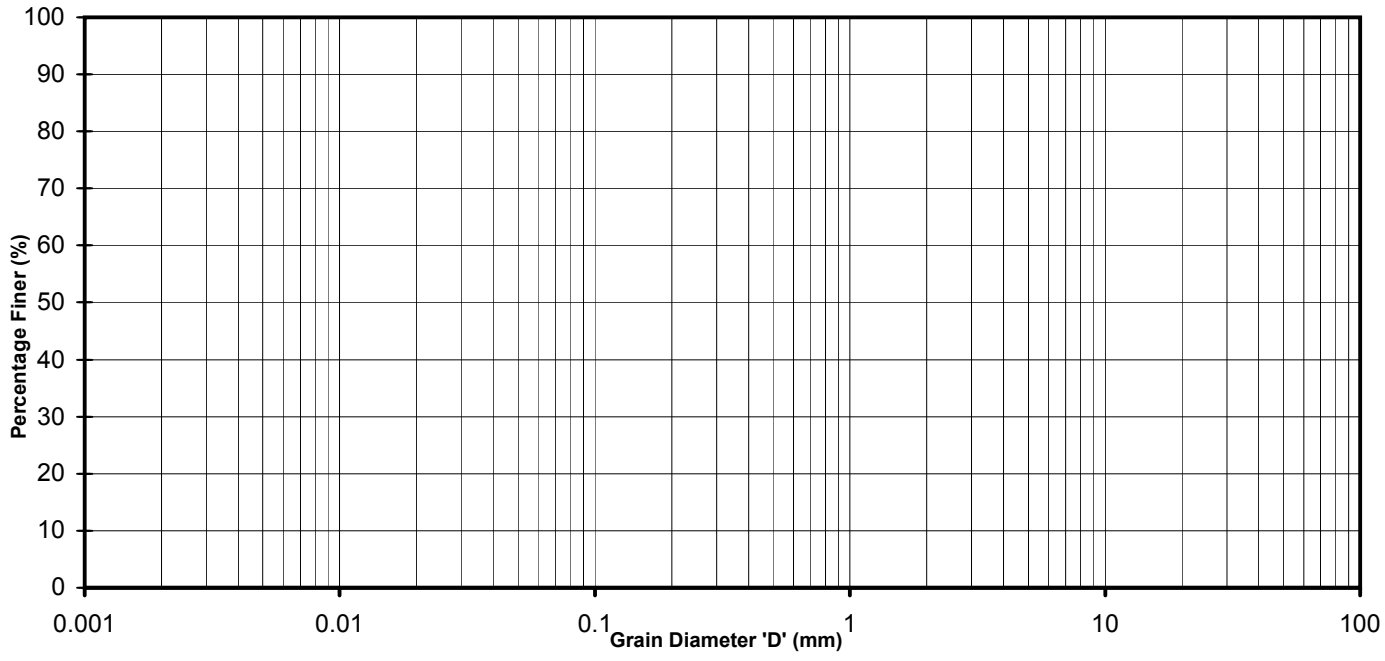
BH NO.:	Depth (m) :	-15.80 - -16.20	-17.40 - -17.85
BH-19			

	CLAY	SILT	SAND FINE	SAND MEDIUM	SAND COARSE	GRAVEL
-15.80 - -16.20	1		6	34	24	35
-17.40 - -17.85	4	15	33	35	8	5



BH NO.:	Depth (m) :		

	CLAY	SILT	SAND FINE	SAND MEDIUM	SAND COARSE	GRAVEL



Tested By : P.M. Prepared By : V.N. Checked By : S.D. Approved By : S.T.

PARTICLE SIZE DISTRIBUTION

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

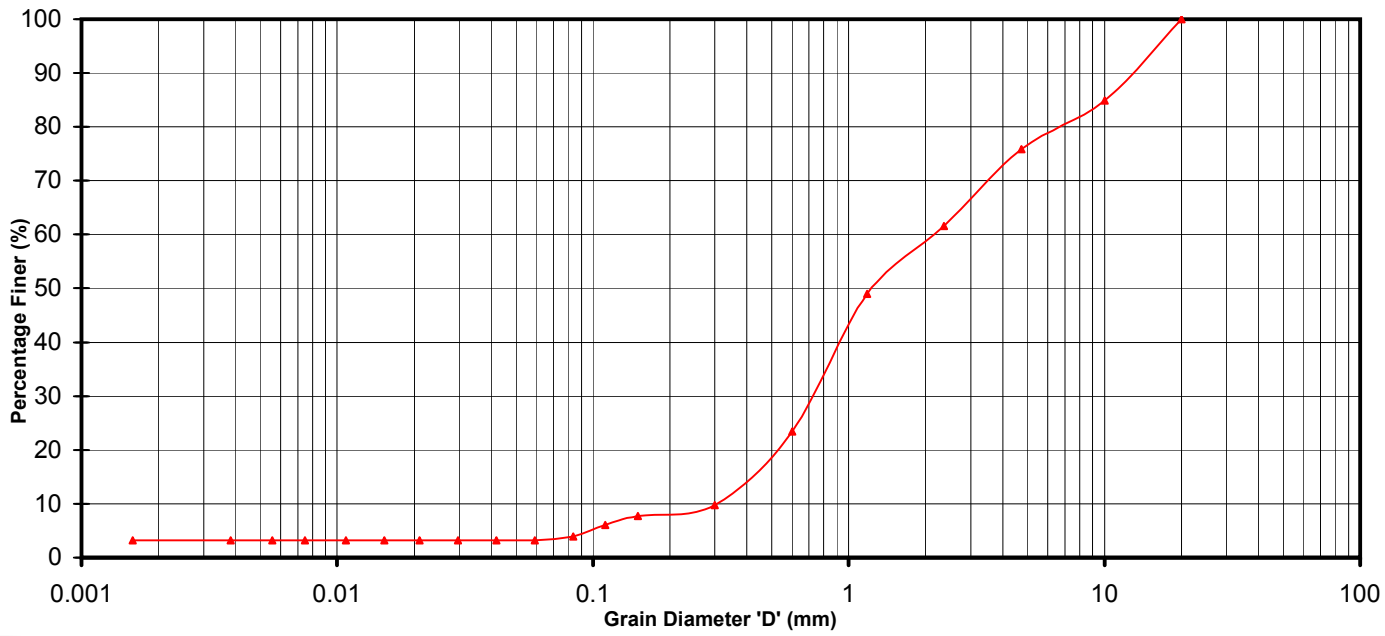
Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

As Per IS:2720

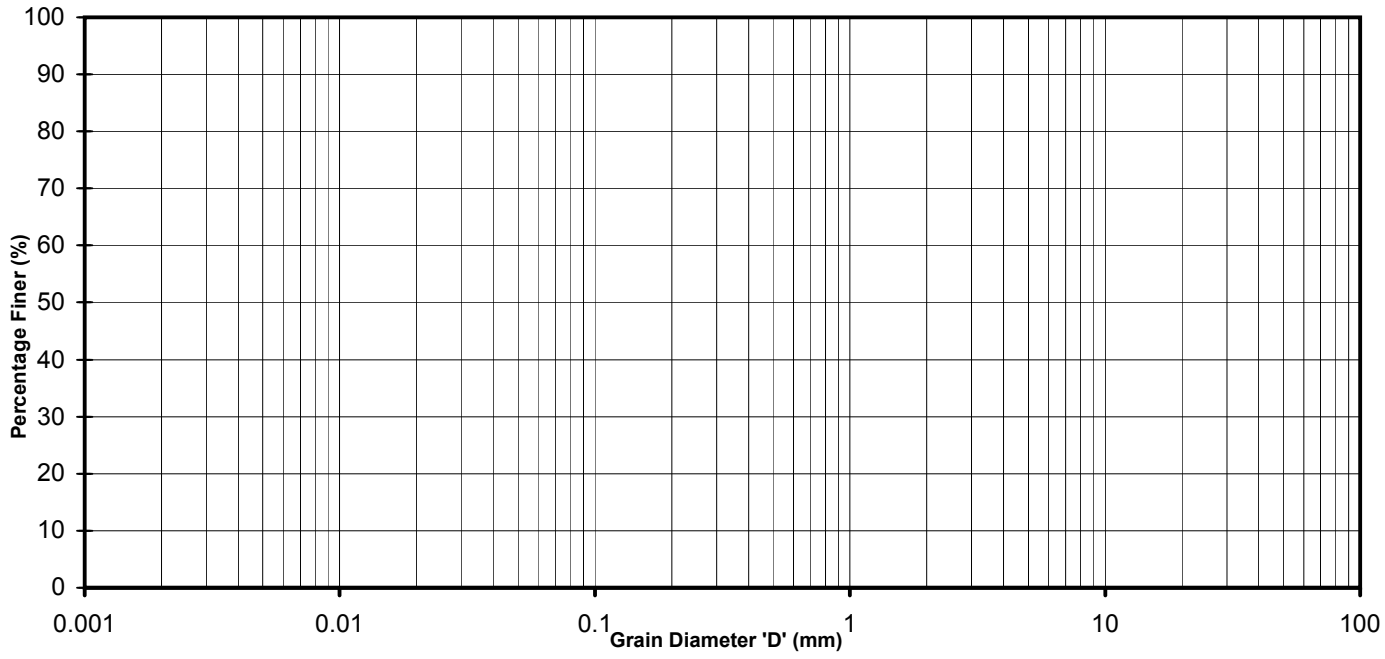
BH NO.: **BH-20** | Depth (m) : **-14.70 - -15.20**

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	
3	3	9	43	18	24



BH NO.: | Depth (m) :

CLAY	SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	



Tested By : P.M. | Prepared By : V.N. | Checked By : S.D. | Approved By : S.T.

PARTICLE SIZE DISTRIBUTION

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

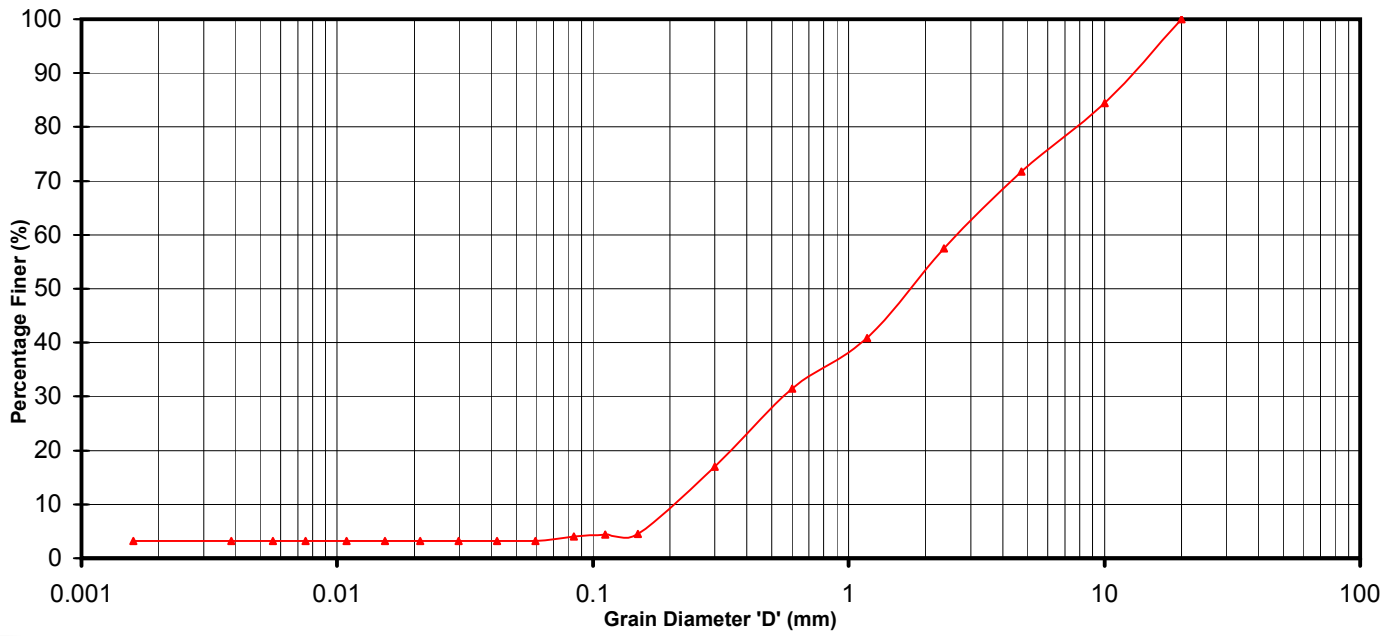
Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

As Per IS:2720

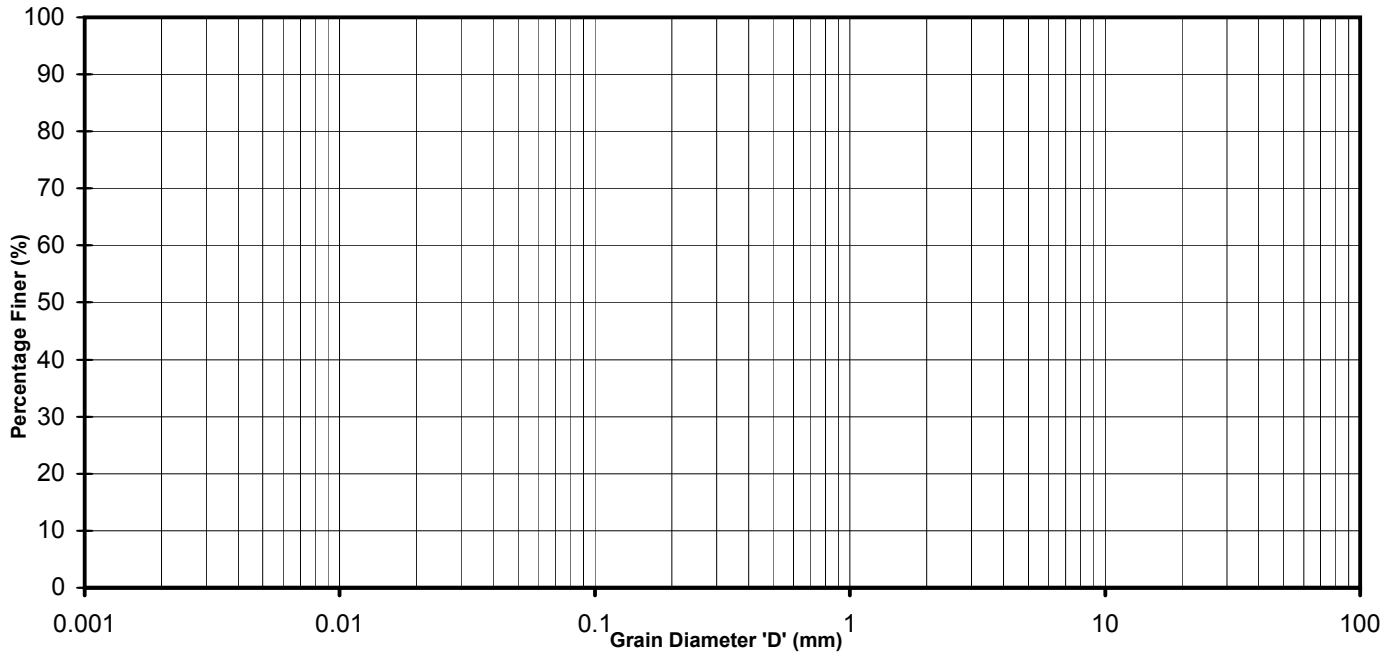
BH NO.: **BH-21** | Depth (m) : **-15.00 - - 15.50**

	CLAY	SILT	SAND			GRAVEL
			FINE	MEDIUM	COARSE	
	3	1	19	29	20	28



BH NO.: | Depth (m) :

	CLAY	SILT	SAND			GRAVEL
			FINE	MEDIUM	COARSE	



Tested By : P.M. | Prepared By : V.N. | Checked By : S.D. | Approved By : S.T.

PARTICLE SIZE DISTRIBUTION

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

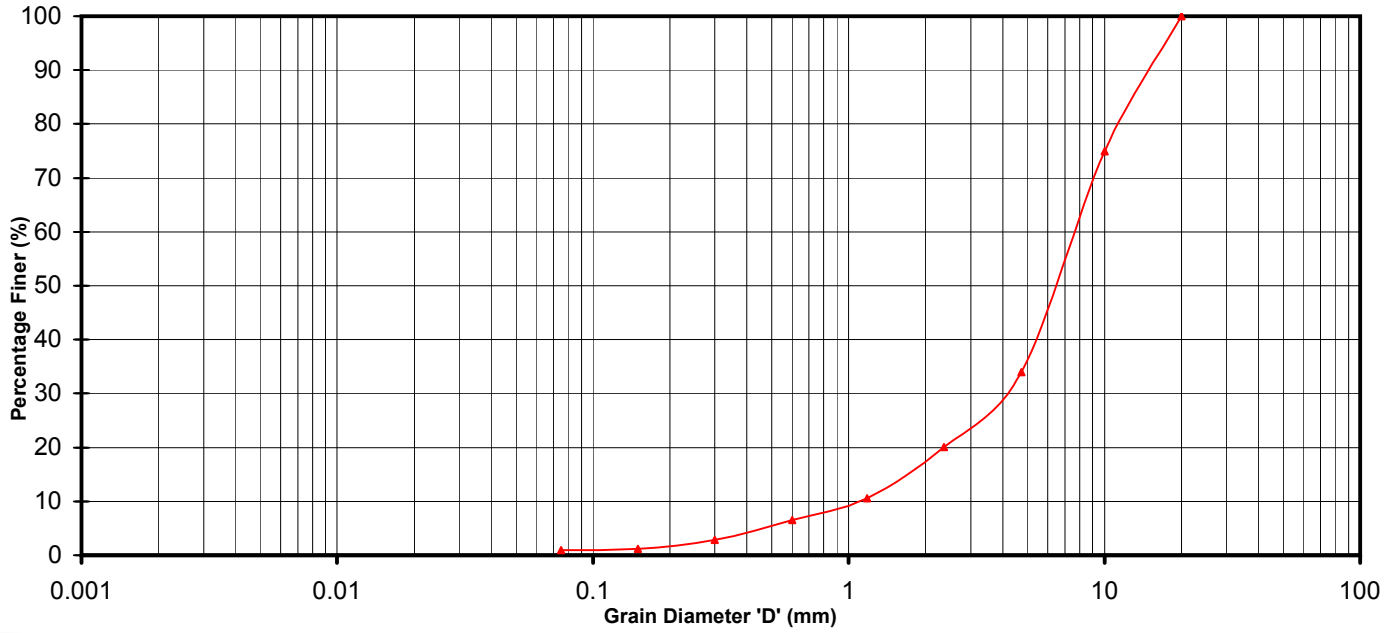
Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

As Per IS:2720

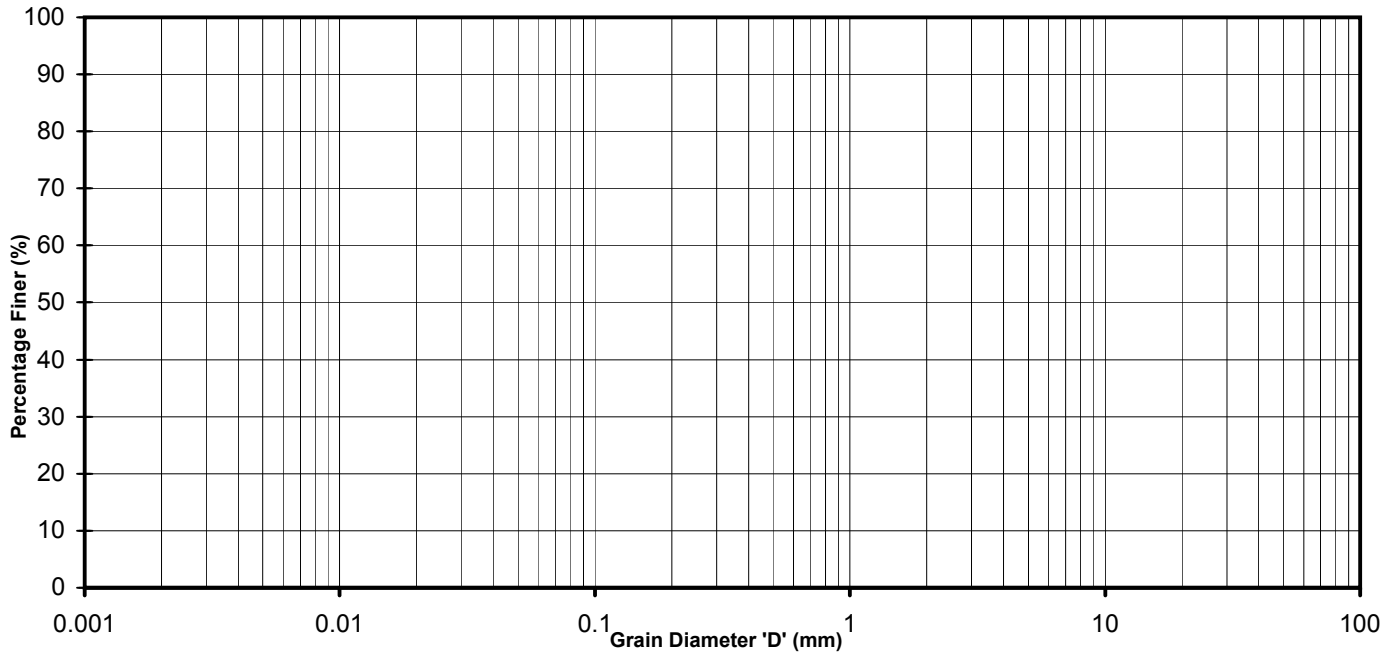
BH NO.:	Depth (m) :	
BH-22	-15.00 - 15.50	

	CLAY & SILT	SAND			GRAVEL
		FINE	MEDIUM	COARSE	
	1	3	13	17	66



BH NO.:	Depth (m) :	

	CLAY	SILT	SAND			GRAVEL
			FINE	MEDIUM	COARSE	



Tested By : P.M. Prepared By : V.N. Checked By : S.D. Approved By : S.T.

Client : V.O.CHIDAMBARANAR PORT TRUST

Liquid Limit *(Casagrande method)* and Plastic Limit

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

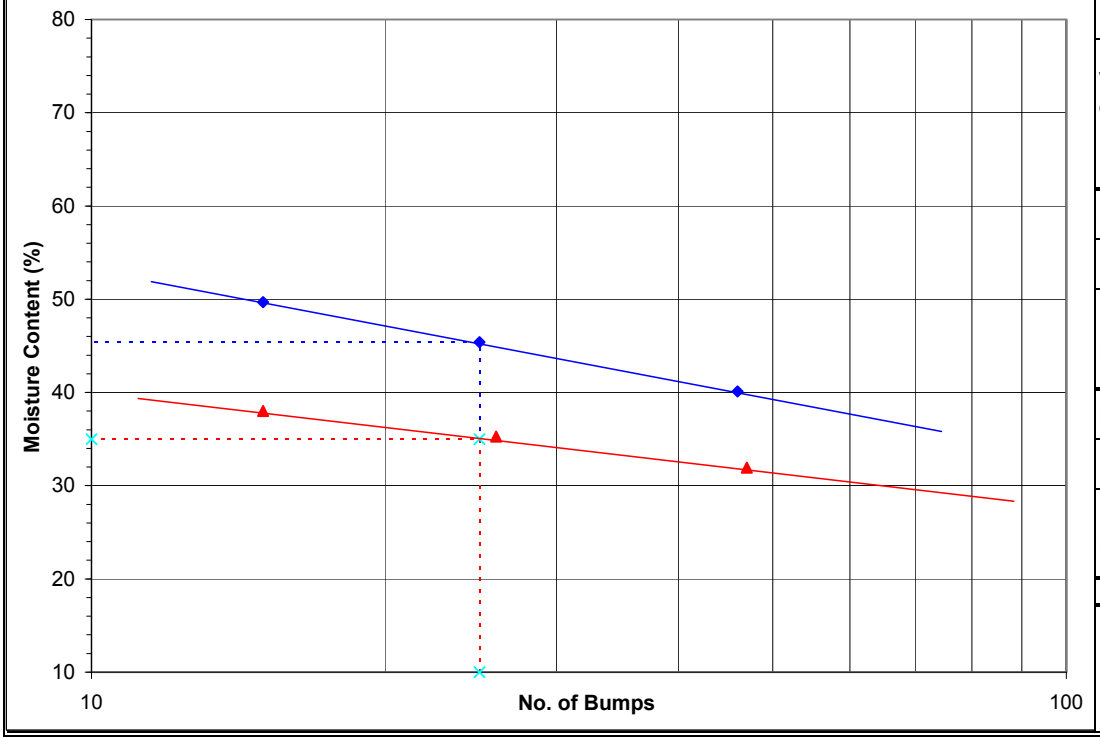
Project No. : GT-VOCPT-088

BH NO. :		Sample Depth(m) :		Sample No. :		Date :
	BH-07		-17.40 - -17.90		ID-BH-07-D200	07-05-2018
	BH-07		-18.52 - -18.97		ID-BH-07-S312	07-05-2018

Test method : **IS 2720 : Part 5**

PLASTIC LIMIT	Test no.	1	2	Average	1	2	Average
Container no.		A29	A31		A16	A24	
Mass of wet soil + container	g	35.90	39.49		28.26	30.74	
Mass of dry soil + container	g	34.36	37.49		27.41	29.69	
Mass of container	g	26.13	26.97		23.12	24.37	
Mass of moisture	g	1.54	2.00		0.85	1.05	
Mass of dry soil	g	8.23	10.52		4.29	5.32	
Moisture Content	%	**18.71**	**19.01**	**18.86**	**19.81**	**19.74**	**19.78**

LIQUID LIMIT	Test no.	1	2	3	1	2	3
Number of bumps		15	26	47	15	25	46
Container no.		A26	A11	A34	C21	C8	C13
Mass of wet soil + container (m_3)	g	34.36	30.53	36.92	36.65	33.40	32.00
Mass of dry soil + container (m_2)	g	32.03	28.60	34.42	34.37	30.74	29.91
Mass of container (m_1)	g	25.90	23.13	26.59	29.78	24.88	24.70
Mass of moisture ($m_3 - m_2$)	g	2.33	1.93	2.50	2.28	2.66	2.09
Mass of dry soil ($m_2 - m_1$)	g	6.13	5.47	7.83	4.59	5.86	5.21
Water Content	%	**38.01**	**35.28**	**31.93**	**49.67**	**45.39**	**40.12**



Sample preparation
washed on 425 μ m sieve oven dried at 105 ^{0}C
.

Liquid limit	**35** %
Plastic limit	**19** %
Plasticity index	**16** %
Liquid limit	**45** %
Plastic limit	**20** %
Plasticity index	**25** %

Operator	Checked	Approved
P.M.	K.B.	S.T.

Client : V.O.CHIDAMBARANAR PORT TRUST

Liquid Limit *(Casagrande method)* and Plastic Limit

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

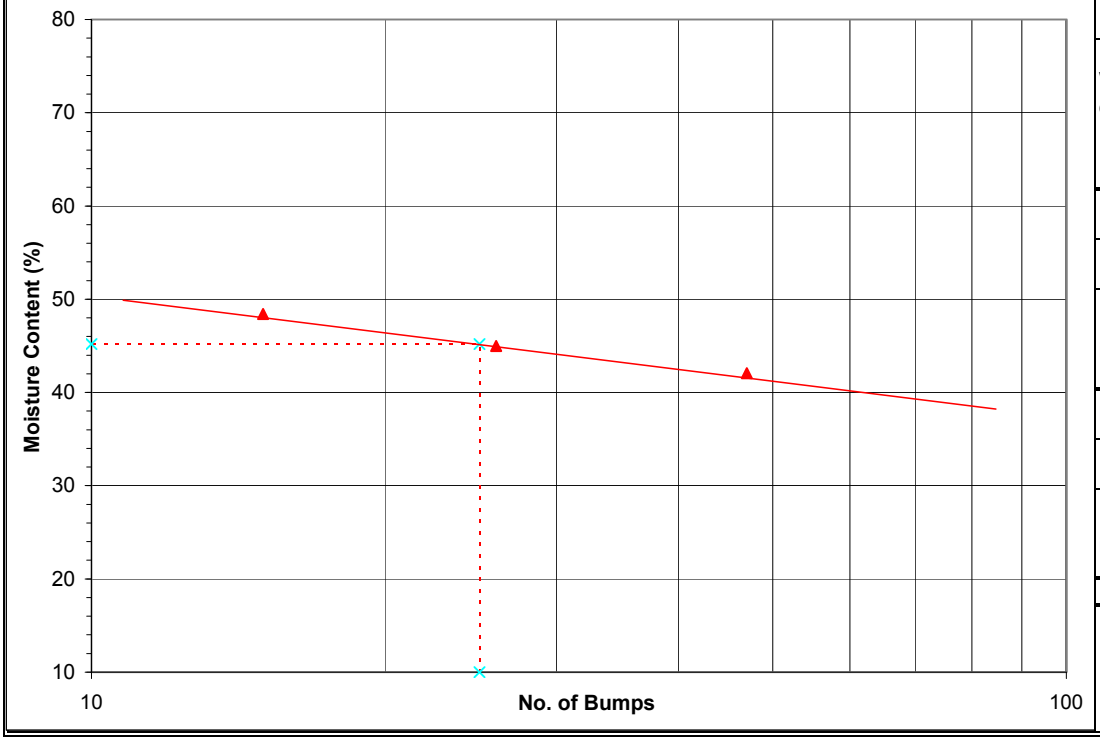
Project No. : GT-VOCPT-088

BH NO. :	BH-07	Sample Depth(m) :	-19.40 - -19.90	Sample No. :	ID-BH-07-D400	Date :	07-05-2018

Test method : **IS 2720 : Part 5**

PLASTIC LIMIT	Test no.	1	2	Average	1	2	Average
Container no.		A6	C56				
Mass of wet soil + container	g	30.42	38.08				
Mass of dry soil + container	g	28.87	36.47				
Mass of container	g	21.46	28.54				
Mass of moisture	g	1.55	1.61				
Mass of dry soil	g	7.41	7.93				
Moisture Content	%	**20.92**	**20.30**	**20.61**			

LIQUID LIMIT	Test no.	1	2	3	1	2	3
Number of bumps		15	26	47			
Container no.		C41	C36	C6			
Mass of wet soil + container (m_3)	g	39.04	40.20	33.37			
Mass of dry soil + container (m_2)	g	36.14	34.85	30.29			
Mass of container (m_1)	g	30.15	22.96	22.97			
Mass of moisture ($m_3 - m_2$)	g	2.90	5.35	3.08			
Mass of dry soil ($m_2 - m_1$)	g	5.99	11.89	7.32			
Water Content	%	**48.41**	**45.00**	**42.08**			



Sample preparation
washed on 425 μ m sieve oven dried at 105 ^{0}C
.

Liquid limit	**45** %
Plastic limit	**21** %
Plasticity index	**24** %
Liquid limit	%
Plastic limit	%
Plasticity index	%

Operator	Checked	Approved
P.M.	K.B.	S.T.

Client : V.O.CHIDAMBARANAR PORT TRUST

Liquid Limit *(Casagrande method)* and Plastic Limit

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

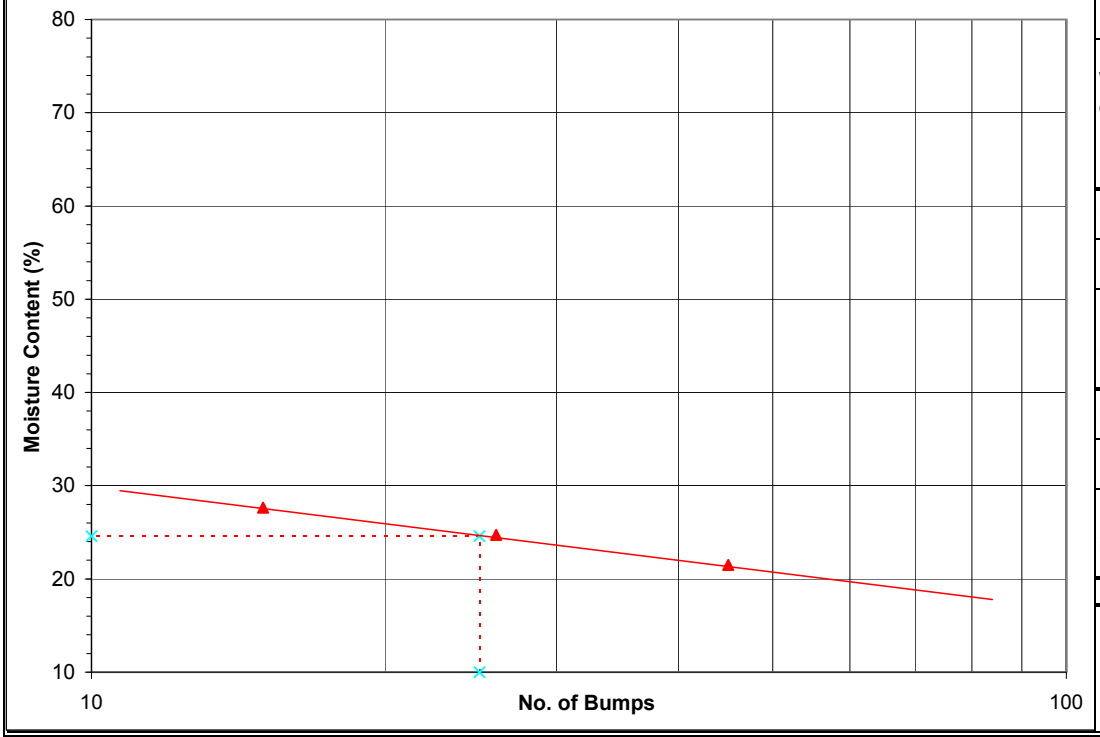
Project No. : GT-VOCPT-088

BH NO. :	BH-08	Sample Depth(m) :	-18.30 - -18.75	Sample No. :	ID-BH-08-S300	Date :	07-05-2018

Test method : **IS 2720 : Part 5**

PLASTIC LIMIT	Test no.	1	2	Average	1	2	Average
Container no.		A15	A23				
Mass of wet soil + container	g	33.11	35.32				
Mass of dry soil + container	g	32.12	34.13				
Mass of container	g	24.23	24.53				
Mass of moisture	g	0.99	1.19				
Mass of dry soil	g	7.89	9.60				
Moisture Content	%	12.55	12.40	12.47			

LIQUID LIMIT	Test no.	1	2	3	1	2	3
Number of bumps		15	26	45			
Container no.		C32	C44	C26			
Mass of wet soil + container (m_3)	g	34.39	32.60	37.19			
Mass of dry soil + container (m_2)	g	32.62	30.97	35.76			
Mass of container (m_1)	g	26.22	24.38	29.11			
Mass of moisture ($m_3 - m_2$)	g	1.77	1.63	1.43			
Mass of dry soil ($m_2 - m_1$)	g	6.40	6.59	6.65			
Water Content	%	27.66	24.73	21.50			



Sample preparation
washed on 425 μ m sieve oven dried at 105 ^{0}C
.

Liquid limit	25 %
Plastic limit	12 %
Plasticity index	13 %
Liquid limit	%
Plastic limit	%
Plasticity index	%

Operator	Checked	Approved
P.M.	K.B.	S.T.

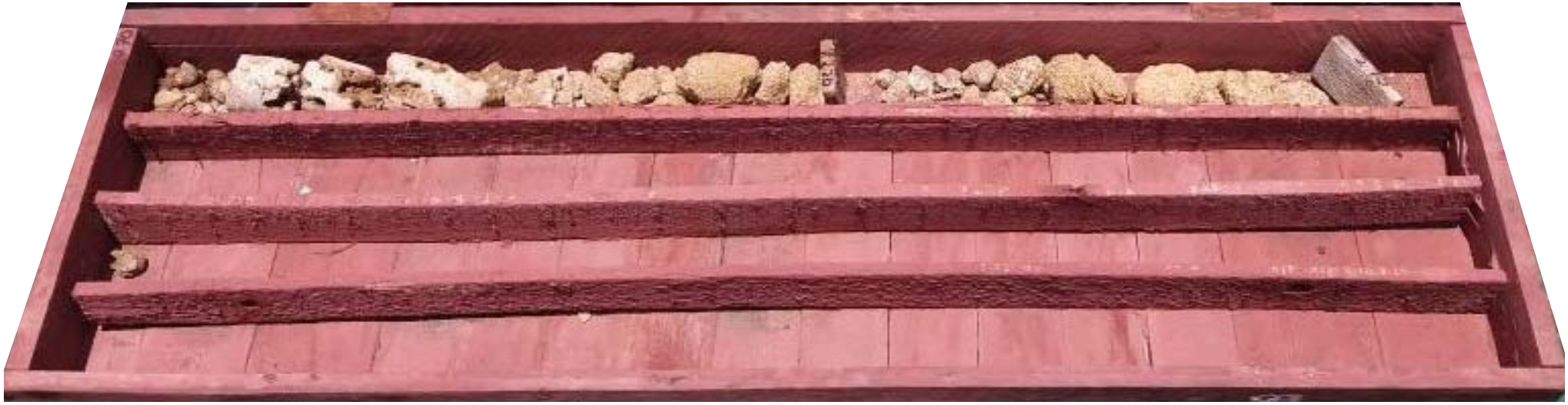
APPENDIX D – CORE BOX PHOTOGRAPHS

PROJECT : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Project No. : GT-VOCPT-088

Client : V.O.CHIDAMBARANAR PORT TRUST

BOREHOLE NO.	BH-01	Depth in (m) : 0.70 - 2.20	Core Box 01 of 01



PROJECT : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Project No. : GT-VOCPT-088

Client : V.O.CHIDAMBARANAR PORT TRUST

BOREHOLE NO.	BH-03	Depth in (m) : 1.00 - 5.00	Core Box 01 of 01

PROJECT : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Project No. : GT-VOCPT-088

Client : V.O.CHIDAMBARANAR PORT TRUST

BOREHOLE NO.	BH-05	Depth in (m) : 2.40 - 3.50	Core Box 01 of 01

PROJECT : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Project No. : GT-VOCPT-088

Client : V.O.CHIDAMBARANAR PORT TRUST

BOREHOLE NO.	BH-08	Depth in (m) : 4.20 - 4.70	Core Box 01 of 01

PROJECT : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Project No. : GT-VOCPT-088

Client : V.O.CHIDAMBARANAR PORT TRUST

BOREHOLE NO.	BH-11	Depth in (m) : 2.00 - 4.50	Core Box 01 of 01

PROJECT : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Project No. : GT-VOCPT-088

Client : V.O.CHIDAMBARANAR PORT TRUST

BOREHOLE NO.	BH-12	Depth in (m) : 1.55 - 4.00	Core Box 01 of 01

PROJECT : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Project No. : GT-VOCPT-088

Client : V.O.CHIDAMBARANAR PORT TRUST

BOREHOLE NO.	BH-13	Depth in (m) : 1.50 - 4.00	Core Box 01 of 01

PROJECT : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Project No. : GT-VOCPT-088

Client : V.O.CHIDAMBARANAR PORT TRUST

BOREHOLE NO.	BH-14	Depth in (m) : 1.70 - 4.10	Core Box 01 of 01

PROJECT : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Project No. : GT-VOCPT-088

Client : V.O.CHIDAMBARANAR PORT TRUST

BOREHOLE NO.	BH-15	Depth in (m) : 1.50 - 4.50	Core Box 01 of 01

PROJECT : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Project No. : GT-VOCPT-088

Client : V.O.CHIDAMBARANAR PORT TRUST

BOREHOLE NO.	BH-16	Depth in (m) : 0.80 - 4.80	Core Box 01 of 01

PROJECT : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Project No. : GT-VOCPT-088

Client : V.O.CHIDAMBARANAR PORT TRUST

BOREHOLE NO.	BH-17	Depth in (m) : 0.66 - 5.00	Core Box 01 of 01

PROJECT : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Project No. : GT-VOCPT-088

Client : V.O.CHIDAMBARANAR PORT TRUST

BOREHOLE NO.	BH-18	Depth in (m) : 0.55 - 5.05	Core Box 01 of 01

PROJECT : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Project No. : GT-VOCPT-088

Client : V.O.CHIDAMBARANAR PORT TRUST

BOREHOLE NO.	BH-19	Depth in (m) : 2.10 - 4.30	Core Box 01 of 01

PROJECT : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Project No. : GT-VOCPT-088

Client : V.O.CHIDAMBARANAR PORT TRUST

BOREHOLE NO.	BH-20	Depth in (m) : 0.65 - 5.35	Core Box 01 of 01

PROJECT : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Project No. : GT-VOCPT-088

Client : V.O.CHIDAMBARANAR PORT TRUST

BOREHOLE NO.	BH-21	Depth in (m) : 0.80 - 5.80	Core Box 01 of 01

PROJECT : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Project No. : GT-VOCPT-088

Client : V.O.CHIDAMBARANAR PORT TRUST

BOREHOLE NO.	BH-22	Depth in (m) : 0.55 - 5.05	Core Box 01 of 01

PROJECT : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Project No. : GT-VOCPT-088

Client : V.O.CHIDAMBARANAR PORT TRUST

BOREHOLE NO.	BH-23	Depth in (m) : 0.65 - 5.15	Core Box 01 of 01

PROJECT : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Project No. : GT-VOCPT-088

Client : V.O.CHIDAMBARANAR PORT TRUST

BOREHOLE NO.	BH-24	Depth in (m) : 0.62 - 5.12	Core Box 01 of 01

APPENDIX E – DGPS CALIBIRATION

GT-VOCPT-088 - Position Report

Project Information

Project No. :	**GT-VOCPT-088**
Position for :	DGPS Verification
Date :	08 February 2018
Vessel / Barge / Rig :	Horizon Office
Project :	Geotech Investigation at V.O. Chidambarnar Port, East Coast India
Client :	Horizon GeoSciences
Project Location :	V.O Chidambarnar Port
Positioning System :	Simrad DGPS MX510
Spheroid :	WGS 84
Datum :	ITRF 2008
UTM Zone :	43N
Location Name :	HSC02
Location Coordinates :	292180.92mE
	2112968.02mN

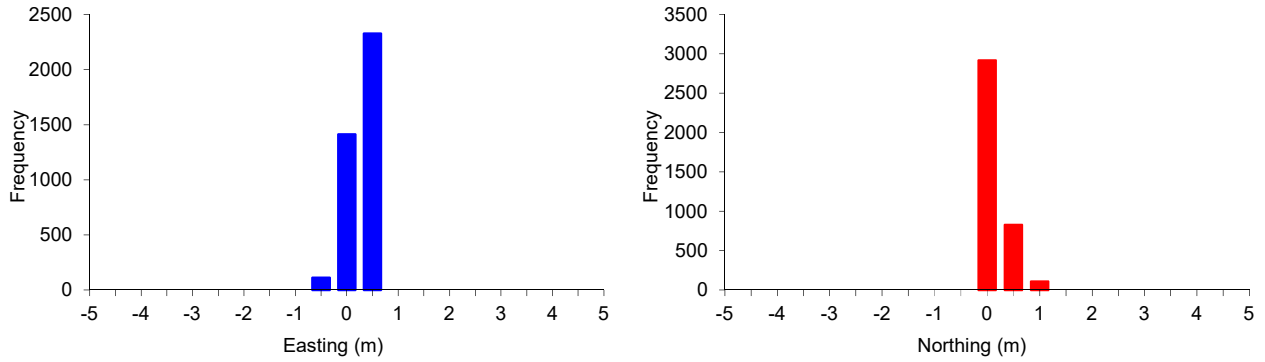
Logging Statistics

Logging Period :	1 Hrs 04 min	
Number of Observations :	3849	
Average Number of Satellites :	8	
Standard Deviation :	0.26mE	0.18mN
Max. Positive Deviation :	0.20mE	0.86mN
Max. Negative Deviation :	-0.85mE	-0.27mN
Difference from Intended :	-0.43mE	-1.01mN
Offset from Intended :	1.10m	203.0° (Grid)

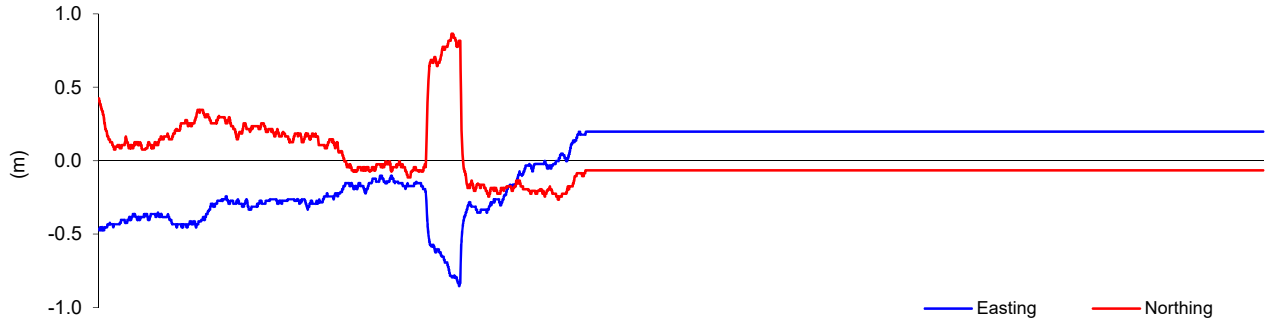
Final Position

UTM Coordinates :	**292180.49mE**
	2112967.01mN

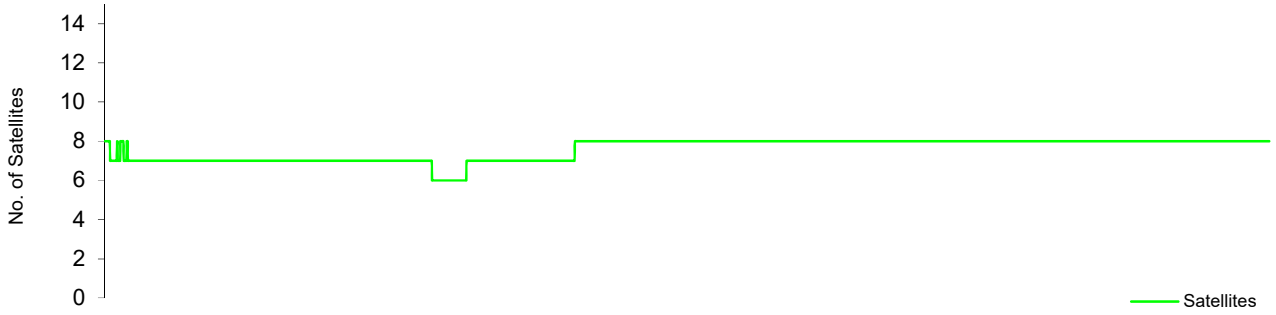
Statistical Plot - Histogram of Delta-East and Delta-North



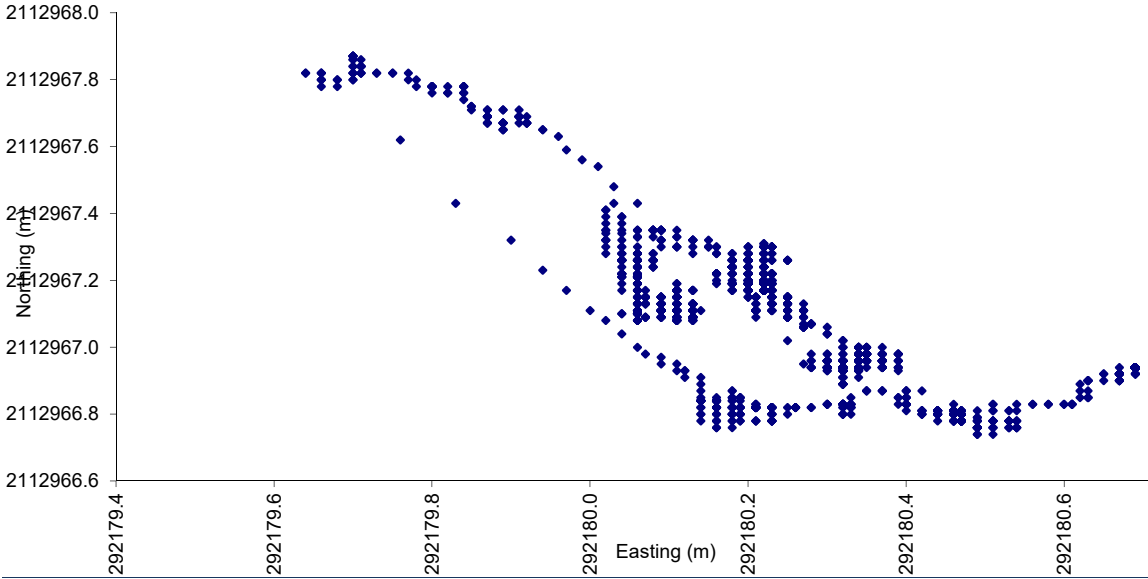
Time Series Plot - Difference from Mean



Time Series Plot - Number of Satellites



Scatter Plot



APPENDIX F – PETROGRAPHY ANALYSIS

Mr. John D'Souza.
Assistant Professor,
Department of Geology,
St. Xavier's College (Autonomous),
Mumbai.
5, Mahapalika Marg,
Mumbai 400 001, INDIA

Date: 31/07/2018

To,
Horizon Survey Company India Pvt. Ltd.
(HORIZON GEOSCIENCES)
Plot A-732, M.I.D.C,
Khairane, TTC Ind. Area,
Thane-Belapur Road,
Navi Mumbai-400 0710, India.

Subject: Report on petrographic analysis of the given samples
(Your letter Ref.No.GT_VOCPT_088_PA001 dated 12/07/2018)

Disclaimer : The report is exclusively made for the samples specified below and may not be used for any other samples.
Total 17 samples were submitted by Horizon Survey Company India Pvt. Ltd for petrographic analysis as per letter number as mentioned above.

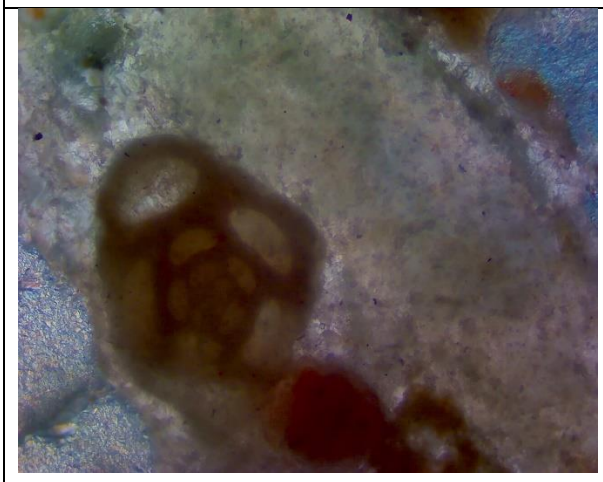
SR.NO	BH NO	Depth
1	19	3.00-4.30
2	1	0.70-2.30
3	3	1.00-2.00
4	5	2.40-3.50
5	8	4.20-4.70
6	11	2.00-3.50
7	13	2.50-4.00
8	15	1.50-3.00
9	18	2.05-3.55
10	22	4.05-5.05
11	26	6.20-7.70
12	29	12.60-14.10
13	32	3.20-4.70
14	34	2.37-3.87
15	37	1.10-2.60
16	38	8.50-10.00
17	40	14.00-15.00

Sr.No.1/BH-19/Depth 3.00-4.30

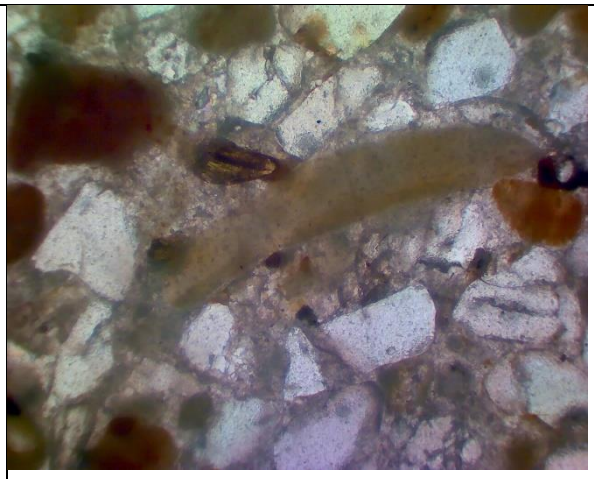
Petrographic study of the thin section shows presence of unequal, sub-angular to sub-rounded grains of quartz. Mostly anhedral quartz grains are embedded in very fine grained ferruginitic-carbonaceous groundmass. Rock also contains shell fragments of bivalves and nummulites.

Effervescence on diluted HCl Acid (1:10) – Mild

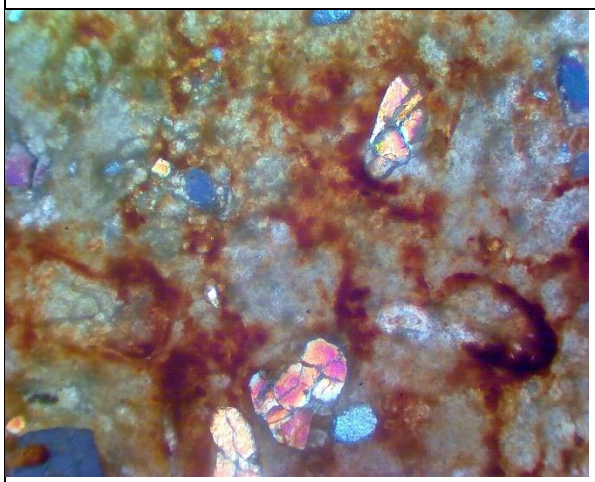
Rock Name: Fossiliferous Sandstone



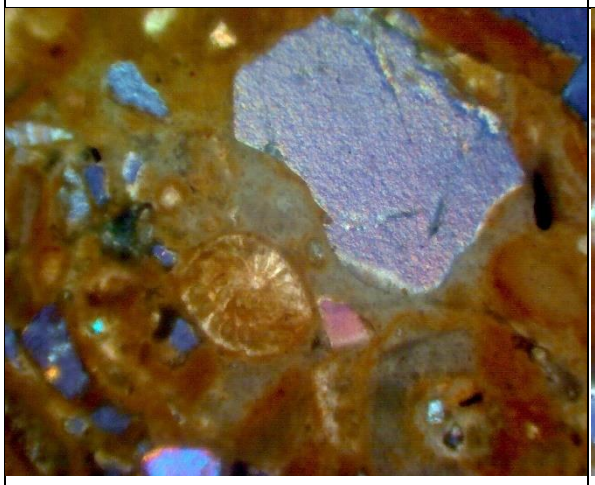
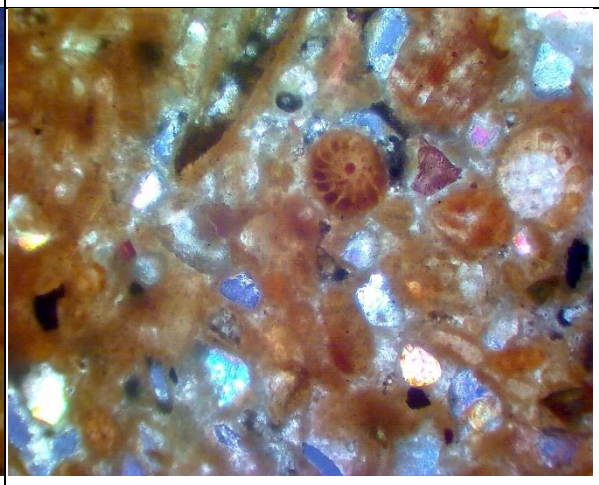
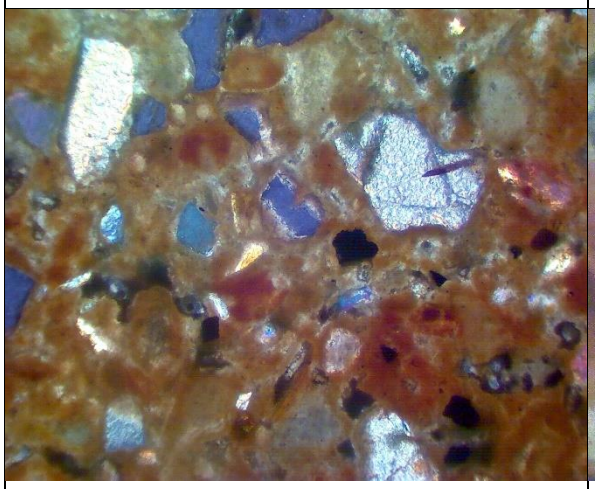
Field of view is 2mm. Under 4X.XPL
Shell fragment of a nummulite within micritic groundmass.



Field of view is 2mm. Under 4X.PPL
Bivalve shell fragment at the centre of the image. High interference (red-orange)colours of quartz are due to slight thickness of the slide



Field of view is 2mm. Under 4X.XPL
Ferruginous cement in the centre of the image.

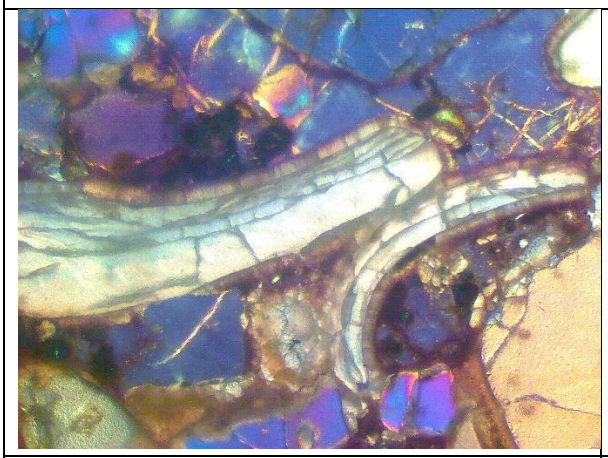
Sr.No.2/BH-1/Depth 0.70-2.30	
Rock shows ferruginous groundmass observed as light brown colour material in thin section. Multiple anhedral-subangular quartz grains are embedded within ferruginous and micritic groundmass. Shell fragments of foraminifera and bivalves are present. Opaque minerals are also observed as dark patches in the section. Effervescence on diluted HCl Acid (1:10) – Mild **Rock name: Calcareous Fossiliferous Sandstone**	
	
Field of view is 2mm. Under 4X.XPL Ferruginous cement present in the rock.	Field of view is 2mm. Under 4X.XPL Few bivalve and foraminifera shells with fine grained subangular quartz grains.
	
Field of view is 2mm. Under 4X.XPL Ferruginous cement with subangular quartz grains present.	Field of view is 0.5mm. Under 10X.XPL Nummulite shell at the centre of the image.

Sr.No.3/BH-3/Depth 1.00-2.00

Rock has unequal quartz grain and various shell fragments. There are few quartz grains present throughout the section which are angular. Grains are poorly sorted. Rock appears to be grain supported and has less than 10% of calcareous mud.

Effervescence on diluted HCl Acid (1:10) – Mild

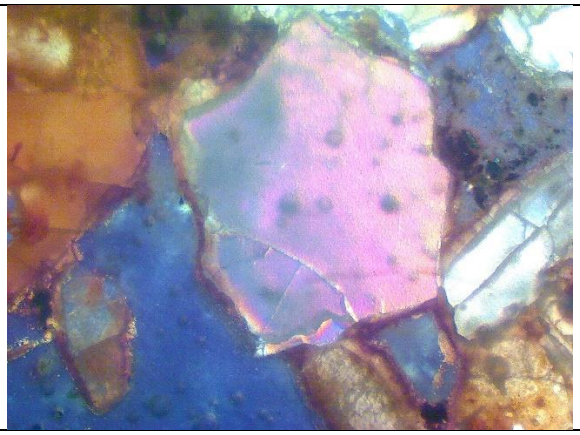
Rock Name: **Fossiliferous Sandstone**



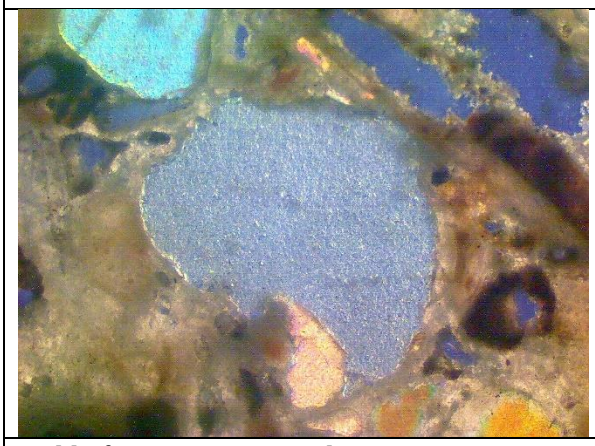
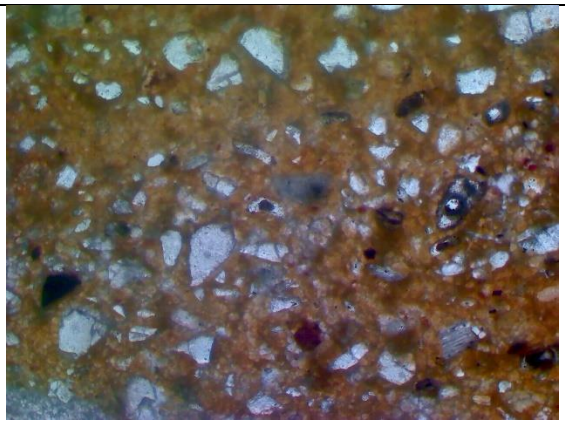
Field of view is 2mm. Under 4X.XPL
Bivalve shells.

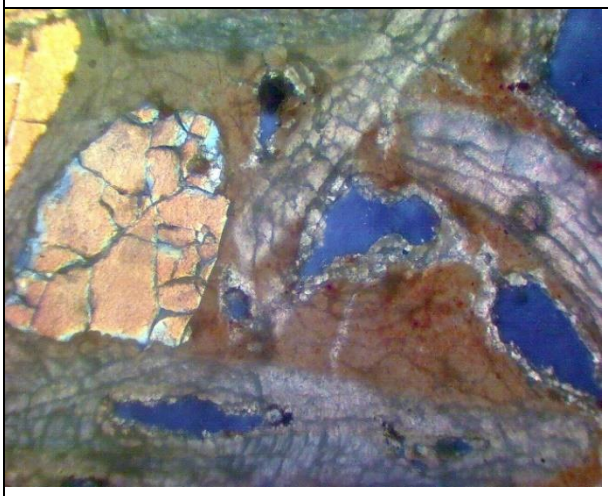
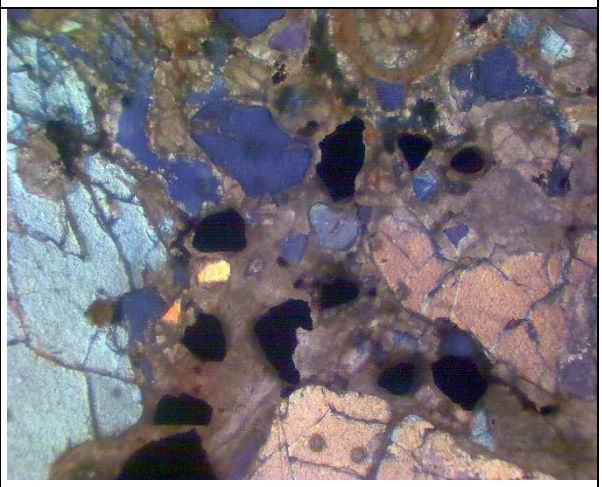
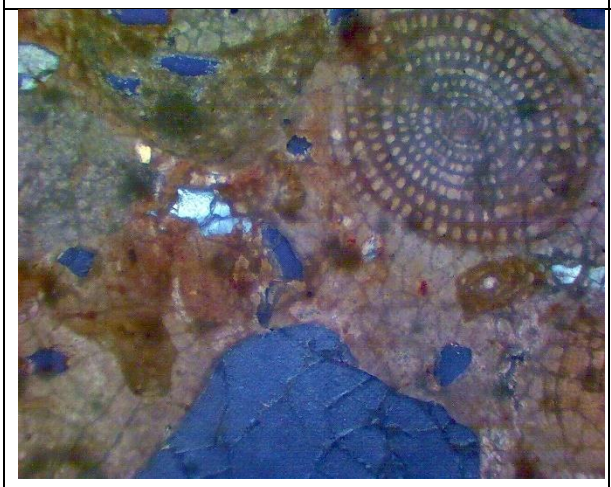
Field of view is 2mm. Under 4X.XPL
Aragonite needle within the shell.

Field of view is 2mm. Under 4X.XPL
Bivalve shell



Field of view is 2mm. Under 4X.XPL
Quartz grain in the centre-Colour variations are due to variable thickness of the slide.

Sr.No.4/BH-5/Depth 2.40-3.50	
Rock thin section show shell hash. Quartz grains are unequal- anhedral-subangular. Micritic and ferruginous cement is present throughout the rock. Opaques are scattered in the section. Overall rock is poorly sorted. Most of the fossils replaced by ferruginous content. Some of the bivalve fragments are longer than 2mm in length. Effervescence on diluted HCl Acid (1:10) – Mild **Rock Name: Calcareous Fossiliferous Sandstone**	
	
Field of view is 2mm. Under 4X, XPL Anhedral-subangular quartz grain at the centre of the image.	Field of view is 2mm. Under 4X, PPL Algae remnant
	
Field of view is 2mm. Under 4X, PPL Nummulite shell	Field of view is 2mm. Under 4X, PPL Ferruginous cement with quartz grains.

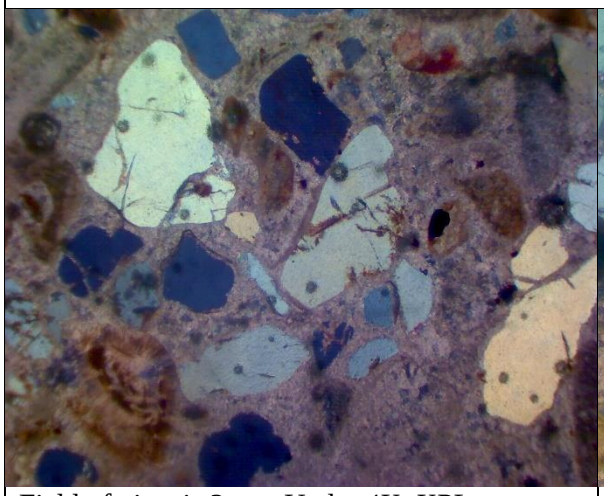
Sr.No.5/BH-8/Depth 4.20-4.70	
Rock contains angular to subangular quartz grain which are mostly anhedral in shape. multiple shell fragments (of bivalves, nummulite and foraminifera). It has very fine micrite present throughout. Angular- anhedral quartz grains are visible. Some of them are 2mm in diameter. Few grains of pyroxenes and opaque are also observed. Effervescence on diluted HCl Acid (1:10) – Mild Rock Name: **Fossiliferous sandstone**	
	
Field of view is 2mm. Under 4X, XPL Bivalve shell fragment- approx.1.5 mm in length.	Field of view is 2mm. Under 4X, XPL Few large quartz grain and opaques with part of foraminifera shell on top central part.
	
Field of view is 2mm. Under 4X, XPL Foraminifera shell and quartz grains within micrite.	

Sr.No.6/BH-11/Depth 2.50-3.50

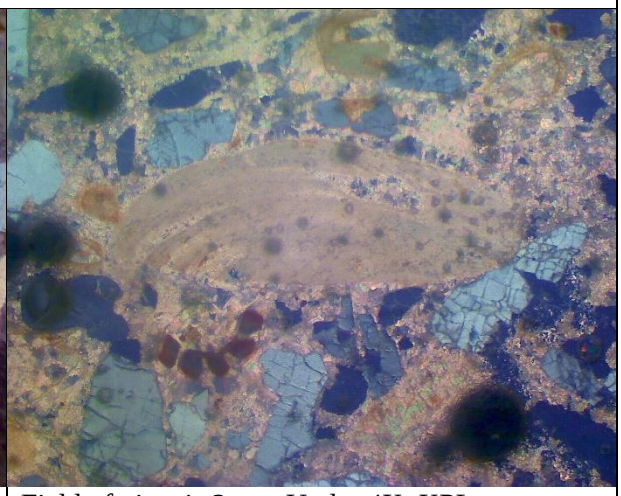
Thin section shows presence of quartz and multiple shell fragments in a matrix of micrite. Quartz grains are unequal in size, subangular to subrounded in shape embedded in micrite. Quartz grains size varies from 0.1 mm to 2mm, where large grains fractured. Shell fragments include bivalves and nummulites. Some of the shells have been replaced by ferruginous material. Few plagioclase, altered K-feldspar and opaques scattered are noticed in the thin sections.

Effervescence on diluted HCl Acid (1:10) – Mild

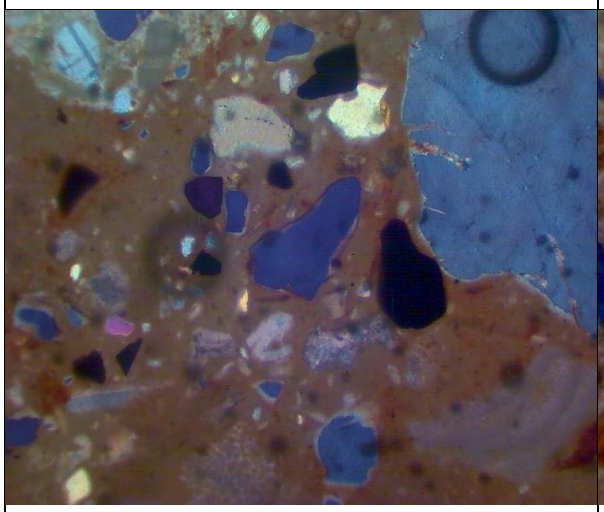
Rock Name: **Calcareous Sandstone**



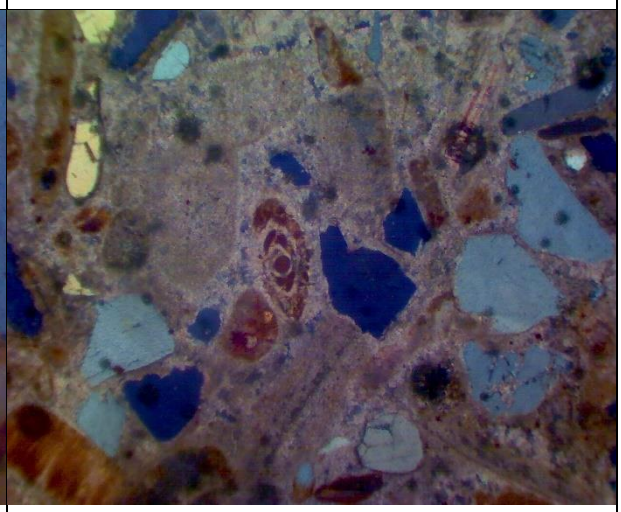
Field of view is 2mm. Under 4X, XPL
Multiple quartz grains embedded in micrite.



Field of view is 2mm. Under 4X, XPL
Bivalve shell fragment.



Field of view is 2mm. Under 4X, XPL
Quartz and opaque grains in ferruginous matrix.



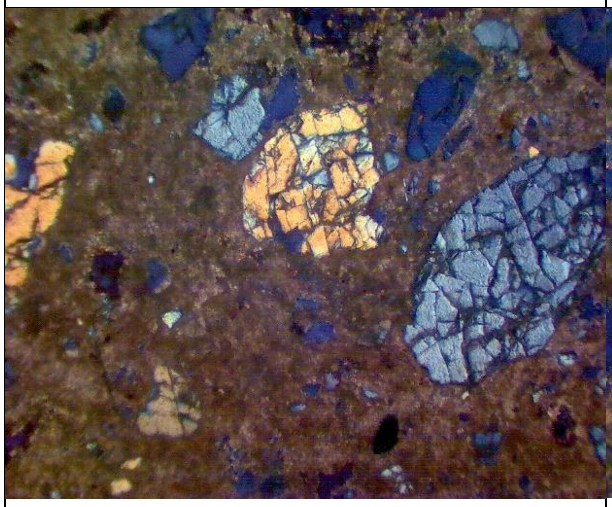
Field of view is 2mm. Under 4X, XPL
Nummulite shell replaced by ferruginous content present at the centre of the image. Background mass is micrite.

Sr.No.7/BH-13/Depth 2.50-4.00

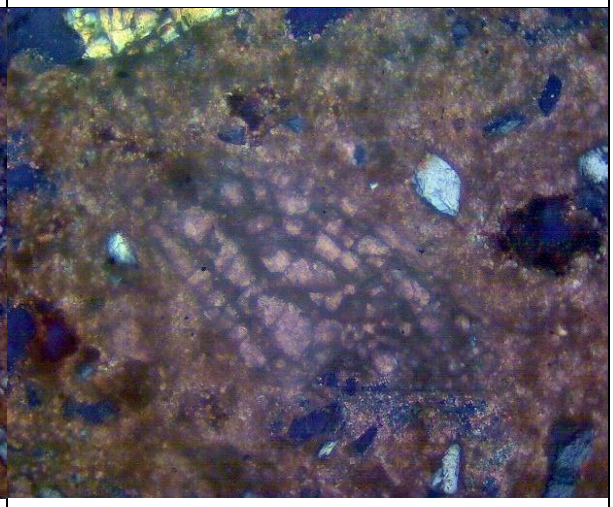
Rock shows micrite rich groundmass/matrix in which few quartz grains are embedded. Quartz grains are anhedral- subangular to subrounded. Quartz grains range in size from 0.1 mm to 1.0 mm. Few fossils are recognized with difficulty like nummulite. Opaque minerals are present.

Effervescence on diluted HCl Acid (1:10) – Strong
Rock friable/loose

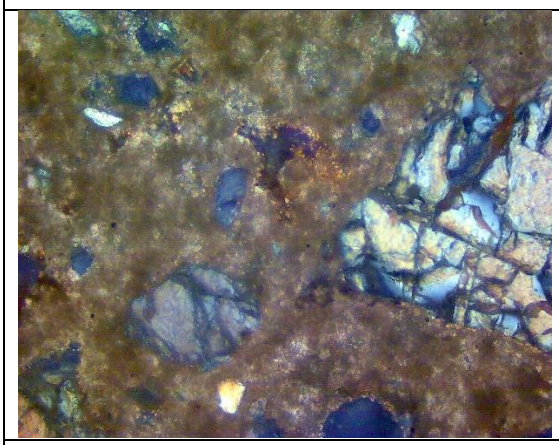
Rock Name: Calcareous Sandstone



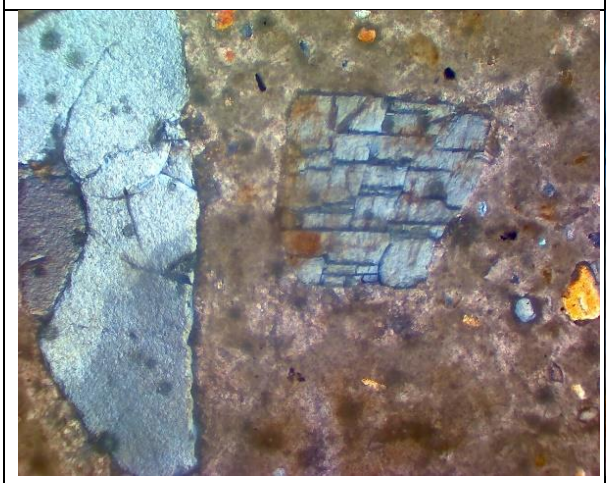
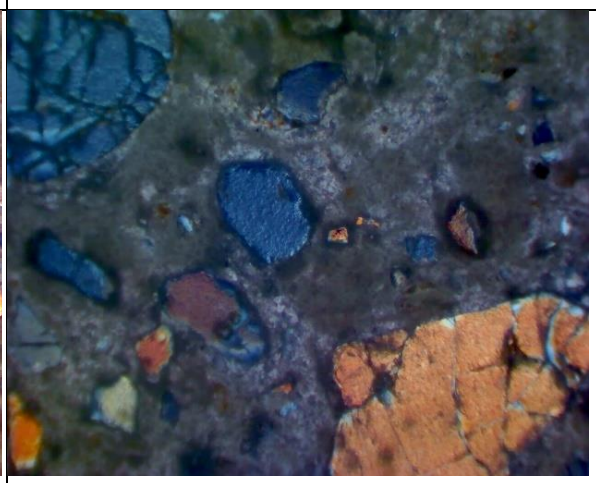
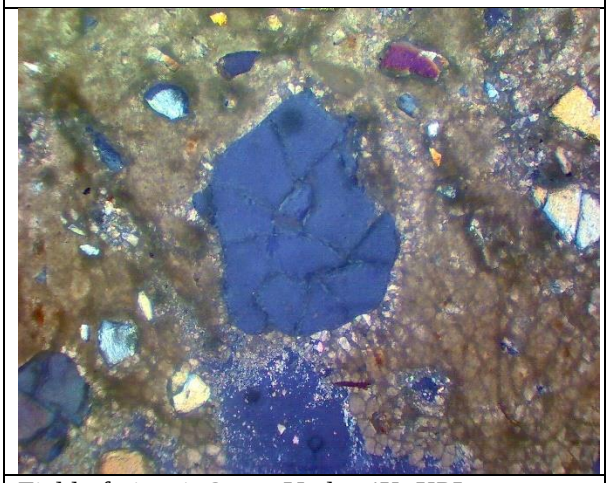
Field of view is 2mm. Under 4X, XPL
Highly fractured quartz grains embedded in micrite groundmass.

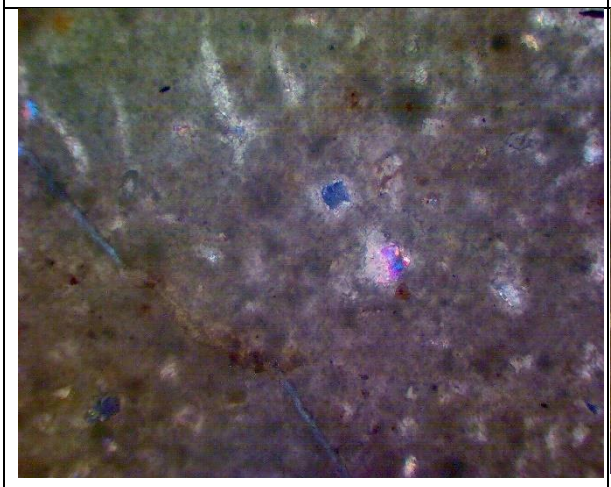
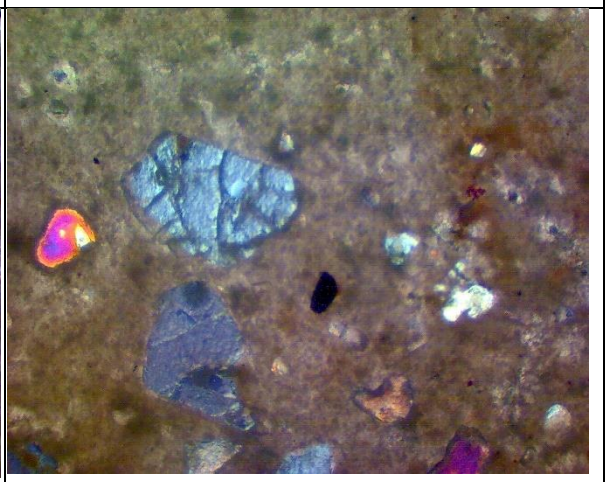
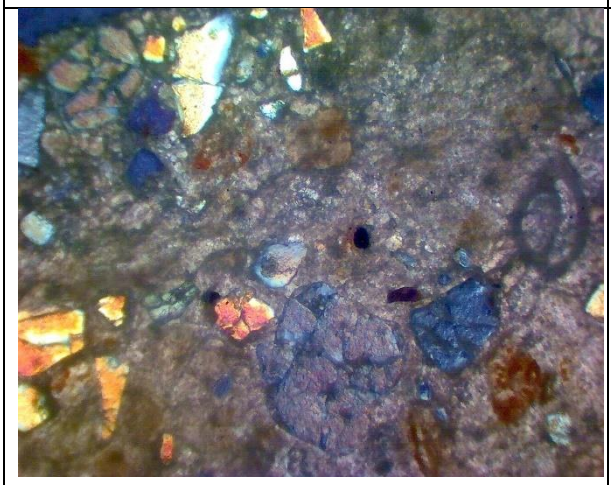


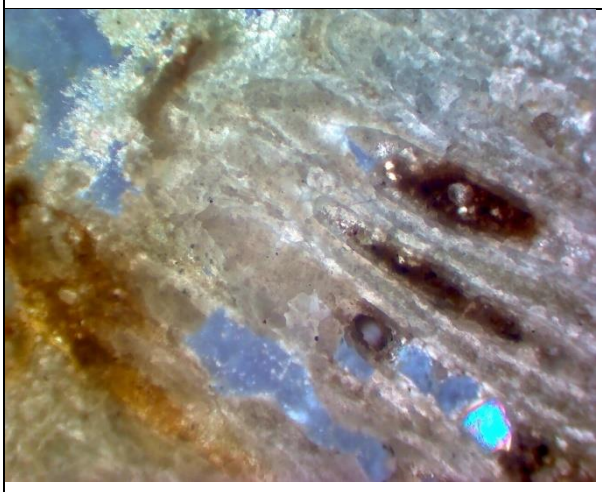
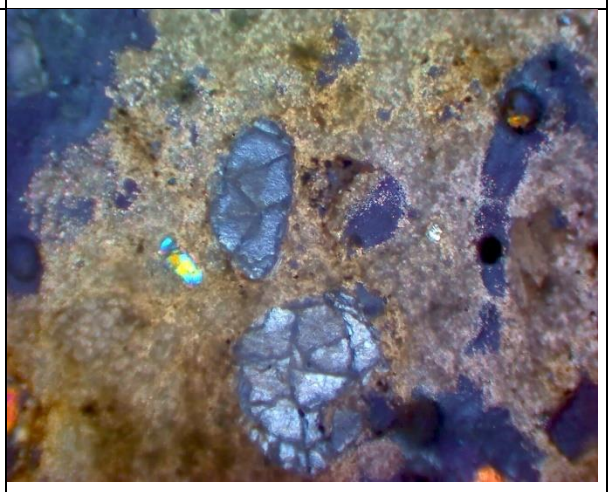
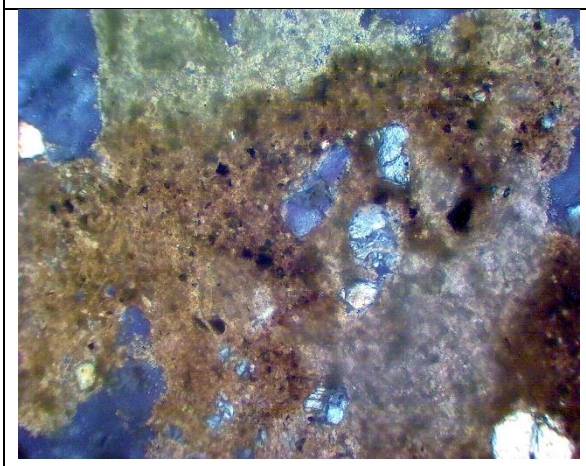
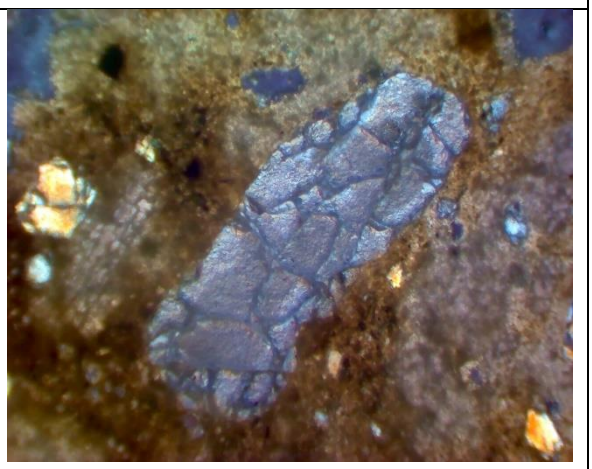
Field of view is 0.5mm. Under 10X, XPL
A single shell of nummulite highly fractured set in a micritic groundmass.



Field of view is 2mm. Under 4X, XPL
Micrite embedded with grains of quartz.

Sr.No.8/BH-15/Depth 1.50-3.00	
Rock has multiple quartz grains embedded in a fine matrix of micrite. Quartz grain size vary from 0.01 mm to 1.0 mm. Quartz grains are angular to subangular in shape, unequal in size They are fractured in places. Few opaque grains are present. One grain of altered pyroxene is observed. Effervescence on diluted HCl Acid (1:10) – Mild **Rock Name: Calcareous Sandstone.**	
	
Field of view is 2mm. Under 4X, XPL A large grain of quartz and altered pyroxene in a micritic matrix.	Field of view is 2mm. Under 4X, PPL Multiple grains of quartz of varying size observed in a micrite.
	
Field of view is 2mm. Under 4X, XPL Single fractured grain of quartz as observed.	

Sr.No.9/BH-18/Depth 2.05-3.55	
Rock has very fine grain micritic cement in which quartz grains are present. Quartz grains vary in size from 0.01 to 0.5 mm in diameter. Quartz grains shows fractured nature. Quartz is less than 20% in the overall thin section being studied, Effervescence on diluted HCl Acid (1:10) – Mild **Rock Name: Calcareous Sandstone**	
	
Field of view is 2mm. Under 4X.XPL Micritic cement	Field of view is 2mm. Under 4X.XPL Small quartz grains are present throughout.
	
Field of view is 2mm. Under 4X.XPL Few shell fragments such as on right central part of this image is observed.	

Sr.No.10/BH-22/Depth 4.05-5.05	
Rock shows presence of quartz fragments which are anhedral and sub angular. Some of the grains are highly fractured. Grain size varies from 0.02mm to 2mm. Shell fragments are present. At places ferruginous cement encloses quartz grains. Micritic cement is distinct in major portion of the section. Effervescence on diluted HCl Acid (1:10) – Strong Rock friable/loose **Rock Name: Calcareous Sandstone**	
	
Field of view is 2mm. Under 4X, XPL Shell fragments visible.	Field of view is 2mm. Under 4X, XPL Quartz grains visible at centre and lower central portion of the image embedded in micrite.
	
Field of view is 2mm. Under 4X, XPL Ferruginous cement and quartz crystals ebedded within.	Field of view is 2mm. Under 4X, XPL A little larger and fractured grain of quartz in ferruginous cement.

Geotechnical Investigation Report

In the Inner Harbour Basin
and
Approach Channel
at
V.O.Chidambaranar Port

For

V.O.Chidambaranar Port Trust

Revision: 0

Project Date: February - June 2018

Prepared By

Horizon Survey Company India Pvt. Ltd.

Plot A-732, M.I.D.C, Khairne,
TTC Industrial Area,
Thane-Belapur Road,
Navi Mumbai - 400 710, India

Tel.: +91 9833 975 010
Fax: +91 9833 973 123
E-mail: enquiries.india@horizon-geosciences.com

HSC Project No.: GT-VOCPT-088

Document No. : GT-VOCPT-088 - Geotechnical Report -V2_Rev 01

Project Information	
Document Type :	Geotechnical Investigation Report
Project :	Geotechnical Investigation in the Inner Harbour Basin and Approach Channel at VOCPT Port, Tuticorin
Client / PMIT :	V.O.Chidambaranar Port Trust
HSC Project No. :	GT-VOCPT-088
Document No. :	GT-VOCPT-088 - Geotechnical Report -V2_Rev 01

Issued To: V.O.Chidambaranar Port Trust	
For the Attention of :	Chief Engineer
Address :	V.O. Chidambaranar Port Trust Tuticorin -628004 Tamil Nadu, India
Tel : **Fax :** **Email :**	+91 461 2352252 +91 461 2354270 ce@vocport.gov.in

Issued By: Horizon Survey Company India Pvt. Ltd.	
General Manager :	Mr. Sudesh Tiwari
Address :	Horizon Survey Company India. Pvt. Ltd. Plot A-732, M.I.D.C, Khairane T.T.C Indl. Area, Thane-Belapur Road, Navi Mumbai 400 710.
Email :	s.tiwari@horizon-geosciences.com

Revision Control					
Revision No.	**Description**	**Prepared By**	**Checked By**	**Approved By**	**Issue Date**
0	Report	VN	KB	ST	09-06-2018
01	Report	VN	KB	ST	07-08-2018

GQP Volume Description		
Volume No.	**Volume Title**	**Contents**
1	GT-VOCPT-088 - Geotechnical Quality Plan - Rev0	Project Description, Methodology to carry out the work and proposed equipment

Service Warranty

The data presented within the report and associated charts/drawings have been acquired and processed to meet the requirements of the contract as agreed by the VOCPT. Any unauthorised use of the information presented within this report and charts/drawings is prohibited. Horizon Survey Company India Pvt. Ltd. will not accept any liability if the data is used for purposes other than those agreed in the contract.

Table of Contents

1. INTRODUCTION

V.O.Chidambaranar Port Trust (VOCPT/ Client) contracted **Horizon Survey Company India Pvt. Ltd.(Contractor)** to provide Geotechnical Investigation services in the inner harbour basin and approach channel of VOCPT

This report 'GT-VOCPT-088 - Geotechnical Report -V2_Rev 01.docx' presents the raw data obtained from the field as well as laboratory investigation along with the photographs of the field work and laboratory testing.

The Geotechnical Investigation field work was conducted from 22nd February 2018 to 20th May 2018.

1.1. Reference Documentation

1. **Contract Agreement No.62.CE/2017-18.**
2. **Tender No.E(C)/F. 79/PD/Boreholes/2017/D 2871**
3. **Client supplied reference Borehole Location drawing ref. 'RP008 (FIG 16)**

1.2. Scope of Work

The principal objectives of the investigation were to obtain adequate information on the sub sea bed stratigraphy, the type and strength of the soils / rocks below the seabed and other geotechnical details of relevance to enable arriving at the dredgeability of the soil/rock. The entire work was carried out under the supervision of VOCPT representatives, the client for this project.

In order to accomplish the above objectives the scope of work was to drill twenty forty (40) Nos. of boreholes in the inner harbour basin and approach channel upto a level of -20.0m CD. However during the execution of the boreholes four (4) boreholes (BH-26, BH-29, BH-32 and BH-33) were drilled upto a level varying between -24.40m CD to -25.20m CD . The scope of work also includes carrying out standard penetration tests, collection of disturbed and undisturbed samples of soils, logging visually identifiable lithological and engineering characteristics of the soil and rock samples, testing the samples in laboratory for their classification, index and engineering properties and preparation and submission of Geotechnical Investigation report. The field test location drawing is presented in Plate-1.

The list of the geotechnical boreholes carried out at locations of various areas are presented in **Table 1**.

Sr. No.	Proposed Structure	Field Test
1	Approach Channel	BH-01 to BH-24
2	Inner Harbour Basin	BH-25 to BH-40

Table 1: Details of Borehole Locations w.r.t. various area

APPENDIX A – FIELD AND LABORATORY PHOTGRAPHS

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Project No. : GT-VOCPT-088

Client : V.O.CHIDAMBARANAR PORT TRUST

FIELD PHOTOGRAPH

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Project No. : GT-VOCPT-088

Client : V.O.CHIDAMBARANAR PORT TRUST

FIELD PHOTOGRAPH

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Project No. : GT-VOCPT-088

Client : V.O.CHIDAMBARANAR PORT TRUST

LABORATORY TESTING PHOTOGRAPHS

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Project No. : GT-VOCPT-088

Client : V.O.CHIDAMBARANAR PORT TRUST

LABORATORY TESTING PHOTOGRAPHS

APPENDIX B – FIELD BOREHOLE LOGS

Horizon Survey Company India Pvt. Ltd.

HORIZON GEOSCIENCES

BOREHOLE NO. : BH-1

Project No.	:	GT-VOCPT-088					
Project Name	:	Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port				Client : V.O. Chidambaranar Port Trust	SHEET 1 of 1
T.D. (m)	:	4.65	Sea Bed Level w.r.t. CD in (m)	:	16.00	Equipment Record : JACKUP BARGE	SEA WATER DEPTH
Date Commenced	:	13/4/18	Circulation Fluid	:	Sea Water	SANGAM - II	Date / Time / Mtrs.
Date Completed	:	13/4/18	Drilling Orientation	:	Vertical	Type of Rig : Hydraulic / Shell & Auger	13/4/18 / 9:30 / 16.30
Coordinates (Given)	:	E : 202246.206	N : 961409.455			Details of Casing (m) : SX : 0.70 HX : 4.20 NX :	
Coordinates (Achived)		E : 202236.3	N : 961429.1			Core-Diameter (mm) :	

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum / Strata Description	Remarks
TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.			
DS	0.00	0.50											Yellowish brown medium to fine SAND with SHELL AND GRAVELS	L-0.50
SPT	0.70	0.70				R								
NX. CORING	0.70	2.20					38	0	0	V	N1		Moderately to highly weathered yellowish brown moderatly weak CALCAREOUS SAND STONE.	
NX CORING	2.70	2.70					62	0	0	V	N1			
NX CORING	2.70	4.20					0	0	0				NO RECOVERY	
SPT	4.20	4.65	7	7	8	15							MIDENCE Yellowish brown medium to fine SAND	
													BH-1 TERMINATED AT 4.65m below the sea bed level	

Details:

Weather Condition :

For Horizon (HSCIPL) Representative

Sudhi

For Client Representative

13/4/18

Plate-B1

Horizon Survey Company India Pvt. Ltd.

HORIZON GEOSCIENCES

BOREHOLE NO. : BH 2

Project No.	: GT-VOCPT-088			Client	: V.O. Chidambaranar Port Trust	SHEET 1 of 2	
Project Name	: Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port						
T.D. (m)	: 5.12	Sea Bed Level w.r.t. CD in (m)	: 15.40	Equipment Record	: JACKUP BARGE	SEA WATER DEPTH	
Date Commenced	: 14/4/18	Circulation Fluid	: Sea Water		SANGAM - II	Date / Time / Mtrs.	
Date Completed	: 14/4/18	Drilling Orientation	: Vertical	Type of Rig	: Hydraulic / Shell & Auger	14/4/18 / 15.40 / 15.88	
Coordinates (Given)	: E: 201876.706	N: 961746.307		Details of Casing (m)	: SX: 4.67 HX: NX:		
Coordinates (Achived)	E: 201866.3	N: 961757.4		Core-Diameter (mm)	:		

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum	Remarks
TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.		Strata Description	
DS	0.00	0.50											Yellowish brown coarse to medium SAND with SHELL FRAGMENTS and GRAVELS	L-0.80 m
DS	0.80	1.29												
SPT	1.29	1.74	15	20	20	40							DENSE yellowish brown medium to fine SAND with SHELL FRAGMENTS AND GRAVELS (1.29-1.62) GREYISH yellow silty fine SAND Residual soils (1.62-1.	
DS	2.00	2.50											yellowish brown medium to coarse SAND with SHELL FRAGMENTS AND GRAVELS	
SPT	3.00	3.45	5	6	15	21							NO RECOVERY	
DS	3.00	3.50											yellowish brown fine SAND with few SHELL FRAGMENTS	

Details:

Weather Condition :

For Horizon (HSCIPL) Representative: Sathi

For Client Representative: 14/4/18

Plate-B2

Survey Company India Pvt. Ltd.

HORIZON GEOSCIENCES

BOREHOLE NO. : BH-2

Project No.	:	GT-VOCPT-088			Client : V.O. Chidambaranar Port Trust		SHEET 2 of 2
Project Name	:	Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port					
T.D. (m)	:	5.12	Sea Bed Level w.r.t. CD in (m) :	15.40	Equipment Record :	JACKUP BARGE	SEA WATER DEPTH
Date Commenced	:	14/1/18	Circulation Fluid :	Sea Water		SANGAM - II	Date / Time / Mtrs.
Date Completed	:	14/1/18	Drilling Orientation :	Vertical	Type of Rig :	Hydraulic / Shell & Auger	14/1/18 / 9.40 / 15.88
Coordinates (Given)	:	E : 201876.706	N : 961746.307		Details of Casing (m) :	SX : 4.67 HX : NX :	
Coordinates (Achived)		E : 20186.3	N : 961757.4		Core-Diameter (mm) :		

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum	Remarks
TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.		Strata Description	
SPT	3.65	4.10	2	2	6	8							LOOSE yellowish fine SAND with few SHELL FRAGMENTS	
SPT	4.67	5.12	5	7	12	19							MDENSE yellowish brown fine SAND with SILT found in the bottom	
													BH-2 TERMINATED AT 5.12 m below the sea bed level	

Details:

Weather Condition :

For Horizon (HSCIPL) Representative

For Client Representative

14/1/18

Plate-B3

Horizon Survey Company India Pvt. Ltd.

HORIZON GEOSCIENCES

BOREHOLE NO. : 3

Project No.	:	GT-VOCPT-088				
Project Name	:	Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port				
T.D. (m)	:	5.45 m	Sea Bed Level w.r.t. CD in (m)	:	15.30	
Date Commenced	:	12/4/18	Circulation Fluid	:	Sea Water	
Date Completed	:	12/4/18	Drilling Orientation	:	Vertical	
Coordinates (Given)	:	E: 201690.878	N: 961915.716			
Coordinates (Achived)		E: 201688.6	N: 962022.4			

Client : V.O. Chidambaranar Port Trust

SHEET 1 of 1

Equipment Record	:	JACKUP BARGE	SANGAM - II	
Type of Rig	:	Hydraulic / Shell & Auger		
Details of Casing (m)	:	SX: 9.00	HX:	NX:
Core-Diameter (mm)	:			

SEA WATER DEPTH

Date	Time	Mtrs.
12/4/18	18:20	16.00

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum / Strata Description	Remarks
TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.			
DS	0.00	0.50											Yellowish brown fine SAND with SHELL AND GRAVELS	L-0.50
SPT	0.50	0.95	11	12	13	25							M DENSE yellowish brown coarse SAND (ROCK Fragments)	
NX CORING	1.00	2.50	[illegible]	[illegible]			62	52	26	IV			Moderately to highly weathered yellowish brown fine to medium grain moderately weak to moderately strong CALCAREOUS SAND STONE	
NX CORING	2.50	4.00					33	23	0	IV				
NX CORING	4.00	5.00					19	9	0	V				
SPT	5.00	5.45	8	12	12	24	[illegible]						M DENSE yellowish brown coarse to medium SAND with GRAVELS	
													BH-3 TERMINATED AT 5.45m below the sea bed level	

Details:

Weather Condition :

For Horizon (HSCIPL) Representative

sudhir

For Client Representative

12/4/18

Plate-B4

Horizon Survey Company India Pvt. Ltd.

HORIZON GEOSCIENCES

BOREHOLE NO. : BH-4

Project No.	GT-VOCPT-088					
Project Name	Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port			Client : V.O. Chidambaranar Port Trust		SHEET 1 of 1
T.D. (m)	3.65	Sea Bed Level w.r.t. CD in (m) :	16.50	Equipment Record :	JACKUP BARGE SANGAM - II	SEA WATER DEPTH
Date Commenced	12/4/18	Circulation Fluid :	Sea Water			Date: 12/4/18 Time: 10:30 Mtrs: 17.0
Date Completed	12/4/18	Drilling Orientation :	Vertical	Type of Rig :	Hydraulic / Shell & Auger	
Coordinates (Given)	E: 201507.205	N: 9620833.159		Details of Casing (m) :	SX: 3.00 m HX: NX:	
Coordinates (Achived)	E: 201497.3	N: 9620862		Core-Diameter (mm) :		

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum	Remarks
TYPE	From (m)	To (m)	150	300	450	'N' VALUE	TCR %	SCR %	RQD %	W.G	F.I.		Strata Description	
DS	0.00	0.50											Yellowish brown medium to fine SAND with SHELL FRAGMENTS	L-0.50m
DS	1.00	1.50												
SPT	1.50	1.95	3	7	12	19							M. DENSE yellowish brown medium to fine SAND with SHELL FRAGMENTS	
DS	2.50	3.00												
SPT	3.00	3.45	1	2	1	3							Very LOOSE brownish Grey medium to fine SAND with SHELL FRAGMENTS	
DS	3.45	3.65											BH-4 TERMINATED AT 3.65m below the sea BED LEVEL	

Details:

Weather Condition:

For Horizon (HSCIPL) Representative

For Client Representative

12/4/18

Plate-B5

Horizon Survey Company India Pvt. Ltd.

HORIZON GEOSCIENCES

BOREHOLE NO. : BH-5

Project No.	:	GT-VOCPT-088			Client : V.O. Chidambaranar Port Trust		SHEET 1 of 1
Project Name	:	Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port					
T.D. (m)	:	3.50	Sea Bed Level w.r.t. CD in (m) :	16.60	Equipment Record :	JACKUP BARGE	SEA WATER DEPTH
Date Commenced	:	14/4/18	Circulation Fluid :	Sea Water		SANGAM - II	Date: 14/4/18 Time: 18.00 Mtrs.: 17.10
Date Completed	:	14/4/18	Drilling Orientation :	Vertical	Type of Rig :	Hydraulic / Shell & Auger	
Coordinates (Given)	:	E: 201137.704	N: 962420.011		Details of Casing (m) :	SX: 2.40 HX: 2.40 NX:	
Coordinates (Achived)		E: 201147.5	N: 962428.2		Core-Diameter (mm) :		

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum / Strata Description	Remarks
TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.			
DS	0.00	0.50											YELLOWISH BROWN FINE SAND WITH SHELL FRAGMENTS	L-1m
DS	0.50	1.00												
SPT	1.50	1.95	6	6	15	21							MDENSE YELLOWISH BROWN MEDIUM TO COARSE SAND WITH SHELL FRAGMENTS	
DS	2.00	2.35											YELLOWISH BROWN WEATHERD ROCK FRAGMENTS	
SPT	2.35	2.40	50			R							VDENSE YELLOWISH BROWN WEATHERD ROCK FRAGMENTS	
NX CORE	2.40	3.50					68	48	18	IV	5		MODERATELY TO HIGHLY WEATHERD YELLOWISH BROWN MODERATELY STRONG TO MODERATLY WEAK CALCARIOUS SANDSTONE	
													BH-5 TERMINATED AT 3.50m DEPTH BELOW THE SEA BED LEVEL	

Details:

Weather Condition :

For Horizon (HSCIPL) Representative

Sathi

For Client Representative

14/4/18

Plate-B6

Horizon Survey Company India Pvt. Ltd.

HORIZON GEOSCIENCES

BOREHOLE NO. : BH-6

Project No.	GT-VOCPT-088					
Project Name	Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port			Client : V.O. Chidambaranar Port Trust		SHEET 1 of 1
T.D. (m) :	4.95	Sea Bed Level w.r.t. CD in (m) :	15.10	Equipment Record :	JACKUP BARGE SANGAM - II	SEA WATER DEPTH
Date Commenced :	11/4/18	Circulation Fluid :	Sea Water			Date / Time / Mtrs
Date Completed :	11/4/18	Drilling Orientation :	Vertical	Type of Rig :	Hydraulic / Shell & Auger	11/4/18 / 10:10 / 16.6
Coordinates (Given) :	E : 200768.204	N : 962756.863		Details of Casing (m) :	SX : 4.50 HX : NX :	
Coordinates (Achived)	E : 200753.1	N : 962754.8		Core-Diameter (mm) :		

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum	Remarks
TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.		Strata Description	
DS	0.00	0.50								.			Brownish Black medium to fine SAND with SHELL FRAGMENTS	L-070.
DS	1.00	1.00												
SPT	1.50	1.95	17	16	9	25							DENSE yellowish brown medium to fine SAND with SHELL FRAGMENTS	
SPT	3.00	3.45	6	4	3	7							LOOSE yellowish brown medium to fine SAND with shell fragments.	
DS	3.50	4.00												
SPT	4.50	4.95	2	1	1	2							Yellowish brown fine SAND with few SHELL FRAGMENS	
													BH-6 TERMINATED AT 4.95 below the sea bed level	

Details:

Weather Condition:

For Horizon (HSCIPL) Representative

For Client Representative

11/4/18

Plate-B7

Horizon Survey Company India Pvt. Ltd.

HORIZON GEOSCIENCES

BOREHOLE NO. : BH-7

Project No.	:	GT-VOCPT-088			Client : V.O. Chidambaranar Port Trust		SHEET 1 of 2
Project Name	:	Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port					
T.D. (m)	:	4.95	Sea Bed Level w.r.t. CD in (m) :	15.40	Equipment Record :	JACKUP BARGE	SEA WATER DEPTH
Date Commenced	:	15/4/18	Circulation Fluid :	Sea Water		SANGAM - II	Date / Time / Mtrs.
Date Completed	:	15/4/18	Drilling Orientation :	Vertical	Type of Rig :	Hydraulic / Shell & Auger	15/4/18 / 11.46 / 16.32
Coordinates (Given)	:	E: 200398.703	N: 963093.715		Details of Casing (m) :	SX: 4.50 HX: NX:	
Coordinates (Achived)		E: 200378.4	N: 963088.6		Core-Diameter (mm) :		

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum	Remarks
TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.		Strata Description	
DS	0.00	0.50											Greyish medium to fine SAND with SHELL FRAGMENTS	L-1
DS	1.00	1.50												
SPT	1.50	1.95	7	12	21	33							DENSE Greyish fine SAND with few SHELL FRAGMENTS	
DS	2.00	2.50											Greyish CLAYEY SILT with SHELL FRAGMENT	
SPT	3.12	3.57	6	14	16	30							VERY Stif Greyish CLAYEY SILT with GRAVELS	
DS	4.00	4.50											GYEYISH hard CLAYEY SAND	

Details:

Weather Condition :

For Horizon (HSCIPL) Representative

sushil

For Client Representative

15/4/18

Plate-B8

BOREHOLE NO. : 7

Project No.	:	GT-VOCPT-088			Client : V.O. Chidambaranar Port Trust		SHEET 2 of 2
Project Name	:	Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port					
T.D. (m)	:	4.95	Sea Bed Level w.r.t. CD in (m) :	15.40	Equipment Record :	JACKUP BARGE	SEA WATER DEPTH
Date Commenced	:	15/4/18	Circulation Fluid :	Sea Water		SANGAM - II	Date / Time / Mtrs.
Date Completed	:	15/4/18	Drilling Orientation :	Vertical	Type of Rig :	Hydraulic / Shell & Auger	15/4/18 / 11.46 / 16.30
Coordinates (Given)	:	E : 200398.703	N : 963093.715		Details of Casing (m) :	SX : 4.50 / HX : / NX :	
Coordinates (Achived)		E : 200378.4	N : 963088.6		Core-Diameter (mm) :		

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum	Remarks
TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.		Strata Description	
SPT	4.50	4.95	35	19	23	42							Hard Grey CLAY with wearth ROCK Fragments	
													BH-7 Terminated At 4.95m below the sea bed level	

Details:

Weather Condition :

For Horizon (HSCIPL) Representative

sudhN

For Client Representative

15/4/18

Plate-B9

Horizon Survey Company India Pvt. Ltd.

HORIZON GEOSCIENCES

BOREHOLE NO. : BH-8

Project No.	GT-VOCPT-088			Client : V.O. Chidambaranar Port Trust		SHEET 1 of 2	
Project Name	Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port						
T.D. (m) :	4.70	Sea Bed Level w.r.t. CD in (m) :	15.30	Equipment Record :	JACKUP BARGE SANGAM - II	SEA WATER DEPTH	
Date Commenced :	10/4/18	Circulation Fluid :	Sea Water			Date	Time / Mtrs.
Date Completed :	10/4/18	Drilling Orientation :	Vertical	Type of Rig :	Hydraulic / Shell & Auger	10/4/18	18.00 / 15.8
Coordinates (Given) :	E: 200205.094	N: 963270.218		Details of Casing (m) :	SX 4.20 HX 4.20 NX		
Coordinates (Achived)	E: 200200.3	N: 963263.2		Core-Diameter (mm) :			

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum	Remarks
TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I		Strata Description	
DS	0.00	0.50											Yellowish brown medium to fine SAND with shell fragments	L-3m
DS	0.50	1.00												
SPT	1.50	1.95	6	6	8	14							MDENSE yellowish brown midium to fine SILTY SAND	
DS	2.00	2.50												
DS	2.75	3.00											yellowish brown medium to fine SAND with GRAVELS	
SPT	3.00	3.45	2	2	3	5							LOOSE Greyish white SILTY SAND with SHELL FRAGMENTS	

Details

Weather Condition

For Horizon (HSCIPL) Representative

Supvr

For Client Representative

10/4/18

Plate-B10

BOREHOLE NO. : BH-8

Project No.	GT-VOCPT-088						SHEET 2 of 2
Project Name	Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port			Client : V.O. Chidambaranar Port Trust			
T.D. (m)	4.70	Sea Bed Level w.r.t. CD in (m)	15.30	Equipment Record	JACKUP BARGE		SEA WATER DEPTH
Date Commenced	10/4/18	Circulation Fluid	Sea Water		SANGAM - II		Date / Time / Mtrs
Date Completed	10/4/18	Drilling Orientation	Vertical	Type of Rig	Hydraulic / Shell & Auger		10/4/18 / 18'-00 / 15.81
Coordinates (Given)	E: 200205.094	N: 963270.218		Details of Casing (m)	SX: 4.20 HX: 4.20 NX:		
Coordinates (Achived)	E: 200200.3	N: 963263.2		Core-Diameter (mm)			

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum	Remarks
TYPE	From (m)	To (m)	150	300	450	'N' VALUE	TCR %	SCR %	RQD %	W G	F I		Strata Description	
DS	3.50	4.00											Greyish white SILTY SAND with GRAVELS	
SPT	4.20	4.20				R							NO RECOVERY	
NX CORING	4.20	4.70					100	86	20	IV	4		moderately to highly weathered yellowish brown moderately weak to moderately strong CALCARENITE	
													BH-8 TERMINATED AT 4.70 depth of below the seabed level.	

Details

Weather Conditions

For Horizon (HSCIPL) Representative

For Client Representative

10/4/18

Plate-B11

Horizon Survey Company India Pvt. Ltd.

HORIZON GEOSCIENCES

BOREHOLE NO. : BH-9

Project No.	: GT-VOCPT-088			Client : V.O. Chidambaranar Port Trust		SHEET 1 of 2	
Project Name	: Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port						
T.D. (m)	: 4.95	Sea Bed Level w.r.t. CD in (m)	: 15.30	Equipment Record	: JACKUP BARGE	SEA WATER DEPTH	
Date Commenced	: 10/4/18	Circulation Fluid	: Sea Water		SANGAM - II	Date	Time / Mtrs.
Date Completed	: 10/4/18	Drilling Orientation	: Vertical	Type of Rig	: Hydraulic / Shell & Auger	10/4/18	8:45 / 15.81
Coordinates (Given)	: E: 200029.202	N: 963430.567		Details of Casing (m)	: SX: 4.50 HX: NX:		
Coordinates (Achived)	E: 200020.1	N: 963432.3		Core-Diameter (mm)	:		

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum	Remarks
TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.		Strata Description	
DS	0.00	0.50											Yellowish brown medium to fine SAND with SHELL FRAGMENTS	L-1m
DS	1.00	1.50											Loose yellowish brown medium to fine SAND with SHELL FRAGMENTS	
SPT	1.50	1.95	3	3	4	7								
DS	2.00	2.50												
SPT	3.00	3.45	4	4	5	9								
DS	4.00	4.50												

Details:

Weather Condition

For Horizon (HSCIPL) Representative

Sudhan

For Client Representative

10/4/18

Plate-B12

...on Survey Company India Pvt. Ltd.

HORIZON GEOSCIENCES

BOREHOLE NO. : BH-9

Project No.	:	GT-VOCPT-088			Client : V.O. Chidambaranar Port Trust		SHEET 2 of 2
Project Name	:	Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port					
T.D. (m)	:	4.95	Sea Bed Level w.r.t. CD in (m) :	15.30	Equipment Record :	JACKUP BARGE	SEA WATER DEPTH
Date Commenced	:	10/4/18	Circulation Fluid :	Sea Water		SANGAM - II	Date: 10/4/18 Time: 8:45 Mtrs.: 13.81
Date Completed	:	10/4/18	Drilling Orientation :	Vertical	Type of Rig :	Hydraulic / Shell & Auger	
Coordinates (Given)	:	E: 200029.202	N: 963430.567		Details of Casing (m) :	SX: 4.50 HX: NX:	
Coordinates (Achived)		E: 200020.1	N: 963432.3		Core-Diameter (mm) :		

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum	Remarks
TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.		Strata Description	
SPT	4.50	4.95	4	3	5	8							LOOSE Yellowish brown medium to fine SAND with SHELL FRAGMENTS.	
													BH-9 Terminated At 4.95M below the sea bed level	

Details:

Weather Condition :

For Horizon (HSCIPL) Representative

For Client Representative

10/4/18

Plate-B13

Horizon Survey Company India Pvt. Ltd.

HORIZON GEOSCIENCES

BOREHOLE NO. : 10

Project No.	: GT-VOCPT-088			Client : V.O. Chidambaranar Port Trust		SHEET 1 of 1	
Project Name	: Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port						
T.D. (m)	: 5.95m	Sea Bed Level w.r.t. CD in (m) :	14.50	Equipment Record :	JACKUP BARGE	SEA WATER DEPTH	
Date Commenced	: 8/4/18	Circulation Fluid :	Sea Water		SANGAM - II	Date	Time / Mtrs.
Date Completed	: 8/4/18	Drilling Orientation :	Vertical	Type of Rig :	Hydraulic / Shell & Auger	8/4/18	10:20 / 15.00
Coordinates (Given)	: E: 199659.702	N: 963767.419		Details of Casing (m) :	SX: 5.50 HX: NX:		
Coordinates (Achived)	E: 199641.1	N: 963756.3		Core-Diameter (mm) :			

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum	Remarks
TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.		Strata Description	
DS	0.00	0.50											Yellowish brown medium to fine SAND with SHELL Fragments	1 - 1m
SPT	1.50	1.95	13	9	10	19							MDENSE yellowish brown medium to fine SAND with SHELL Fragments	
SPT	3.00	3.45	3	4	11	15								
SPT	4.50	4.87	3	31	50	R							VDENSE yellowish brown CLAYEY SILTYSAND	
SPT	5.50	5.95	11	16	19	35							DENSE yellowish brown SILTY SAND	
													BH-10 Terminated depth AT 5.95m below the sea bed level.	

Details:

Weather Condition :

For Horizon (HSCIPL) Representative

For Client Representative

8/4/18

Plate-B14

Horizon Survey Company India Pvt. Ltd.

HORIZON GEOSCIENCES

BOREHOLE NO. : 11

Project No.	: GT-VOCPT-088			Client : V.O. Chidambaranar Port Trust		SHEET 1 of 1	
Project Name	: Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port						
T.D. (m)	: 4.50	Sea Bed Level w.r.t. CD in (m)	: 15.70	Equipment Record	: JACKUP BARGE	SEA WATER DEPTH	
Date Commenced	: 15/4/18	Circulation Fluid	: Sea Water		SANGAM - II	Date / Time / Mtrs.	
Date Completed	: 15/4/18	Drilling Orientation	: Vertical	Type of Rig	: Hydraulic / Shell & Auger		
Coordinates (Given)	: E: 199290.201	N: 964104.271		Details of Casing (m)	: SX: 2.60 HX: NX: 3.50		
Coordinates (Achived)	E: 199278.7	N: 964089.3		Core-Diameter (mm)	:		

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum	Remarks
TYPE	From (m)	To (m)	150	300	450	'N' VALUE	TCR %	SCR %	RQD %	W.G	F.I.		Strata Description	
DS	0.00	0.50											Yellowish Brown fine SAND with SHELL FRAGMENT	L-1
DS	0.50	1.00												
SPT	1.50	1.90	9	9	50	R							1.V DENSE yellowish brown fine SAND with GRAVELS (1.5-1.9) 2.Greyish white wethered ROCK fragments (1.5-1.90)	
NX CORING	2.00	3.50					59	44	17	1N1	4		Yellowish brown moderately to slightly weathered, moderately weak to strong CALCAREOUS SANDSTONE.	
NX CORE	3.50	4.50					67	48	13	1N1	3			
													BH-11 terminated At 4.50m below the sea bed level	

Details:

Weather Condition :

For Horizon (HSCIPL) Representative

sushin

For Client Representative

15/4/18

Plate-B15

Horizon Survey Company India Pvt. Ltd.

HORIZON GEOSCIENCES

BOREHOLE NO. : 12

Project No.	:	GT-VOCPT-088		Client	:	V.O. Chidambaranar Port Trust	SHEET 1 of 1
Project Name	:	Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port					
T.D. (m)	:	4.00 M	Sea Bed Level w.r.t. CD in (m) : 16.20	Equipment Record	:	JACKUP BARGE: SANGAM - II	SEA WATER DEPTH: Date 7/4/18, Time 15:00, Mtrs. 16.71
Date Commenced	:	7/4/18	Circulation Fluid : Sea Water				
Date Completed	:	7/4/18	Drilling Orientation : Vertical	Type of Rig	:	Hydraulic / Shell & Auger	
Coordinates (Given)	:	E: 198920.7	N: 964441.123	Details of Casing (m)	:	SX: 1m HX: 15m NX: 3.0m	
Coordinates (Achived)		E: 198912.3	N: 964449.1	Core-Diameter (mm)	:		

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum	Remarks
TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.		Strata Description	
DS	0.00	0.50											Brownish white medium to fine SAND with SHELL fragments	1 - 0.50
SPT	1.50	1.55	50			R							V DENSE yellowish brown weather rock fragments	
NX CORE	1.55	3.00					90	90	25	IV	>10		Moderately to highly weathered yellowish brown fine to medium grain moderately to moderately ~~weak~~ WEEK CALCAREOUS SANDSTONE	
NX CORE	3.00	4.00					100	77	26	IV	8		BH 12 TERMINATED AT 4M below the sea bed.	

Details:

Weather Condition

For Horizon (HSCIPL) Representative: sushil

For Client Representative: 7/4/18

Plate-B16

Horizon Survey Company India Pvt. Ltd.

HORIZON GEOSCIENCES

BOREHOLE NO. : 13

Project No.	:	GT-VOCPT-088			Client : V.O. Chidambaranar Port Trust		SHEET 1 of 1
Project Name	:	Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port					
T.D. (m)	:	4.00	Sea Bed Level w.r.t. CD in (m) :	16.10	Equipment Record :	JACKUP BARGE	SEA WATER DEPTH
Date Commenced	:	16/4/18	Circulation Fluid :	Sea Water		SANGAM - II	Date / Time / Mtrs.
Date Completed	:	16/4/18	Drilling Orientation :	Vertical	Type of Rig :	Hydraulic / Shell & Auger	16/4/18 / 9:40 / 16.58
Coordinates (Given)	:	E: 198551.2	N: 964777.975		Details of Casing (m) :	SX: 1.50 HX: NX:	
Coordinates (Achived)		E: 198540.2	N: 964805.7		Core-Diameter (mm) :		

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum	Remarks
TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.		Strata Description	
DS	0.00	0.50											Greyish brown medium to fine SAND with SHELL FRAGMENTS	1 - 0.50m
DS	0.50	1.00												
SPT	1.50	1.57				R							NO Recovery	
NX CORE	1.50	2.50					80	42	38	111	5		highly to moderately weathered yellowish brown moderately weak to moderately strong CALCAREOUS SANDSTONE	
NX CORE	2.50	4.00					63	30	10	111	7			
													BH B Terminated At 4.00 depth below the sea bed	

Details:

Weather Condition :

For Horizon (HSCIPL) Representative

Sudhi

For Client Representative

16/4/18

Plate-B17

Horizon Survey Company India Pvt. Ltd.

HORIZON GEOSCIENCES

BOREHOLE NO. : 14

Project No.	:	GT-VOCPT-088			Client : V.O. Chidambaranar Port Trust		SHEET 1 of 1
Project Name	:	Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port					
T.D. (m)	:	4.10	Sea Bed Level w.r.t. CD in (m) :	16.00	Equipment Record :	JACKUP BARGE	SEA WATER DEPTH
Date Commenced	:	16/4/18	Circulation Fluid :	Sea Water		SANGAM - II	Date: 16/4/18 Time: 18.00 Mtrs: 16.30
Date Completed	:	16/4/18	Drilling Orientation :	Vertical	Type of Rig :	Hydraulic / Shell & Auger	
Coordinates (Given)	:	E : 198181.699	N : 965114.827		Details of Casing (m) :	SX : 1.00 HX : NX : 1.70	
Coordinates (Achived)		E : 198186.3	N : 965133.6		Core-Diameter (mm) :		

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum	Remarks
TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.		Strata Description	
DS	0.00	0.50											yellowish brown fine SAND with SHELL FRAGMENTS	L-0.80m
DS	0.50	1.00												
SPT	1.50	1.70	13	50		R							V DENSE yellowish brown fine SAND with SHELL FRAGMENTS	
NX CORE	1.70	3.20					63	42	9	111	5		yellowish brown moderately weathered to moderately fractured moderately strong to moderately weak CALCAREOUS SANDSTONE	
NX CORE	3.20	4.10					64	59	0	111	7			
													BH-14 terminated At 4.10m depth below the sea bed level	

Details:

Weather Condition :

For Horizon (HSCIPL) Representative

Sushil

For Client Representative

16/4/18

Plate-B18

Horizon Survey Company India Pvt. Ltd.

HORIZON GEOSCIENCES

BOREHOLE NO. : 15

Project No.	:	GT-VOCPT-088			Client : V.O. Chidambaranar Port Trust		SHEET 1 of 1
Project Name	:	Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port					
T.D. (m)	:	4.50	Sea Bed Level w.r.t. CD in (m) :	15.60	Equipment Record :	JACKUP BARGE	SEA WATER DEPTH
Date Commenced	:	17/4/18	Circulation Fluid :	Sea Water		SANGAM - II	Date / Time / Mtrs
Date Completed	:	17/4/18	Drilling Orientation :	Vertical	Type of Rig :	Hydraulic / Shell & Auger	17/4/18 / 17'40 / 16.0
Coordinates (Given)	:	E: 197812.199	N: 965451.679		Details of Casing (m) :	SX: 1.40 HX: NX: 3.00	
Coordinates (Achived)	:	E: 197808.3	N: 965473.4		Core-Diameter (mm) :		

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum	Remarks
TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I		Strata Description	
DS	0.00	0.50											Yellowish brown fine SAND with SHELL FRAGMENTS	L-0.70
DS	0.50	1.00												
SPT	1.40	1.50	50			R							V DENSE YELLOWISH GREY WEATHERD ROCK FRAGMENTS	
NX CORE	1.50	3.00					58	28	0	IV	3		Yellowish Grey moderately weathered to moderately fracture moderately weak to moderately strong CALCAREOUS SANDSTONE	
NX CORE	3.00	4.50					43	13	0	IV	2			
													BH-15 terminated AT 4.50m depth below the sea bed level	

Details:

Weather Condition

For Horizon (HSCIPL) Representative

For Client Representative

17/4/18

Plate-B19

BOREHOLE NO. : 16

ect No.	: GT-VOCPT-088			Client : V.O. Chidambaranar Port Trust		SHEET 1 of 1	
ect Name	: Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port						
(m)	: 4.80	Sea Bed Level w.r.t. CD in (m) :	15.20	Equipment Record :	JACKUP BARGE	SEA WATER DEPTH	
Commenced	: 18/4/18	Circulation Fluid :	Sea Water		SANGAM - II	Date	Time / Mtrs.
Completed	: 18/4/18	Drilling Orientation :	Vertical	Type of Rig :	Hydraulic / Shell & Auger	18/4/18	9:30 / 15.90
rdinates (Given)	: E: 197641.043	N: 965615.519		Details of Casing (m) :	SX: 0.80 HX:	NX: 2.10	
rdinates (Achived)	E: 197626.5	N: 965600.3		Core-Diameter (mm) :			

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum	Remarks
TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.		Strata Description	
IS	0.00	0.50											Greyish brown medium to coarse SAND with SHELL FRAGMENTS	L-0.50
PT	0.80	0.80	50			R								
7 RING	0.80	2.10					100	75	54	III			yellowish Grey slightly weathered moderately strong CALCAREOUS SANDSTONE	
7 RING	2.10	3.60					53	35	22	IV			yellowish Grey moderately weathered, moderately weak to moderately strong CALCAREOUS SANDSTONE	
7 RING	3.60	4.80					35	6	0	IV			completly to highly weathered yellowish Grey moderatly weak to weak CALCAREOUS SANTSTONE	
													BH-16 terminated at 4.80m below the seabed level	

For Horizon (HSCIPL) Representative

For Client Representative

18/4/18

orizon Survey Company India Pvt. Ltd.

HORIZON GEOSCIENCES

BOREHOLE NO. : 17

oject No. :	GT-VOCPT-088			Client : V.O. Chidambaranar Port Trust		SHEET 1 of 1	
oject Name :	Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port						
D. (m) :	5.00	Sea Bed Level w.r.t. CD in (m) :	15.30	Equipment Record :	JACKUP BARGE	SEA WATER DEPTH	
ıte Commenced :	18/4/18	Circulation Fluid :	Sea Water		SANGAM - II	Date	Time / Mtrs.
ıte Completed :	18/4/18	Drilling Orientation :	Vertical	Type of Rig :	Hydraulic / Shell & Auger	18/4/18	18.30 / 15.90
ordinates (Given) :	E: 197442.698	N: 965788.531		Details of Casing (m) :	SX: 0.60 HX: NX: 0.70		
ordinates (Achived)	E: 197441.2	N: 965771.8		Core-Diameter (mm) :			

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum	Remarks
TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.		Strata Description	
DS	0.00	0.30											Greyish Brown medium to coarse SAND with SHELL FRAGMENTS	
SPT	0.60	0.66	50			R							NO RECOVERY	
NX CORING	0.66	2.00					72	61	28	III	6		yellowish Grey moderately weathered moderately weak to moderately strong CALCAREOUS SANDSTONE	
NX CORING	2.00	3.50					34	07	0	IV	1		yellowish Grey complitly to highly weathered weak to weak CALCAREOUS SANDSTONE	
SPT	3.50	3.60	50			R							very DENSE yellowish Grey weathered ROCK FRAGMENTS	
NX CORING	3.60	5.00					57	17	0	IV	3		yellowish Grey moderately weathred moderately weak to moderately strong CALCAREOUS SANDSTONE	
													BH-17 terminated at 5.00 below the seabed level	

Details:

Weather Condition :

For Horizon (HSCIPL) Representative

For Client Representative

18/4/18

Plate-B21

orizon Survey Company India Pvt. Ltd.

HORIZON GEOSCIENCES

BOREHOLE NO. : 18

ect No.	: GT-VOCPT-088			Client : V.O. Chidambaranar Port Trust		SHEET 1 of 1	
ject Name	: Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port						
(m)	: 5.25	Sea Bed Level w.r.t. CD in (m) :	15.60	Equipment Record :	JACKUP BARGE	SEA WATER DEPTH	
e Commenced	: 19/4/18	Circulation Fluid :	Sea Water		SANGAM - II	Date / Time / Mtrs.	
e Completed	: 19/4/18	Drilling Orientation :	Vertical	Type of Rig :	Hydraulic / Shell & Auger	19/4/18 / 9:40 / 15.62	
ordinates (Given)	: E: 197073.197	N: 966125.383		Details of Casing (m) :	SX: 0.55 HX: NX: 2.05		
ordinates (Achived)	E: 197080.1	N: 966128 5		Core-Diameter (mm) :			

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum	Remarks
TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.		Strata Description	
D S	0.00	0.50											Yellowish brown coarse SAND with SHELL and GRAVELS	L-0.50
SPT	0.55	0.55	50			R								
NX. DRING	0.55	2.05					83	76	60	III	4		Yellowish brown moderately weathered, moderately strong to strong CALCAREOUS SANDSTONE	
NX DRNG	2.05	3.55					31	6	0	IV	3		Yellowish Grey highly to completely weathered moderately weak to weak CALCAREOUS SANDSTONE	
NX DRNG	3.55	5.05					12	0	0	V	N1		Yellowish Grey completely weathered, very weak CALCAREOUS SANDSTONE	
SPT	5.05	5.25	17	50		R							VERY DENSE Yellowish Grey weathered ROCK fragments.	
													BH 18 terminated at 5.25m below seabed level	

etails:

eather Condition:

For Horizon (HSCIPL) Representative

Sathiv

For Client Representative

19/4/18

Plate-B22

orizon Survey Company India Pvt. Ltd.

HORIZON GEOSCIENCES

BOREHOLE NO. : 19

oject No.	: GT-VOCPT-088			Client	: V.O. Chidambaranar Port Trust	SHEET 1 of	
oject Name	: Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port						
. (m)	: 4.30	Sea Bed Level w.r.t. CD in (m)	: 15.80	Equipment Record	: JACKUP BARGE	SEA WATER DEPTH	
te Commenced	: 21/4/18	Circulation Fluid	: Sea Water		SANGAM - II	Date / Time / Mtrs.	
te Completed	: 21/4/18	Drilling Orientation	: Vertical	Type of Rig	: Hydraulic / Shell & Auger	21/4/18 / 9:30 / 16:25	
ordinates (Given)	: E: 196703.697	N: 966469.235		Details of Casing (m)	: SX: 2.05 HX: NX: 3.60		
ordinates (Achived)	E: 196695.3	N: 966474.5		Core-Diameter (mm)	:		

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum	Remarks
TYPE	From (m)	To (m)	150	300	450	'N' VALUE	TCR %	SCR %	RQD %	W.G	F.I.		Strata Description	
DS	0.00	0.50											Yellowish brown medium to coarse SAND with shell fragments and GRAVELS	L-1m
DS	0.50	1.00												
SPT	1.60	2.05	8	9	8	17							DENSE Greyish white medium to coarse SAND with SHELL FRAGMENTS AND GRAVELS.	
NX CORE	2.10	3.00					25	0	0	V	N1		Yellowish Grey highly weathered to complite fractured moderately weak to weak CALCAREOUS SANDSTONE	
NX CORE	3.00	4.30					35	2	0	V	N1			
													Bit-19 terminated at 4.30m below the sea bed level	

etails

/eather Condition

For Horizon (HSCIPL) Representative

For Client Representative

21/4/18

Plate-B23

Horizon Survey Company India Pvt. Ltd.

HORIZO GEOSCIENC

BOREHOLE NO. : 20

Project No.	:	GT-VOCPT-088			Client : V.O. Chidambaranar Port Trust		SHEET 1 of 1
Project Name	:	Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port					
T.D. (m)	:	5.35	Sea Bed Level w.r.t. CD in (m) :	14.70	Equipment Record :	JACKUP BARGE	SEA WATER DEPTH
Date Commenced	:	20/5/18	Circulation Fluid :	Sea Water		SANGAM - II	Date / Time / M
Date Completed	:	20/5/18	Drilling Orientation :	Vertical	Type of Rig :	Hydraulic / Shell & Auger	20/5/18 / 1230 / LS
Coordinates (Given)	:	E: 196734.196	N: 966799.087		Details of Casing (m) :	SX: 0.65 HX: NX: 0.65	
Coordinates (Achived)		E: 196310.5	N: 966795.0		Core-Diameter (mm) :		

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum	Remarks
TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.		Strata Description	
DS	0.00	0.50											Yellowish brown gravels with weathered ROCK FRAGMENTS	
NX CORE	0.65	2.15					56	36.	24	IV			Yellowish brown moderately weathered moderately strong to weak CALCAREOUS SANDSTONE	
NX CORE	2.15	2.85					100	60	0	IV			Greyish white highly weathered, weak to weak CALCAREOUS SANDSTONE.	
NX CORE	2.85	3.85					80	60	0	IV			"	
NX CORE	3.85	5.35					65	17	0	IV			"	
													BH-20 terminated at 5.35 m below the sea bed level.	

Details:	For Horizon (HSCIPL) Representative	For Client Representative
Weather Condition :	Sudhi	

Plate-B24

Horizon Survey Company India Pvt. Ltd.

HORIZO GEOSCIENC

BOREHOLE NO. : 2

Project No.	:	GT-VOCPT-088			Client : V.O. Chidambaranar Port Trust		SHEET 1 of 1
Project Name	:	Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port					
T.D. (m)	:	5.60	Sea Bed Level w.r.t. CD in (m) :	15.60	Equipment Record :	JACKUP BARGE	SEA WATER DEPTH
Date Commenced	:	20/5/18	Circulation Fluid :	Sea Water		SANGAM - II	Date / Time / M
Date Completed	:	20/5/18	Drilling Orientation :	Vertical	Type of Rig :	Hydraulic / Shell & Auger	20/5/18 9:20 W4
Coordinates (Given)	:	E: 195964.695	N: 967135.939		Details of Casing (m) :	SX: 0.60 HX: NX: 0.60	50
Coordinates (Achived)		E: 195931.6	N: 967096.9		Core-Diameter (mm) :		

Sampling Details			Standard Penetration Test (SFT)				Details of Rock core					STRATA DEPTH	Details of Stratum	Remarks
TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.		Strata Description	
DS	0.00	0.50											Yellowish brown Gravels with weathered Rock Fragments	
SPT	0.50	0.60	50			R							NO RECOVERY	
NX CORE	0.60	2.10					87	47	43	IV	6		Yellowish brown moderately weatherd moderetaly strong to weak CALCAREOUS SANDSTONE	
NX CORE	2.10	3.60					50	7	7	V	1		Yellowish brown highly weatherd weak to weak CALCAREOUS SANDSTONG	
NX CORE	3.60	5.00					60	60	29	IV	7		Greyish white highly weatherd weak to weak CALCAREOUS SANDSTONE	
													BH-21 terminated at 5.60 m below the seabed level	

Details:

Weather Condition :

For Horizon (HSCIPL) Representative

Sudhir

For Client Representative

20/5/18

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Horizon Survey Company India Pvt. Ltd

HORIZO GEOSCIENC

BOREHOLE NO. : 22

Project No.	:	GT-VOCPT-088			Client : V.O. Chidambaranar Port Trust		SHEET 1 of 1
Project Name	:	Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port					
T.D. (m)	:	5.05	Sea Bed Level w.r.t. CD in (m) :	15.00	Equipment Record :	JACKUP BARGE, SANGAM - II	SEA WATER DEPTH
Date Commenced	:	15/5/18	Circulation Fluid :	Sea Water			Date: 15/5/18, Time: 9:35, M: 15
Date Completed	:	15/5/18	Drilling Orientation :	Vertical	Type of Rig :	Hydraulic / Shell & Auger	
Coordinates (Given)	:	E: 195595.195	N: 967472.791		Details of Casing (m) :	SX: 0.55 HX: NX: 1.55	
Coordinates (Achived)		E: 195578.3	N: 967465.2		Core-Diameter (mm) :		

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum	Remarks
TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.		Strata Description	
DS	0.00	0.50											Yellowish brown Gravels with weathered Rock fragments	L-020
~~DPX~~ CORG	0.55	1.55					36	14	0	V	2		Yellowish brown highly weathered weak to weak CALCAREOUS SANDSTONE	
NX. CORG	1.55	2.55					52	0	0	V	N1			
NX CORG	2.55	4.05					52	0	0	V	N1			
NX CORG	4.05	5.05					100	57	57	IV	2		Greyish white moderately weathered weak to weak CALCAREOUS SANDSTONE	
													BH-22 terminated at 5.05m below the sea bed level	

Details:

Weather Condition :

For Horizon (HSCIPL) Representative: Sushil

For Client Representative: 15/5/18

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Horizon Survey Company India Pvt. Ltd.

HORIZON GEOSCIENCES

BOREHOLE NO. : BH-23

Project No.	:	GT-VOCPT-088			Client : V.O. Chidambaranar Port Trust		SHEET 1 of 1
Project Name	:	Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port					
T.D. (m)	:	5.15	Sea Bed Level w.r.t. CD in (m) :	14.90	Equipment Record :	JACKUP BARGE: SANGAM - II	SEA WATER DEPTH
Date Commenced	:	9/5/18	Circulation Fluid :	Sea Water			Date: 9/5/18 Time: 9.40 Mtrs.: 15.90
Date Completed	:	9/5/18	Drilling Orientation :	Vertical	Type of Rig :	Hydraulic / Shell & Auger	
Coordinates (Given)	:	E: 195 225.853	N: 9678099.498		Details of Casing (m) :	SX: 0.60 HX: NX: 0.65	
Coordinates (Achived)		E: 195222.3	N: 967797.5		Core-Diameter (mm) :		

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum	Remarks
TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.		Strata Description	
DS	0.00	0.50											Yellowish brown Gravels with weathered ROCK fragments	L-0.20
SPT	0.60	0.65	50			R							NO RECOVERY	
NX. CORE	0.65	1.75					85	50	30	IV	3		yellowish brown moderately weathered Medium to weak CALCAREOUS SANDSTONE	
NX CORE	1.75	2.25					100	0	0	IV	NIL		yellowish brown highly weathered weak to weak CALCAREOUS SANDSTONE	
NX CORE	2.25	3.75					72	32	27	IV	3			
NX CORE	3.75	5.15					60	20	20	IV	2			
													BH-23 terminated at 5.15m below the seabed level	

Details:

Weather Condition :

For Horizon (HSCIPL) Representative: Sushil

For Client Representative: 9/5/18

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Horizon Survey Company India Pvt. Ltd.

HORIZON GEOSCIENCES

BOREHOLE NO. : 24

Project No.	:	GT-VOCPT-088			Client : V.O. Chidambaranar Port Trust		SHEET 1 of 2
Project Name	:	Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port					
T.D. (m)	:	5.12	Sea Bed Level w.r.t. CD in (m) :	14.90	Equipment Record :	JACKUP BARGE	SEA WATER DEPTH
Date Commenced	:	5/5/18	Circulation Fluid :	Sea Water		SANGAM - II	Date / Time / Mtrs.
Date Completed	:	5/5/18	Drilling Orientation :	Vertical	Type of Rig :	Hydraulic / Shell & Auger	5/5/18 / 9.00 / 15.70
Coordinates (Given)	:	E: 194849.783	N: 968145.581		Details of Casing (m) :	SX: 0.57 HX: NX: 1.62	
Coordinates (Achived)		E: 194835.6	N: 968151.7		Core-Diameter (mm) :		

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum	Remarks
TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.		Strata Description	
DS	0.00	0.50											Yellowish brown coarse SAND with GRAVELS CROCK Fragments)	L - 0.30
SPT	0.57	0.62	50			R								
NX. CORING	0.62	1.62					52	0	0	V	N1		Yellowish brown compliteiy weathered weak to weak CALCAREOUS SANDSTONE.	
NX CORING	1.62	2.62					58	12	0	V	2			
NX CORING	2.62	3.12					100	0	0	V	N1			
NX CORING	3.12	4.62					87	80	80	IV	2		Yellowish brown compliteiy weathered moderateiy weak toweak CALCAREOUS SAND STONG	

Details:

Weather Condition :

For Horizon (HSCIPL) Representative

Suthi

For Client Representative

5/5/18

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Horizon Survey Company India Pvt. Ltd.

HORIZON GEOSCIENCES

BOREHOLE NO. : 24

Project No.	:	GT-VOCPT-088			Client : V.O. Chidambaranar Port Trust		SHEET 1 of 2
Project Name	:	Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O. Chidambaranar Port					
T.D. (m)	:	5.12	Sea Bed Level w.r.t. CD in (m) :	14.90	Equipment Record :	JACKUP BARGE	SEA WATER DEPTH
Date Commenced	:	5/5/18	Circulation Fluid :	Sea Water		SANGAM - II	Date: 5/5/18, Time: 9.00, Mtrs: 15.70
Date Completed	:	5/5/18	Drilling Orientation :	Vertical	Type of Rig :	Hydraulic / Shell & Auger	
Coordinates (Given)	:	E: 194849.783	N: 968145.581		Details of Casing (m) :	SX: 0.57 HX: NX: 1.62	
Coordinates (Achived)		E: 194835.6	N: 968151.7		Core-Diameter (mm) :		

Sampling Details			Standard Penetration Test (SPT)				Details of Rock core					STRATA DEPTH	Details of Stratum	Remarks
TYPE	From (m)	To (m)	150	300	450	"N" VALUE	TCR %	SCR %	RQD %	W.G	F.I.		Strata Description	
NX CORE	4.62	5.12					100	14	0	IV	2		Yellowish brown moderately weathered, weak to weak CALCAREOUS SANDSTONE	
													BH-24 terminated at 5.12m below the sealed level	

Details:

Weather Condition:

For Horizon (HSCIPL) Representative: sudhir

For Client Representative: 5/5/18

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APPENDIX C – SOIL – INDEX PROPERTIES – RAW DATA

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

GRAIN SIZE ANALYSIS

		Bore-hole No.		Depth FROM - TO		Wt. of Soil Sieved in gms	I.S. Sieve No.	Wt. of Soil Retained in gms	Cumulative weight Retained	Particles finer than %		
							10	9	9	91.00		
Gravel =	30						4.75	21	30	70.00		
							2.36	19.4	49.4	50.60		
Sand =	69						1.18	17.8	67.2	32.80		
		BH-01		-16.00 - -16.50		100	0.6	13.3	80.5	19.50		
Silt Clay =	1						0.3	13.8	94.3	5.70		
							0.15	4.3	98.6	1.40		
							0.075	0.3	98.9	1.10		
BH.NO.	**Depth(m)**	**SP.Gr(G)**	**C**	**Time**	**Rh '**	**Rh**	**R=Rh'+C**	**He**	**M**	**factor'N'**	**Dia 'D'**	**% finer**
		2.68	1	0.5	10	10.5	11.00	20.85773	0.012073632	3.19	0.077981	35.09524
				1	9.5	10	10.50	21.049515			0.055394	33.5
		Ms	**μ**	2	9	9.5	10.00	21.2413			0.039347	31.90476
		50	0.8	4	8.5	9	9.50	21.433085		N'	0.027948	30.30952
				8	7.5	8	8.50	21.816655		0.94	0.019938	27.11905
				15	6	6.5	7.00	22.39201			0.014752	22.33333
				30	5	5.5	6.00	22.77558			0.01052	19.14286
				63	3.5	4	4.50	23.350935			0.007351	14.35714
				113	2	2.5	3.00	23.92629			0.005556	9.571429
				240	1.5	2	2.50	24.118075			0.003827	7.97619
				1408	1	1.5	2.00	24.30986			0.001586	6.380952

Horizon Survey Company India Pvt. Ltd.

HORIZON GEOSCIENCES

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

GRAIN SIZE ANALYSIS

		Bore-hole		Depth		Wt. of Soil	I.S.	Wt. of Soil	Cumulative	Particles
		No.		FROM - TO		Sieved in	Sieve	Retained	weight	finer than %
						gms	No.	in gms	Retained	
							10	**8.8**	**8.8**	91.20
Gravel =	22						4.75	12.8	21.6	78.40
							2.36	17.6	39.2	60.80
Sand =	77						1.18	23.7	62.9	37.10
		BH-02		-15.40 - -15.90		100	0.6	10.5	73.4	26.60
Silt Clay =	1						0.3	15.8	89.2	10.80
							0.15	8.9	98.1	1.90
							0.075	0.5	98.6	1.40

		Bore-hole		Depth		Wt. of Soil	I.S.	Wt. of Soil	Cumulative	Particles
		No.		FROM - TO		Sieved in	Sieve	Retained	weight	finer than %
						gms	No.	in gms	Retained	
							10	5.3	5.3	94.70
Gravel =	8						4.75	2.6	7.9	92.10
							2.36	1.6	9.5	90.50
Sand =	79						1.18	6	15.5	84.50
		BH-02		-16.69 - -17.14		100	0.6	11.5	27	73.00
Silt Clay =	14						0.3	41.6	68.6	31.40
							0.15	15	83.6	16.40
							0.075	2.9	86.5	13.50

BH.NO.		SP.Gr(G)	C	Time	Rh '	Rh	R=Rh'+C	He	M	factor'N'	Dia 'D'	% finer
		2.66	1	0.5	7	7.5	8.00	22.00844	0.012146147	1.60	0.0805839	12.819277
				1	6	6.5	7.00	22.39201			0.0574758	11.216867
		Ms	**μ**	2	5	5.5	6.00	22.77558			0.0409881	9.6144578
		100	0.8	4	4.5	5	5.50	22.967365		N'	0.0291048	8.813253
				8	4	4.5	5.00	23.15915		0.56	0.0206659	8.0120482
				15	3.5	4	4.50	23.350935			0.0151546	7.2108434
				30	3	3.5	4.00	23.54272			0.0107599	6.4096386
				63	2.5	3	3.50	23.734505			0.0074552	5.6084337
				113	2	2.5	3.00	23.92629			0.005589	4.8072289
				240	1.5	2	2.50	24.118075			0.0038504	4.0060241
				1408	1	1.5	2.00	24.30986			0.001596	3.2048193

		Bore-hole		Depth		Wt. of Soil	I.S.	Wt. of Soil	Cumulative	Particles
		No.		FROM - TO		Sieved in	Sieve	Retained	weight	finer than %
						gms	No.	in gms	Retained	
							10	**0**	**0**	100.00
Gravel =	0						4.75	0	0	100.00
							2.36	0.4	0.4	99.60
Sand =	88						1.18	5	5.4	94.60
		BH-02		-20.07 - -20.52		100	0.6	4.8	10.2	89.80
Silt Clay =	12						0.3	15.8	26	74.00
							0.15	50.1	76.1	23.90
							0.075	12	88.1	11.90

BH.NO.	Depth(m)	SP.Gr(G)	C	Time	Rh '	Rh	R=Rh'+C	He	M	factor'N'	Dia 'D'	% finer
		2.68	1	0.5	5.5	6	6.50	22.583795	0.012073632	1.60	0.0811431	10.369048
				1	5	5.5	6.00	22.77558			0.0576199	9.5714286
		Ms	**μ**	2	4	4.5	5.00	23.15915			0.0410851	7.9761905
		100	0.8	4	3	3.5	4.00	23.54272		N'	0.0292911	6.3809524
				8	2.5	3	3.50	23.734505		0.47	0.0207962	5.5833333
				15	2.5	3	3.50	23.734505			0.0151874	5.5833333
				30	2	2.5	3.00	23.92629			0.0107824	4.7857143
				63	1.5	2	2.50	24.118075			0.0074703	3.9880952
				113	1	1.5	2.00	24.30986			0.0056	3.1904762
				240	1	1.5	2.00	24.30986			0.0038426	3.1904762
				1408	1	1.5	2.00	24.30986			0.0015865	3.1904762

Plate-C2

Horizon Survey Company India Pvt. Ltd.

HORIZON GEOSCIENCES

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

GRAIN SIZE ANALYSIS

		Bore-hole		Depth		Wt. of Soil	I.S.	Wt. of Soil	Cumulative	Particles		
		No.		FROM - TO		Sieved in	Sieve	Retained	weight	finer than %		
						gms	No.	in gms	Retained			
							10	0	0	100.00		
Gravel =	5						4.75	4.8	4.8	95.20		
							2.36	3.1	7.9	92.10		
Sand =	94						1.18	6.6	14.5	85.50		
		BH-03		-15.30 - -15.80		100	0.6	17.8	32.3	67.70		
Silt Clay =	1						0.3	42.3	74.6	25.40		
							0.15	22.2	96.8	3.20		
							0.075	2.1	98.9	1.10		
BH.NO.	**Depth(m)**	**SP.Gr(G)**	**C**	**Time**	**Rh '**	**Rh**	**R=Rh'+C**	**He**	**M**	**factor'N'**	**Dia 'D'**	**% finer**
		2.68	1	0.5	10	10.5	11.00	20.85773	0.012073632	3.19	0.077981	35.09524
				1	9.5	10	10.50	21.049515			0.055394	33.5
		Ms	**μ**	2	9	9.5	10.00	21.2413			0.039347	31.90476
		50	0.8	4	8.5	9	9.50	21.433085		N'	0.027948	30.30952
				8	7.5	8	8.50	21.816655		0.94	0.019938	27.11905
				15	6	6.5	7.00	22.39201			0.014752	22.33333
				30	5	5.5	6.00	22.77558			0.01052	19.14286
				63	3.5	4	4.50	23.350935			0.007351	14.35714
				113	2	2.5	3.00	23.92629			0.005556	9.571429
				240	1.5	2	2.50	24.118075			0.003827	7.97619
				1408	1	1.5	2.00	24.30986			0.001586	6.380952

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

GRAIN SIZE ANALYSIS

		Bore-hole		Depth		Wt. of Soil	I.S.	Wt. of Soil	Cumulative	Particles
		No.		FROM - TO		Sieved in	Sieve	Retained	weight	finer than %
						gms	No.	in gms	Retained	
							10	**2.3**	**2.3**	97.70
Gravel =	5						4.75	2.4	4.7	95.30
							2.36	5.5	10.2	89.80
Sand =	94						1.18	15.5	25.7	74.30
		BH-04		-16.50- -17.00		100	0.6	18.4	44.1	55.90
Silt Clay =	2						0.3	35.3	79.4	20.60
							0.15	18.2	97.6	2.40
							0.075	0.8	98.4	1.60

		Bore-hole		Depth		Wt. of Soil	I.S.	Wt. of Soil	Cumulative	Particles
		No.		FROM - TO		Sieved in	Sieve	Retained	weight	finer than %
						gms	No.	in gms	Retained	
							10	3.2	3.2	96.80
Gravel =	5						4.75	1.4	4.6	95.40
							2.36	6.7	11.3	88.70
Sand =	93						1.18	5.6	16.9	83.10
		BH-04		-18.00 - -18.45		100	0.6	18.3	35.2	64.80
Silt Clay =	2						0.3	36.1	71.3	28.70
							0.15	23.8	95.1	4.90
							0.075	2.6	97.7	2.30

		Bore-hole		Depth		Wt. of Soil	I.S.	Wt. of Soil	Cumulative	Particles
		No.		FROM - TO		Sieved in	Sieve	Retained	weight	finer than %
						gms	No.	in gms	Retained	
							10	**0**	**0**	100.00
Gravel =	0						4.75	0.2	0.2	99.80
							2.36	2.2	2.4	97.60
Sand =	99						1.18	8.6	11	89.00
		BH-04		-19.50 - -19.95		100	0.6	39.7	50.7	49.30
Silt Clay =	1						0.3	40.4	91.1	8.90
							0.15	7	98.1	1.90
							0.075	0.6	98.7	1.30

GRAIN SIZE ANALYSIS

		Bore-hole		Depth		Wt. of Soil	I.S.	Wt. of Soil	Cumulative	Particles
		No.		FROM - TO		Sieved in	Sieve	Retained	weight	finer than %
						gms	No.	in gms	Retained	
							10	**0**	**0**	100.00
Gravel =	7						4.75	6.8	6.8	93.20
							2.36	5	11.8	88.20
Sand =	93						1.18	7.9	19.7	80.30
		BH-05		-16.60 - -17.10		100	0.6	19.8	39.5	60.50
Silt Clay =	0						0.3	39.6	79.1	20.90
							0.15	19.8	98.9	1.10
							0.075	1	99.9	0.10
		Bore-hole		**Depth**		**Wt. of Soil**	**I.S.**	**Wt. of Soil**	**Cumulative**	**Particles**
		No.		**FROM - TO**		**Sieved in**	**Sieve**	**Retained**	**weight**	**finer than %**
						gms	**No.**	**in gms**	**Retained**	
							10	0	0	100.00
Gravel =	0						4.75	0	0	100.00
							2.36	0.4	0.4	99.60
Sand =	99						1.18	4.5	4.9	95.10
		BH-05		-18.10 - -18.55		100	0.6	22.4	27.3	72.70
Silt Clay =	1						0.3	49.2	76.5	23.50
							0.15	21.1	97.6	2.40
							0.075	1.4	99	1.00

GRAIN SIZE ANALYSIS

		Bore-hole		Depth		Wt. of Soil	I.S.	Wt. of Soil	Cumulative	Particles
		No.		FROM - TO		Sieved in	Sieve	Retained	weight	finer than %
						gms	No.	in gms	Retained	
							10	0	0	100.00
Gravel =	2						4.75	1.8	1.8	98.20
							2.36	4.4	6.2	93.80
Sand =	96						1.18	17.4	23.6	76.40
		BH-06		-15.10 - -15.60		100	0.6	25.2	48.8	51.20
Silt Clay =	2						0.3	33.1	81.9	18.10
							0.15	15.7	97.6	2.40
							0.075	0.6	98.2	1.80
		Bore-hole		Depth		Wt. of Soil	I.S.	Wt. of Soil	Cumulative	Particles
		No.		FROM - TO		Sieved in	Sieve	Retained	weight	finer than %
						gms	No.	in gms	Retained	
							10	4.8	4.8	95.20
Gravel =	8						4.75	3.2	8	92.00
							2.36	2	10	90.00
Sand =	90						1.18	4.5	14.5	85.50
		BH-06		-16.60 - -17.05		100	0.6	15.8	30.3	69.70
Silt Clay =	2						0.3	41.7	72	28.00
							0.15	25.4	97.4	2.60
							0.075	1	98.4	1.60
		Bore-hole		Depth		Wt. of Soil	I.S.	Wt. of Soil	Cumulative	Particles
		No.		FROM - TO		Sieved in	Sieve	Retained	weight	finer than %
						gms	No.	in gms	Retained	
							10	0	0	100.00
Gravel =	1						4.75	1.3	1.3	98.70
							2.36	1.1	2.4	97.60
Sand =	76						1.18	3.5	5.9	94.10
		BH-06		-19.60 - -20.05		100	0.6	6	11.9	88.10
Silt Clay =	23						0.3	33.3	45.2	54.80
							0.15	27.5	72.7	27.30
							0.075	4.3	77	23.00

BH.NO.	Depth(m)	SP.Gr(G)	C	Time	Rh '	Rh	R=Rh'+C	He	M	factor'N'	Dia 'D'	% finer
		2.65	1	0.5	12.5	13	13.50	19.898805	0.012182898	1.61	0.076856	21.68182
				1	10.5	11	11.50	20.665945			0.055383	18.4697
		Ms	μ	2	7.5	8	8.50	21.816655			0.040237	13.65152
		100	0.8	4	6	6.5	7.00	22.39201		N'	0.028825	11.24242
				8	4.5	5	5.50	22.967365		0.47	0.020642	8.833333
				15	4	4.5	5.00	23.15915			0.015138	8.030303
				30	3.5	4	4.50	23.350935			0.010748	7.227273
				63	2.5	3	3.50	23.734505			0.007478	5.621212
				113	2	2.5	3.00	23.92629			0.005606	4.818182
				240	1.5	2	2.50	24.118075			0.003862	4.015152
				1408	1	1.5	2.00	24.30986			0.001601	3.212121

GRAIN SIZE ANALYSIS

		Bore-hole No.		Depth FROM - TO		Wt. of Soil Sieved in gms	I.S. Sieve No.	Wt. of Soil Retained in gms	Cumulative weight Retained	Particles finer than %		
							10	**0**	**0**	100.00		
Gravel =	3						4.75	3.4	3.4	96.60		
							2.36	6.6	10	90.00		
Sand =	96						1.18	11.1	21.1	78.90		
		BH-07		-16.40 - -16.90		100	0.6	16.1	37.2	62.80		
Silt Clay =	1						0.3	26.7	63.9	36.10		
							0.15	31.8	95.7	4.30		
							0.075	3.3	99	1.00		
		Bore-hole No.		**Depth FROM - TO**		**Wt. of Soil Sieved in gms**	**I.S. Sieve No.**	**Wt. of Soil Retained in gms**	**Cumulative weight Retained**	**Particles finer than %**		
							10	0	0	100.00		
Gravel =	0						4.75	0	0	100.00		
							2.36	1.4	1.4	97.20		
Sand =	52						1.18	1.8	3.2	93.60		
		BH-07		-17.40 - -17.90		50	0.6	3.3	6.5	87.00		
Silt Clay =	48						0.3	11.2	17.7	64.60		
							0.15	8.2	25.9	48.20		
							0.075	0.3	26.2	47.60		
BH.NO.		**SP.Gr(G)**	**C**	**Time**	**Rh '**	**Rh**	**R=Rh'+C**	**He**	**M**	**factor'N'**	**Dia 'D'**	**% finer**
		2.67	1	0.5	13.5	14	14.50	19.515235	0.012109727	3.20	0.0756548	46.365269
				1	12.5	13	13.50	19.898805			0.0540192	43.167665
		Ms	**μ**	2	11.5	12	12.50	20.282375			0.0385637	39.97006
		50	0.8	4	11	11.5	12.00	20.47416		N'	0.0273973	38.371257
				8	10.5	11	11.50	20.665945		1.12	0.0194633	36.772455
				15	10	10.5	11.00	20.85773			0.0142798	35.173653
				30	9.5	10	10.50	21.049515			0.0101437	33.57485
				63	9	9.5	10.00	21.2413			0.0070316	31.976048
				113	8.5	9	9.50	21.433085			0.005274	30.377246
				240	7.5	8	8.50	21.816655			0.0036511	27.179641
				1408	6	6.5	7.00	22.39201			0.0015271	22.383234
		Bore-hole No.		**Depth FROM - TO**		**Wt. of Soil Sieved in gms**	**I.S. Sieve No.**	**Wt. of Soil Retained in gms**	**Cumulative weight Retained**	**Particles finer than %**		
							10	**0**	**0**	100.00		
Gravel =	4						4.75	2.1	2.1	95.80		
							2.36	2.8	4.9	90.20		
Sand =	30						1.18	4.1	9	82.00		
		BH-07		-18.52 - -18.97		50	0.6	2	11	78.00		
Silt Clay =	65						0.3	2.8	13.8	72.40		
							0.15	2.5	16.3	67.40		
							0.075	1	17.3	65.40		
BH.NO.	**Depth(m)**	**SP.Gr(G)**	**C**	**Time**	**Rh '**	**Rh**	**R=Rh'+C**	**He**	**M**	**factor'N'**	**Dia 'D'**	**% finer**
		2.68	1	0.5	19.5	20	20.50	17.213815	0.012073632	3.19	0.0708421	65.404762
				1	18	18.5	19.00	17.78917			0.0509232	60.619048
		Ms	**μ**	2	17	17.5	18.00	18.17274			0.0363943	57.428571
		50	0.8	4	16	16.5	17.00	18.55631		N'	0.0260048	54.238095
				8	15.5	16	16.50	18.748095		0.94	0.018483	52.642857
				15	15	15.5	16.00	18.93988			0.0135669	51.047619
				30	14	14.5	15.00	19.32345			0.0096899	47.857143
				63	13	13.5	14.00	19.70702			0.0067527	44.666667
				113	12	12.5	13.00	20.09059			0.0050909	41.47619
				240	11	11.5	12.00	20.47416			0.0035264	38.285714
				1408	8	8.5	9.00	21.62487			0.0014963	28.714286
		Bore-hole No.		**Depth FROM - TO**		**Wt. of Soil Sieved in gms**	**I.S. Sieve No.**	**Wt. of Soil Retained in gms**	**Cumulative weight Retained**	**Particles finer than %**		
							10	0	0	100.00		
Gravel =	2						4.75	0.8	0.8	98.40		
							2.36	2	2.8	94.40		
Sand =	25						1.18	2.8	5.6	88.80		
		BH-07		-19.40 - -19.90		50	0.6	1.8	7.4	85.20		
Silt Clay =	74						0.3	2.5	9.9	80.20		
							0.15	2.45	12.35	75.30		
							0.075	0.8	13.15	73.70		
BH.NO.		**SP.Gr(G)**	**C**	**Time**	**Rh '**	**Rh**	**R=Rh'+C**	**He**	**M**	**factor'N'**	**Dia 'D'**	**% finer**
		2.68	1	0.5	21.5	22	22.50	16.446675	0.012073632	3.19	0.0692456	71.785714
				1	20.5	21	21.50	16.830245			0.0495317	68.595238
		Ms	**μ**	2	19.5	20	20.50	17.213815			0.0354211	65.404762
		50	0.8	4	18.5	19	19.50	17.597385		N'	0.025324	62.214286
				8	17.5	18	18.50	17.980955		1.12	0.0181009	59.02381
				15	17	17.5	18.00	18.17274			0.0132893	57.428571
				30	16.5	17	17.50	18.364525			0.0094464	55.833333
				63	15	15.5	16.00	18.93988			0.00662	51.047619
				113	14	14.5	15.00	19.32345			0.0049928	47.857143
				240	13	13.5	14.00	19.70702			0.0034597	44.666667
				1408	10	10.5	11.00	20.85773			0.0014695	35.095238

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

GRAIN SIZE ANALYSIS

		Bore-hole		Depth		Wt. of Soil	I.S.	Wt. of Soil	Cumulative	Particles		
		No.		FROM - TO		Sieved in	Sieve	Retained	weight	finer than %		
						gms	No.	in gms	Retained			
							10	0	0	100.00		
Gravel =	2						4.75	1.8	1.8	98.20		
							2.36	3.7	5.5	94.50		
Sand =	98						1.18	16.3	21.8	78.20		
		BH-08		-15.30 - -15.80		100	0.6	30.4	52.2	47.80		
Silt Clay =	1						0.3	30	82.2	17.80		
							0.15	16	98.2	1.80		
							0.075	1.3	99.5	0.50		

		Bore-hole		Depth		Wt. of Soil	I.S.	Wt. of Soil	Cumulative	Particles		
		No.		FROM - TO		Sieved in	Sieve	Retained	weight	finer than %		
						gms	No.	in gms	Retained			
							10	0	0	100.00		
Gravel =	0						4.75	0	0	100.00		
							2.36	0	0	100.00		
Sand =	75						1.18	3.1	3.1	96.90		
		BH-08		-16.80 - -17.25		100	0.6	16.6	19.7	80.30		
Silt Clay =	25						0.3	29.8	49.5	50.50		
							0.15	21.8	71.3	28.70		
							0.075	4.1	75.4	24.60		

BH.NO.		SP.Gr(G)	C	Time	Rh '	Rh	R=Rh'+C	He	M	factor'N'	Dia 'D'	% finer
		2.67	1	0.5	13.5	14	14.50	19.515235	0.012109727	1.60	0.075655	23.18263
				1	12	12.5	13.00	20.09059			0.054279	20.78443
		Ms	μ	2	10.5	11	11.50	20.665945			0.038927	18.38623
		100	0.8	4	9	9.5	10.00	21.2413		N'	0.027906	15.98802
				8	8.5	9	9.50	21.433085		0.56	0.019821	15.18862
				15	7	7.5	8.00	22.00844			0.014668	12.79042
				30	6	6.5	7.00	22.39201			0.010462	11.19162
				63	5	5.5	6.00	22.77558			0.007281	9.592814
				113	4	4.5	5.00	23.15915			0.005482	7.994012
				240	3	3.5	4.00	23.54272			0.003793	6.39521
				1408	1	1.5	2.00	24.30986			0.001591	3.197605

		Bore-hole		Depth		Wt. of Soil	I.S.	Wt. of Soil	Cumulative	Particles		
		No.		FROM - TO		Sieved in	Sieve	Retained	weight	finer than %		
						gms	No.	in gms	Retained			
							10	0	0	100.00		
Gravel =	0						4.75	0.1	0.1	99.90		
							2.36	1.4	1.5	98.50		
Sand =	62						1.18	8.1	9.6	90.40		
		BH-08		-18.30 - -18.75		100	0.6	14.3	23.9	76.10		
Silt Clay =	38						0.3	25.5	49.4	50.60		
							0.15	10.8	60.2	39.80		
							0.075	1.4	61.6	38.40		

BH.NO.	Depth(m)	SP.Gr(G)	C	Time	Rh '	Rh	R=Rh'+C	He	M	factor'N'	Dia 'D'	% finer
		2.66	1	0.5	22	22.5	23.00	16.25489	0.012146147	1.60	0.069254	36.85542
				1	20.5	21	21.50	16.830245			0.049829	34.45181
		Ms	μ	2	18.5	19	19.50	17.597385			0.036029	31.24699
		100	0.8	4	17	17.5	18.00	18.17274		N'	0.025889	28.84337
				8	16	16.5	17.00	18.55631		0.47	0.018499	27.24096
				15	15	15.5	16.00	18.93988			0.013648	25.63855
				30	14	14.5	15.00	19.32345			0.009748	24.03614
				63	12.5	13	13.50	19.898805			0.006826	21.63253
				113	11	11.5	12.00	20.47416			0.00517	19.22892
				240	9	9.5	10.00	21.2413			0.003613	16.0241
				1408	3	3.5	4.00	23.54272			0.001571	6.409639

GRAIN SIZE ANALYSIS

		Bore-hole No.		Depth FROM - TO		Wt. of Soil Sieved in gms	I.S. Sieve No.	Wt. of Soil Retained in gms	Cumulative weight Retained	Particles finer than %		
							10	**3.5**	**3.5**	96.50		
Gravel =	10						4.75	6.2	9.7	90.30		
							2.36	5.2	14.9	85.10		
Sand =	90						1.18	25.4	40.3	59.70		
		BH-09		-15.30 - -15.80		100	0.6	20.2	60.5	39.50		
Silt Clay =	1						0.3	26.6	87.1	12.90		
							0.15	11.3	98.4	1.60		
							0.075	0.8	99.2	0.80		
		Bore-hole No.		**Depth FROM - TO**		**Wt. of Soil Sieved in gms**	**I.S. Sieve No.**	**Wt. of Soil Retained in gms**	**Cumulative weight Retained**	**Particles finer than %**		
							10	0	0	100.00		
Gravel =	2						4.75	2.4	2.4	97.60		
							2.36	1.4	3.8	96.20		
Sand =	96						1.18	10.5	14.3	85.70		
		BH-09		-16.80 - -17.25		100	0.6	21.8	36.1	63.90		
Silt Clay =	1						0.3	44.4	80.5	19.50		
							0.15	17.4	97.9	2.10		
							0.075	0.9	98.8	1.20		
		Bore-hole No.		**Depth FROM - TO**		**Wt. of Soil Sieved in gms**	**I.S. Sieve No.**	**Wt. of Soil Retained in gms**	**Cumulative weight Retained**	**Particles finer than %**		
							10	**0**	**0**	100.00		
Gravel =	2						4.75	1.5	1.5	98.50		
							2.36	1.4	2.9	97.10		
Sand =	80						1.18	20.5	23.4	76.60		
		BH-09		-18.30 - -18.75		100	0.6	17.5	40.9	59.10		
Silt Clay =	19						0.3	19.4	60.3	39.70		
							0.15	17.7	78	22.00		
							0.075	3.5	81.5	18.50		
BH.NO.	**Depth(m)**	**SP.Gr(G)**	**C**	**Time**	**Rh '**	**Rh**	**R=Rh'+C**	**He**	**M**	**factor'N'**	**Dia 'D'**	**% finer**
		2.68	1	0.5	10	10.5	11.00	20.85773	0.012073632	1.60	0.077981	17.54762
				1	8	8.5	9.00	21.62487			0.056145	14.35714
		Ms	**μ**	2	6	6.5	7.00	22.39201			0.040399	11.16667
		100	0.8	4	5	5.5	6.00	22.77558		N'	0.02881	9.571429
				8	4.5	5	5.50	22.967365		0.47	0.020457	8.77381
				15	4	4.5	5.00	23.15915			0.015002	7.97619
				30	3	3.5	4.00	23.54272			0.010696	6.380952
				63	2.5	3	3.50	23.734505			0.007411	5.583333
				113	2	2.5	3.00	23.92629			0.005556	4.785714
				240	1	1.5	2.00	24.30986			0.003843	3.190476
				1408	1	1.5	2.00	24.30986			0.001586	3.190476
		Bore-hole No.		**Depth FROM - TO**		**Wt. of Soil Sieved in gms**	**I.S. Sieve No.**	**Wt. of Soil Retained in gms**	**Cumulative weight Retained**	**Particles finer than %**		
							10	0	0	100.00		
Gravel =	4						4.75	4.4	4.4	95.60		
							2.36	4.4	8.8	91.20		
Sand =	94						1.18	31.8	40.6	59.40		
		BH-09		-19.30 - -19.80		100	0.6	27.8	68.4	31.60		
Silt Clay =	1						0.3	16	84.4	15.60		
							0.15	12.4	96.8	3.20		
							0.075	1.7	98.5	1.50		

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

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		Bore-hole No.		Depth FROM - TO		Wt. of Soil Sieved in gms	I.S. Sieve No.	Wt. of Soil Retained in gms	Cumulative weight Retained	Particles finer than %		
							10	0	0	100.00		
Gravel =	5						4.75	5.4	5.4	94.60		
							2.36	7.4	12.8	87.20		
Sand =	93						1.18	12.4	25.2	74.80		
		BH-10		-14.50 - -15.00		100	0.6	16.6	41.8	58.20		
Silt Clay =	1						0.3	33.4	75.2	24.80		
							0.15	22.2	97.4	2.60		
							0.075	1.4	98.8	1.20		
		Bore-hole No.		Depth FROM - TO		Wt. of Soil Sieved in gms	I.S. Sieve No.	Wt. of Soil Retained in gms	Cumulative weight Retained	Particles finer than %		
							10	3.5	3.5	96.50		
Gravel =	6						4.75	2.5	6	94.00		
							2.36	6.2	12.2	87.80		
Sand =	84						1.18	8.5	20.7	79.30		
		BH-10		-16.00 - -16.45		100	0.6	9.5	30.2	69.80		
Silt Clay =	10						0.3	43	73.2	26.80		
							0.15	17.1	90.3	9.70		
							0.075	0.1	90.4	9.60		
BH.NO.		SP.Gr(G)	C	Time	Rh '	Rh	R=Rh'+C	He	M	factor'N'	Dia 'D'	% finer
		2.66	1	0.5	5	5.5	6.00	22.77558	0.012146147	1.60	0.081976	9.614458
				1	3.5	4	4.50	23.350935			0.058694	7.210843
		Ms	μ	2	3	3.5	4.00	23.54272			0.041673	6.409639
		100	0.8	4	3	3.5	4.00	23.54272		N'	0.029467	6.409639
				8	2.5	3	3.50	23.734505		0.56	0.020921	5.608434
				15	2	2.5	3.00	23.92629			0.01534	4.807229
				30	1.5	2	2.50	24.118075			0.010891	4.006024
				63	1.5	2	2.50	24.118075			0.007515	4.006024
				113	1	1.5	2.00	24.30986			0.005634	3.204819
				240	1	1.5	2.00	24.30986			0.003866	3.204819
				1408	1	1.5	2.00	24.30986			0.001596	3.204819
		Bore-hole No.		Depth FROM - TO		Wt. of Soil Sieved in gms	I.S. Sieve No.	Wt. of Soil Retained in gms	Cumulative weight Retained	Particles finer than %		
							10	2.8	2.8	97.20		
Gravel =	6						4.75	2.7	5.5	94.50		
							2.36	6.7	12.2	87.80		
Sand =	66						1.18	11	23.2	76.80		
		BH-10		-19.00 - -19.37		100	0.6	6.6	29.8	70.20		
Silt Clay =	29						0.3	13.6	43.4	56.60		
							0.15	13.6	57	43.00		
							0.075	14.2	71.2	28.80		
BH.NO.	Depth(m)	SP.Gr(G)	C	Time	Rh '	Rh	R=Rh'+C	He	M	factor'N'	Dia 'D'	% finer
		2.67	1	0.5	16.5	17	17.50	18.364525	0.012109727	1.60	0.07339	27.97904
				1	12	12.5	13.00	20.09059			0.054279	20.78443
		Ms	μ	2	9	9.5	10.00	21.2413			0.039465	15.98802
		100	0.8	4	6	6.5	7.00	22.39201		N'	0.028652	11.19162
				8	4	4.5	5.00	23.15915		0.47	0.020604	7.994012
				15	3.5	4	4.50	23.350935			0.015109	7.194611
				30	3	3.5	4.00	23.54272			0.010728	6.39521
				63	2.5	3	3.50	23.734505			0.007433	5.595808
				113	2	2.5	3.00	23.92629			0.005572	4.796407
				240	1	1.5	2.00	24.30986			0.003854	3.197605
				1408	1	1.5	2.00	24.30986			0.001591	3.197605
		Bore-hole No.		Depth FROM - TO		Wt. of Soil Sieved in gms	I.S. Sieve No.	Wt. of Soil Retained in gms	Cumulative weight Retained	Particles finer than %		
							10	3.1	3.1	96.90		
Gravel =	7						4.75	3.8	6.9	93.10		
							2.36	4	10.9	89.10		
Sand =	73						1.18	11.2	22.1	77.90		
		BH-10		-20.00 - -20.45		100	0.6	11.2	33.3	66.70		
Silt Clay =	20						0.3	19.7	53	47.00		
							0.15	17.3	70.3	29.70		
							0.075	9.6	79.9	20.10		
BH.NO.		SP.Gr(G)	C	Time	Rh '	Rh	R=Rh'+C	He	M	factor'N'	Dia 'D'	% finer
		2.68	1	0.5	10.5	11	11.50	20.665945	0.012073632	1.60	0.077621	18.34524
				1	9	9.5	10.00	21.2413			0.055645	15.95238
		Ms	μ	2	7	7.5	8.00	22.00844			0.040051	12.7619
		100	0.8	4	5	5.5	6.00	22.77558		N'	0.02881	9.571429
				8	3	3.5	4.00	23.54272		0.56	0.020712	6.380952
				15	2	2.5	3.00	23.92629			0.015249	4.785714
				30	1.5	2	2.50	24.118075			0.010826	3.988095
				63	1	1.5	2.00	24.30986			0.0075	3.190476
				113	1	1.5	2.00	24.30986			0.0056	3.190476
				240	1	1.5	2.00	24.30986			0.003843	3.190476
				1408	0.5	1	1.50	24.501645			0.001593	2.392857

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

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GRAIN SIZE ANALYSIS

		Bore-hole No.		Depth FROM - TO		Wt. of Soil Sieved in gms	I.S. Sieve No.	Wt. of Soil Retained in gms	Cumulative weight Retained	Particles finer than %
							10	**3.6**	**3.6**	96.40
Gravel =	8						4.75	4.8	8.4	91.60
							2.36	9	17.4	82.60
Sand =	90						1.18	10.4	27.8	72.20
		BH-11		-16.20 - -16.70		100	0.6	20.8	48.6	51.40
Silt Clay =	2						0.3	33	81.6	18.40
							0.15	15.2	96.8	3.20
							0.075	0.8	97.6	2.40

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GRAIN SIZE ANALYSIS

		Bore-hole No.		Depth FROM - TO		Wt. of Soil Sieved in gms	I.S. Sieve No.	Wt. of Soil Retained in gms	Cumulative weight Retained	Particles finer than %
							10	0	0	100.00
Gravel =	0						4.75	0	0	100.00
							2.36	0.6	0.6	99.40
Sand =	96						1.18	7.3	7.9	92.10
		BH-12		-16.20 - -16.70		100	0.6	12.5	20.4	79.60
Silt Clay =	4						0.3	30	50.4	49.60
							0.15	41.4	91.8	8.20
							0.075	4.6	96.4	3.60

BH.NO.	Depth(m)	SP.Gr(G)	C	Time	Rh '	Rh	R=Rh'+C	He	M	factor'N'	Dia 'D'	% finer
		2.69	1	0.5	1.5	2	2.50	24.118075	0.012037858	1.59	0.083606	3.97929
				1	1	1.5	2.00	24.30986			0.059353	3.183432
		Ms	μ	2	1	1.5	2.00	24.30986			0.041969	3.183432
		100	0.8	4	1	1.5	2.00	24.30986		N'	0.029676	3.183432
				8	1	1.5	2.00	24.30986		0.47	0.020984	3.183432
				15	1	1.5	2.00	24.30986			0.015325	3.183432
				30	0.5	1	1.50	24.501645			0.010879	2.387574
				63	0.5	1	1.50	24.501645			0.007507	2.387574
				113	0.5	1	1.50	24.501645			0.005605	2.387574
				240	0.5	1	1.50	24.501645			0.003846	2.387574
				1408	0.5	1	1.50	24.501645			0.001588	2.387574

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GRAIN SIZE ANALYSIS

		Bore-hole		Depth		Wt. of Soil	I.S.	Wt. of Soil	Cumulative	Particles
		No.		FROM - TO		Sieved in	Sieve	Retained	weight	finer than %
						gms	No.	in gms	Retained	
							10	**0**	**0**	100.00
Gravel =	0						4.75	0	0	100.00
							2.36	2.3	2.3	97.70
Sand =	99						1.18	9.6	11.9	88.10
		BH-13		-16.10 - -16.60		100	0.6	22.4	34.3	65.70
Silt Clay =	1						0.3	31.1	65.4	34.60
							0.15	28.1	93.5	6.50
							0.075	5.7	99.2	0.80

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GRAIN SIZE ANALYSIS

		Bore-hole		Depth		Wt. of Soil	I.S.	Wt. of Soil	Cumulative	Particles
		No.		FROM - TO		Sieved in	Sieve	Retained	weight	finer than %
						gms	No.	in gms	Retained	
							10	**0**	**0**	100.00
Gravel =	1						4.75	0.6	0.6	99.40
							2.36	1.5	2.1	97.90
Sand =	98						1.18	8.2	10.3	89.70
		BH-14		-16.00 - -16.50		100	0.6	24.9	35.2	64.80
Silt Clay =	1						0.3	39.1	74.3	25.70
							0.15	22.8	97.1	2.90
							0.075	1.9	99	1.00

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GRAIN SIZE ANALYSIS

		Bore-hole		Depth		Wt. of Soil	I.S.	Wt. of Soil	Cumulative	Particles
		No.		FROM - TO		Sieved in	Sieve	Retained	weight	finer than %
						gms	No.	in gms	Retained	
							10	0	0	100.00
Gravel =	1						4.75	0.8	0.8	99.20
							2.36	2.5	3.3	96.70
Sand =	98						1.18	10.4	13.7	86.30
		BH-15		-15.60 - -16.50		100	0.6	31.7	45.4	54.60
Silt Clay =	1						0.3	39	84.4	15.60
							0.15	13.1	97.5	2.50
							0.075	1.2	98.7	1.30

		Bore-hole		Depth		Wt. of Soil	I.S.	Wt. of Soil	Cumulative	Particles
		No.		FROM - TO		Sieved in	Sieve	Retained	weight	finer than %
						gms	No.	in gms	Retained	
							10	0	0	100.00
Gravel =	2						4.75	2.2	2.2	97.80
							2.36	3	5.2	94.80
Sand =	96						1.18	12.6	17.8	82.20
		BH-15		-16.10 - -16.60		100	0.6	20.6	38.4	61.60
Silt Clay =	2						0.3	35.2	73.6	26.40
							0.15	21.2	94.8	5.20
							0.075	3.4	98.2	1.80

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GRAIN SIZE ANALYSIS

		Bore-hole		Depth		Wt. of Soil	I.S.	Wt. of Soil	Cumulative	Particles
		No.		FROM - TO		Sieved in	Sieve	Retained	weight	finer than %
						gms	No.	in gms	Retained	
							10	**0**	**0**	100.00
Gravel =	12						4.75	12.1	12.1	87.90
							2.36	5.8	17.9	82.10
Sand =	87						1.18	10.2	28.1	71.90
		BH-17		-15.30 - -15.80		100	0.6	14.4	42.5	57.50
Silt Clay =	1						0.3	36.5	79	21.00
							0.15	18.3	97.3	2.70
							0.075	1.8	99.1	0.90

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GRAIN SIZE ANALYSIS

		Bore-hole		Depth		Wt. of Soil	I.S.	Wt. of Soil	Cumulative	Particles
		No.		FROM - TO		Sieved in	Sieve	Retained	weight	finer than %
						gms	No.	in gms	Retained	
							10	**3.9**	**3.9**	96.10
Gravel =	8						4.75	4.1	8	92.00
							2.36	6.5	14.5	85.50
Sand =	91						1.18	17.1	31.6	68.40
		BH-18		-15.00 - -15.50		100	0.6	23.1	54.7	45.30
Silt Clay =	2						0.3	31.2	85.9	14.10
							0.15	11.8	97.7	2.30
							0.075	0.8	98.5	1.50

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GRAIN SIZE ANALYSIS

		Bore-hole		Depth		Wt. of Soil	I.S.	Wt. of Soil	Cumulative	Particles
		No.		FROM - TO		Sieved in	Sieve	Retained	weight	finer than %
						gms	No.	in gms	Retained	
							10	**12.4**	**12.4**	87.60
Gravel =	35						4.75	22.2	34.6	65.40
							2.36	16.6	51.2	48.80
Sand =	64						1.18	24.4	75.6	24.40
		BH-19		-15.80 - -16.20		100	0.6	12.3	87.9	12.10
Silt Clay =	1						0.3	8.7	96.6	3.40
							0.15	2	98.6	1.40
							0.075	0	98.6	1.40

		Bore-hole		Depth		Wt. of Soil	I.S.	Wt. of Soil	Cumulative	Particles
		No.		FROM - TO		Sieved in	Sieve	Retained	weight	finer than %
						gms	No.	in gms	Retained	
							10	1.8	1.8	98.20
Gravel =	5						4.75	2.8	4.6	95.40
							2.36	6.3	10.9	89.10
Sand =	76						1.18	7.8	18.7	81.30
		BH-19		-17.40 - -17.85		100	0.6	14.1	32.8	67.20
Silt Clay =	19						0.3	26	58.8	41.20
							0.15	19.1	77.9	22.10
							0.075	2.9	80.8	19.20

BH.NO.		SP.Gr(G)	C	Time	Rh '	Rh	R=Rh'+C	He	M	factor'N'	Dia 'D'	% finer
		2.66	1	0.5	10.5	11	11.50	20.665945	0.012146147	1.60	0.078087	18.42771
				1	10	10.5	11.00	20.85773			0.055472	17.62651
		Ms	**μ**	2	8.5	9	9.50	21.433085			0.039762	15.22289
		100	0.8	4	7.5	8	8.50	21.816655		N'	0.028366	13.62048
				8	7	7.5	8.00	22.00844		0.56	0.020146	12.81928
				15	6.5	7	7.50	22.200225			0.014777	12.01807
				30	6	6.5	7.00	22.39201			0.010494	11.21687
				63	5.5	6	6.50	22.583795			0.007272	10.41566
				113	5	5.5	6.00	22.77558			0.005453	9.614458
				240	4	4.5	5.00	23.15915			0.003773	8.012048
				1408	1	1.5	2.00	24.30986			0.001596	3.204819

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

GRAIN SIZE ANALYSIS

		Bore-hole No.		Depth FROM - TO		Wt. of Soil Sieved in	I.S. Sieve No.	Wt. of Soil Retained in gms	Cumulative weight Retained	Particles finer than %		
							10	**15.1**	**15.1**	84.90		
Gravel =	24						4.75	9	24.1	75.90		
							2.36	14.3	38.4	61.60		
Sand =	70						1.18	12.6	51	49.00	58	
		BH-20		-14.70 - -15.20		100	0.6	25.6	76.6	23.40		
Silt Clay =	6						0.3	13.6	90.2	9.80	15	
							0.15	2.1	92.3	7.70		
							0.075	1.6	93.9	6.10		

BH.NO.	Depth(m)	SP.Gr(G)	C	Time	Rh '	Rh	R=Rh'+C	He	M	factor'N'	Dia 'D'	% finer
		2.69	1	0.5	1.5	2	2.50	24.118075	0.012037858	1.59	0.083606	3.97929
				1	1	1.5	2.00	24.30986			0.059353	3.183432
		Ms	**μ**	2	1	1.5	2.00	24.30986			0.041969	3.183432
		100	0.8	4	1	1.5	2.00	24.30986		N'	0.029676	3.183432
				8	1	1.5	2.00	24.30986		0.47	0.020984	3.183432
				15	1	1.5	2.00	24.30986			0.015325	3.183432
				30	1	1.5	2.00	24.30986			0.010836	3.183432
				63	1	1.5	2.00	24.30986			0.007478	3.183432
				113	1	1.5	2.00	24.30986			0.005583	3.183432
				240	1	1.5	2.00	24.30986			0.003831	3.183432
				1408	1	1.5	2.00	24.30986			0.001582	3.183432

Horizon Survey Company India Pvt. Ltd.

HORIZON GEOSCIENCES

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

GRAIN SIZE ANALYSIS

		Bore-hole		Depth		Wt. of Soil	I.S.	Wt. of Soil	Cumulative	Particles		
		No.		FROM - TO		Sieved in	Sieve	Retained	weight	finer than %		
						gms	No.	in gms	Retained			
							10	**15.6**	**15.6**	84.40		
Gravel =	28						4.75	12.7	28.3	71.70		
							2.36	14.2	42.5	57.50		
Sand =	67						1.18	16.6	59.1	40.90		
		BH-21		-15.00 - - 15.50		100	0.6	9.4	68.5	31.50		
Silt Clay =	4						0.3	14.5	83	17.00		
							0.15	12.5	95.5	4.50		
							0.075	0.1	95.6	4.40		
BH.NO.	**Depth(m)**	**SP.Gr(G)**	**C**	**Time**	**Rh '**	**Rh**	**R=Rh'+C**	**He**	**M**	**factor'N'**	**Dia 'D'**	**% finer**
		2.67	1	0.5	1.5	2	2.50	24.118075	0.012109727	1.60	0.084105	3.997006
				1	1	1.5	2.00	24.30986			0.059707	3.197605
		Ms	**μ**	2	1	1.5	2.00	24.30986			0.042219	3.197605
		100	0.8	4	1	1.5	2.00	24.30986		N'	0.029854	3.197605
				8	1	1.5	2.00	24.30986		0.47	0.02111	3.197605
				15	1	1.5	2.00	24.30986			0.015416	3.197605
				30	1	1.5	2.00	24.30986			0.010901	3.197605
				63	1	1.5	2.00	24.30986			0.007522	3.197605
				113	1	1.5	2.00	24.30986			0.005617	3.197605
				240	1	1.5	2.00	24.30986			0.003854	3.197605
				1408	1	1.5	2.00	24.30986			0.001591	3.197605

Horizon Survey Company India Pvt. Ltd.

HORIZON GEOSCIENCES

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

GRAIN SIZE ANALYSIS

		Bore-hole No.		Depth FROM - TO		Wt. of Soil Sieved in gms	I.S. Sieve No.	Wt. of Soil Retained in gms	Cumulative weight Retained	Particles finer than %		
							10	**25**	**25**	75.00		
Gravel =	66						4.75	41	66	34.00		
							2.36	13.9	79.9	20.10		
Sand =	33						1.18	9.5	89.4	10.60		
		BH-22		-15.00 - 15.50		100	0.6	4.1	93.5	6.50		
Silt Clay =	1						0.3	3.7	97.2	2.80		
							0.15	1.6	98.8	1.20		
							0.075	0.2	99	1.00		
BH.NO.	**Depth(m)**	**SP.Gr(G)**	**C**	**Time**	**Rh '**	**Rh**	**R=Rh'+C**	**He**	**M**	**factor'N'**	**Dia 'D'**	**% finer**
		2.67	1	0.5	1.5	2	2.50	24.118075	0.012109727	1.60	0.084105	3.997006
				1	1	1.5	2.00	24.30986			0.059707	3.197605
		Ms	**μ**	2	1	1.5	2.00	24.30986			0.042219	3.197605
		100	0.8	4	1	1.5	2.00	24.30986		N'	0.029854	3.197605
				8	1	1.5	2.00	24.30986		0.47	0.02111	3.197605
				15	1	1.5	2.00	24.30986			0.015416	3.197605
				30	1	1.5	2.00	24.30986			0.010901	3.197605
				63	1	1.5	2.00	24.30986			0.007522	3.197605
				113	1	1.5	2.00	24.30986			0.005617	3.197605
				240	1	1.5	2.00	24.30986			0.003854	3.197605
				1408	1	1.5	2.00	24.30986			0.001591	3.197605

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel at V.O. Chidambaranar Port

Client : V.O.CHIDAMBARANAR PORT TRUST

Project No. : GT-VOCPT-088

GRAIN SIZE ANALYSIS

		Bore-hole		Depth		Wt. of Soil	I.S.	Wt. of Soil	Cumulative	Particles		
		No.		FROM - TO		Sieved in	Sieve	Retained	weight	finer than %		
						gms	No.	in gms	Retained			
							10	**24.6**	**24.6**	75.40		
Gravel =	39						4.75	14.8	39.4	60.60		
							2.36	8.4	47.8	52.20		
Sand =	38						1.18	10.8	58.6	41.40		
		BH-25		-15.62 - -15.85		100	0.6	5.5	64.1	35.90		
Silt Clay =	23						0.3	6.5	70.6	29.40		
							0.15	4.8	75.4	24.60		
							0.075	1.8	77.2	22.80		
BH.NO.	**Depth(m)**	**SP.Gr(G)**	**C**	**Time**	**Rh '**	**Rh**	**R=Rh'+C**	**He**	**M**	**factor'N'**	**Dia 'D'**	**% finer**
		2.67	1	0.5	10.5	11	11.50	20.665945	0.012109727	1.60	0.0778533	18.386228
				1	10	10.5	11.00	20.85773			0.0553054	17.586826
		Ms	**μ**	2	9	9.5	10.00	21.2413			0.0394648	15.988024
		100	0.8	4	8	8.5	9.00	21.62487		N'	0.0281567	14.389222
				8	7	7.5	8.00	22.00844		0.47	0.0200856	12.790419
				15	6	6.5	7.00	22.39201			0.0147957	11.191617
				30	5	5.5	6.00	22.77558			0.0105514	9.5928144
				63	4	4.5	5.00	23.15915			0.0073422	7.994012
				113	3	3.5	4.00	23.54272			0.0055274	6.3952096
				240	2	2.5	3.00	23.92629			0.0038235	4.7964072
				1408	1	1.5	2.00	24.30986			0.0015912	3.1976048

HORIZON GEOSCIENCES

Project : Conducting Borehole Investigation in the Inner Harbour Basin and Approach Channel
Project No. : GT-VOCPT-088

Client : V.O.CHIDAMBARANAR PORT TRUST

SPECIFIC GRAVITY TEST

Borehole No.	Depth (m) w.t.r CD	Bottle No.	Weight of Bottle W1	Weight of Bottle + Soil W2	Weight of Bottle + Water W3	Weight of Bottle + Soil + Water W4	Specific Gravity (W2-W1) / (W4-W1) - (W3-W2)
BH-02	-16.69 - -17.14	3	31.20	46.20	80.40	89.76	2.66
	-20.07 - -20.52	2	31.30	46.30	80.90	90.30	2.68
BH-07	-17.40 - -17.90	4	31.56	46.56	80.80	90.19	2.67
	-18.57 - -18.97	3	31.55	46.54	80.82	90.23	2.69
	-19.40 - -19.90	2	31.20	46.20	80.10	89.50	2.68
BH-08	-16.80 - -17.25	6	31.60	46.60	80.00	89.39	2.67
	-18.30 - -18.75	5	31.60	46.60	82.20	91.57	2.66
BH-09	-18.30 - -18.75	8	31.40	46.40	80.90	90.29	2.67
BH-10	-16.00 - 16.45	10	32.00	47.00	81.70	91.06	2.66
	-19.00 - -19.37	4	31.55	46.55	80.80	90.19	2.67
	-20.00 - -20.45	5	31.56	46.56	80.80	90.20	2.68
BH-12	-16.20 - -16.70	4	30.57	45.57	80.78	90.20	2.69
BH-19	-17.40 - -17.85	3	30.70	45.70	82.20	91.57	2.66
BH-20	-14.70 - -15.20	6	31.55	46.55	80.80	90.21	2.68
BH-21	-15.00 - -15.50	5	31.57	46.57	80.80	90.18	2.67
BH-25	-15.62 - -15.85	9	31.29	46.29	80.80	90.18	2.67
BH-26	-12.40 - -12.90	4	31.57	46.54	80.82	90.19	2.67
BH-30	-12.70 - -13.20	7	30.55	45.55	80.78	90.21	2.69
BH-31	-15.45 - -15.55	5	31.59	46.59	80.80	90.21	2.68
BH-32	-14.80 - -15.30	6	32.00	47.00	80.81	90.19	2.67
BH-34	-15.77 - -15.87	8	31.80	46.80	82.20	91.56	2.66
BH-35	-13.80 - -14.30	2	31.30	46.30	80.80	90.15	2.65
BH-36	-14.95 - -15.40	4	31.56	46.56	80.80	90.20	2.68
BH-37	-5.50 - -6.00	7	32.00	47.00	80.79	90.18	2.67
BH-38	-5.40 - -5.90	8	32.30	47.30	81.60	90.95	2.65
BH-39	-5.00 - -5.50	3	31.54	46.54	80.81	90.19	2.67
BH-40	-5.20 - -5.70	8	31.40	46.40	80.80	90.15	2.65

APPENDIX D – ROCK – INDEX PROPERTIES – RAW DATA

ROCK TEST - INDEX PROPERTIES

Project : Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O.Chidambaranar Port

Project No. : GT - VOCPT - 088

Client : V.O.CHIDAMBARANAR PORT TRUST

BH No.	Depth(m)	Length (cm)	Diameter (cm)	Test Condition	Bulk Weight (g) (W_b)	Dry Wt.(g) (W_d)	Sat Wt. (g) (W_s)	Volume V (cm^3)	Moisture Absorption (%)((W_s-W_d)/W_d)*100	Porosity (%)((W_s-W_d)/V)*100	Natural Water Content (%) ((W_b-W_d)/W_d)*100	In- situ Unit Weight (kN/m^3) (W_b/V)	Dry Unit Weight (kN/m^3) (W_d/V)
BH - 1	-16.70 - -18.30	4.290	5.12	SOAKED	187.10	186	193.4	88.3257	3.98	8.38	0.59	21.18	21.06
BH - 3	-16.30 - -17.80	8.550	5.06	SOAKED	321.60	301.2	333.3	171.932	10.66	18.67	6.77	18.71	17.52
	-17.80 - -19.30	3.240	5.15	SOAKED	131.30	123.3	134.9	67.4915	9.41	17.19	6.49	19.45	18.27
BH - 5	-19.00 - -20.10	10.298	5.14	SOAKED	511.80	505.5	511.7	213.683	1.23	2.90	1.25	23.95	23.66
BH - 8	-19.50 - -20.00	10.500	5.14	SOAKED	525.30	521.4	532.1	217.874	2.05	4.91	0.75	24.11	23.93
BH - 11	-17.70 - -19.20	11.140	5.12	SOAKED	564.10	558.6	564.2	229.359	1.00	2.44	0.98	24.59	24.35
	-19.20 - -19.70	11.170	5.06	SOAKED	450.40	427.4	459.6	224.618	7.53	14.34	5.38	20.05	19.03
BH - 12	-17.75 - -19.20	11.104	5.14	SOAKED	491.50	480.5	495.5	230.407	3.12	6.51	2.29	21.33	20.85
	-19.20 - -20.20	9.040	5.16	SOAKED	469.10	465.9	469.1	188.895	0.69	1.69	0.69	24.83	24.66
	-19.20 - -20.20	3.060	5.14	SOAKED	147.80	145.1	147.8	63.4947	1.86	4.25	1.86	23.28	22.85

ROCK TEST - INDEX PROPERTIES

Project : Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O.Chidambaranar Port

Project No. : GT - VOCPT - 088

Client : V.O.CHIDAMBARANAR PORT TRUST

BH No.	Depth(m)	Length (cm)	Diameter (cm)	Test Condition	Bulk Weight (g)	Dry Wt.(g)	Sat Wt. (g)	Volume V (cm^3)	Moisture Absorption (%)((W_s-W_d)/W_d)*100	Porosity (%)((W_s-W_d)/V)*100	Natural Water Content (%) ((W_b-W_d)/W_d)*100	In- situ Unit Weight (kN/m^3) (W_b/V)	Dry Unit Weight (kN/m^3) (W_d/V)
BH - 13	-17.60 - -18.60	11.130	5.17	SOAKED	577.20	571	578.5	233.7	1.31	3.21	1.09	24.70	24.44
	-17.60 - -18.60	3.240	5.15	SOAKED	170.40	169.1	171.7	67.54	1.54	3.85	0.77	25.23	25.04
	-18.60 - -20.10	4.540	5.16	SOAKED	209.40	206.1	217.6	94.94	5.58	12.11	1.60	22.06	21.71
	-18.60 - -20.10	3.280	5.15	SOAKED	155.10	151.9	160.9	68.27	5.92	13.18	2.11	22.72	22.25
BH - 14	-17.70 - -19.20	4.770	5.16	SOAKED	252.40	250.8	253.8	99.67	1.20	3.01	0.64	25.32	25.16
	-19.20 - -20.60	7.540	5.15	SOAKED	322.00	316	337.6	157.1	6.84	13.75	1.90	20.50	20.12
BH - 15	-17.10 - -18.60	8.000	5.18	SOAKED	438.40	436.5	438.3	168.5	0.41	1.07	0.44	26.02	25.91
	-18.60 - -20.10	5.380	5.17	SOAKED	267.50	265.8	269.3	112.9	1.32	3.10	0.64	23.68	23.53
BH - 16	-16.00 - -17.30	11.130	5.19	SOAKED	593.90	590.3	593.9	235.5	0.61	1.53	0.61	25.22	25.07
	-17.30 - -18.80	8.310	5.17	SOAKED	419.30	415	424.2	174.5	2.22	5.27	1.04	24.04	23.79
BH - 17	-15.96 - -17.30	11.150	5.16	SOAKED	586.90	580.8	589.3	233.2	1.46	3.65	1.05	25.17	24.91
	-15.96 - -17.30	5.390	5.17	SOAKED	287.60	285.4	288.6	113.3	1.12	2.82	0.77	25.38	25.18
	-18.90 - -20.30	7.290	5.24	SOAKED	311.20	305.7	326	157.2	6.64	12.91	1.80	19.80	19.45

ROCK TEST - INDEX PROPERTIES

Project : Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O.Chidambaranar Port

Project No. : GT - VOCPT - 088

Client : V.O.CHIDAMBARANAR PORT TRUST

BH No.	Depth(m)	Length (cm)	Diameter (cm)	Test Condition	Bulk Weight (g)	Dry Wt.(g)	Sat Wt. (g)	Volume V (cm^3)	Moisture Absorption (%)((W_s-W_d)/W_d)*100	Porosity (%)((W_s-W_d)/V)*100	Natural Water Content (%) ((W_b-W_d)/W_d)*100	In- situ Unit Weight (kN/m^3) (W_b/V)	Dry Unit Weight (kN/m^3) (W_d/V)
BH - 18	-15.55 - -17.05	11.176	5.18	SOAKED	614.50	612.4	615.4	235.5	0.49	1.27	0.34	26.09	26.00
	-15.55 - -17.05	3.210	5.18	SOAKED	178.30	177.8	178.5	67.65	0.39	1.03	0.28	26.36	26.28
	-17.05 - -18.55	4.340	5.20	SOAKED	204.70	201.8	206.4	92.17	2.28	4.99	1.44	22.21	21.89
BH - 19	-17.90 - -18.80	4.153	5.33	SOAKED	256.30	255.2	256	92.66	0.31	0.86	0.43	27.66	27.54
	-18.80 - -20.10	4.722	5.14	SOAKED	264.40	263.2	264.4	97.98	0.46	1.22	0.46	26.98	26.86

ROCK TEST - INDEX PROPERTIES

Project : Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O.Chidambaranar Port

Project No. : GT - VOCPT - 088

Client : V.O.CHIDAMBARANAR PORT TRUST

BH No.	Depth(m)	Length (cm)	Diameter (cm)	Test Condition	Bulk Weight (g)	Dry Wt.(g)	Sat Wt. (g)	Volume V (cm^3)	Moisture Absorption (%)((W_s-W_d)/W_d)*100	Porosity (%)((W_s-W_d)/V)*100	Natural Water Content (%) ((W_b-W_d)/W_d)*100	In- situ Unit Weight (kN/m^3) (W_b/V)	Dry Unit Weight (kN/m^3) (W_d/V)
BH - 20	-15.35 - -16.85	11.210	5.21	SOAKED	615.40	613	618.7	239	0.93	2.39	0.39	25.75	25.65
	-16.85 - -17.55	9.840	5.16	UNSOAKED	400.70	388.9		205.8	-		3.03	19.47	18.90
BH-21	-15.60 - -17.10	11.280	5.23	SOAKED	596.90	593.7	598.9	242	0.88	2.15	0.54	24.67	24.54
	-18.60 - -20.00	10.790	5.15	UNSOAKED	415.90	410.9		224.8	-	-	1.22	18.50	18.28
	-18.60 - -20.00	3.800	5.24	UNSOAKED	146.20	143.5		81.95	-	-	1.88	17.84	17.51
BH-22	-19.05 - -20.05	11.140	5.23	UNSOAKED	463.40	457.9		239.3	-	-	1.20	19.36	19.13
BH-23	-15.65 - -16.65	7.630	5.20	SOAKED	425.00	424.3	427.6	162	0.78	2.04	0.16	26.23	26.18
	-17.15 - -18.65	8.680	5.29	UNSOAKED	348.30	341.3		190.8	-	-	2.05	18.26	17.89
	-18.65 - -20.05	11.190	5.31	UNSOAKED	476.20	459.6		247.8	-	-	3.61	19.22	18.55
BH-24	-18.02 - -19.52	8.460	5.18	UNSOAKED	344.20	338.7		178.3	-	-	1.62	19.31	19.00
BH-25	-17.10 - -18.10	9.000	5.18	UNSOAKED	379.70	375.1		189.7	-	-	1.23	20.02	19.78
	-19.10 - -20.20	10.690	5.17	UNSOAKED	413.20	400		224.4	-	-	3.30	18.41	17.82

APPENDIX E – ROCK – STRENGTH PROPERTIES – RAW DATA

ROCK TEST DATA - POINT LOAD

Project : Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O.Chidambaranar Port

Project No. : GT - VOCPT - 088

BH No.	Depth(m)	Length (cm)	Diameter (cm)	Test Condition	Point Load	Point Load Index Strength (Mpa) I_S 50
BH - 1	-16.70 - -18.30	4.290	5.12	SOAKED	6.3	2.43
BH - 3	-16.30 - -17.80	8.550	5.06	SOAKED		-
	-17.80 - -19.30	3.240	5.15	SOAKED		-
BH - 5	-19.00 - -20.10	10.298	5.14	SOAKED		
BH - 8	-19.50 - -20.00	10.500	5.14	SOAKED	6.8	2.61
BH - 11	-17.70 - -19.20	11.140	5.12	SOAKED		
	-19.20 - -19.70	11.170	5.06	SOAKED		
BH - 12	-17.75 - -19.20	11.104	5.14	SOAKED		-
	-19.20 - -20.20	9.040	5.16	SOAKED		-
	-19.20 - -20.20	3.060	5.14	SOAKED		-

ROCK TEST DATA - POINT LOAD

Project : Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O.Chidambaranar Port

Project No. : GT - VOCPT - 088

BH No.	Depth(m)	Length (cm)	Diameter (cm)	Test Condition	Point Load	Point Load Index Strength (Mpa) $I_{S_{50}}$
BH - 13	-17.60 - -18.60	11.130	5.17	SOAKED		
	-17.60 - -18.60	3.240	5.15	SOAKED		-
	-18.60 - -20.10	4.540	5.16	SOAKED	2.4	0.92
	-18.60 - -20.10	3.280	5.15	SOAKED		-
BH - 14	-17.70 - -19.20	4.770	5.16	SOAKED	4.3	1.64
	-19.20 - -20.60	7.540	5.15	SOAKED	0.2	0.08
BH - 15	-17.10 - -18.60	8.000	5.18	SOAKED	14	5.31
	-18.60 - -20.10	5.380	5.17	SOAKED	6.2	2.36
BH - 16	-16.00 - -17.30	11.130	5.19	SOAKED		
	-17.30 - -18.80	8.310	5.17	SOAKED		
BH - 17	-15.96 - -17.30	11.150	5.16	SOAKED		-
	-15.96 - -17.30	5.390	5.17	SOAKED		-
	-18.90 - -20.30	7.290	5.24	SOAKED	1.5	0.56

ROCK TEST DATA - POINT LOAD

Project : Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O.Chidambaranar Port

Project No. : GT - VOCPT - 088

BH No.	Depth(m)	Length (cm)	Diameter (cm)	Test Condition	Point Load	Point Load Index Strength (Mpa) I_S 50
BH - 18	-15.55 - -17.05	11.176	5.18	SOAKED		
	-15.55 - -17.05	3.210	5.18	SOAKED		-
	-17.05 - -18.55	4.340	5.20	SOAKED	3.1	1.17
BH - 19	-17.90 - -18.80	4.153	5.33	SOAKED	10.7	3.89
	-18.80 - -20.10	4.722	5.14	SOAKED	12.5	4.80

ROCK TEST DATA - POINT LOAD

Project : Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O.Chidambaranar Port

Project No. : GT - VOCPT - 088

BH No.	Depth(m)	Length (cm)	Diameter (cm)	Test Condition	Point Load	Point Load Index Strength (MPa) I_S 50
BH - 20	-15.35 - -16.85	11.210	5.21	SOAKED		-
	-16.85 - -17.55	9.840	5.16	UNSOAKED	1.7	0.65
BH-21	-15.60 - -17.10	11.280	5.23	SOAKED		-
	-18.60 - -20.00	10.790	5.15	UNSOAKED	1.4	0.54
	-18.60 - -20.00	3.800	5.24	UNSOAKED		-
BH-22	-19.05 - -20.05	11.140	5.23	UNSOAKED		-
BH-23	-15.65 - -16.65	7.630	5.20	SOAKED	7.5	2.83
	-17.15 - -18.65	8.680	5.29	UNSOAKED	0.3	0.11
	-18.65 - -20.05	11.190	5.31	UNSOAKED		-
BH-24	-18.02 - -19.52	8.460	5.18	UNSOAKED	0.5	0.19
BH-25	-17.10 - -18.10	9.000	5.18	UNSOAKED	0.1	0.04
	-19.10 - -20.20	10.690	5.17	UNSOAKED		-

ROCK TEST DATA UNIAXIAL COMPRESSIVE STRENGTH

Project : Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O.Chidambaranar Port

Project No. : GT - VOCPT - 088

BH No.	Depth(m)	Length (cm)	Diameter (cm)	Test Condition	Crushing Load Reading	Uniaxial Compressive Strength (MPa)	Corrected Uniaxial Compressive Strength (MPa)
BH - 1	-16.70 - -18.30	4.290	5.12	SOAKED		-	53.50
BH - 3	-16.30 - -17.80	8.550	5.06	SOAKED	6.30	3.13	3.06
	-17.80 - -19.30	3.240	5.15	SOAKED		-	-
BH - 5	-19.00 - -20.10	10.298	5.14	SOAKED	21.80	10.51	10.51
BH - 8	-19.50 - -20.00	10.500	5.14	SOAKED			57.41
BH - 11	-17.70 - -19.20	11.140	5.12	SOAKED	63.50	30.84	30.84
	-19.20 - -19.70	11.170	5.06	SOAKED	14.80	7.36	7.36
BH - 12	-17.75 - -19.20	11.104	5.14	SOAKED	21.80	10.51	10.51
	-19.20 - -20.20	9.040	5.16	SOAKED	82.00	39.24	38.56
	-19.20 - -20.20	3.060	5.14	SOAKED			

ROCK TEST DATA UNIAXIAL COMPRESSIVE STRENGTH

Project : Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O.Chidambaranar Port

Project No. : GT - VOCPT - 088

BH No.	Depth(m)	Length (cm)	Diameter (cm)	Test Condition	Crushing Load Reading	Uniaxial Compressive Strength (MPa)	Corrected Uniaxial Compressive Strength (MPa)
BH - 13	-17.60 - -18.60	11.130	5.17	SOAKED	61.10	29.11	29.11
	-17.60 - -18.60	3.240	5.15	SOAKED			
	-18.60 - -20.10	4.540	5.16	SOAKED		-	20.15
	-18.60 - -20.10	3.280	5.15	SOAKED		-	-
BH - 14	-17.70 - -19.20	4.770	5.16	SOAKED			36.11
	-19.20 - -20.60	7.540	5.15	SOAKED		-	1.68
BH - 15	-17.10 - -18.60	8.000	5.18	SOAKED		-	116.90
	-18.60 - -20.10	5.380	5.17	SOAKED		-	51.89
BH - 16	-16.00 - -17.30	11.130	5.19	SOAKED	77.60	36.68	36.68
	-17.30 - -18.80	8.310	5.17	SOAKED	19.40	9.24	8.97
BH - 17	-15.96 - -17.30	11.150	5.16	SOAKED	63.20	30.22	30.22
	-15.96 - -17.30	5.390	5.17	SOAKED			
	-18.90 - -20.30	7.290	5.24	SOAKED		-	12.30

ROCK TEST DATA UNIAXIAL COMPRESSIVE STRENGTH

Project : Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O.Chidambaranar Port

Project No. : GT - VOCPT - 088

BH No.	Depth(m)	Length (cm)	Diameter (cm)	Test Condition	Crushing Load Reading	Uniaxial Compressive Strength (MPa)	Corrected Uniaxial Compressive Strength (MPa)
BH - 18	-15.55 - -17.05	11.176	5.18	SOAKED	71.80	34.07	34.07
	-15.55 - -17.05	3.210	5.18	SOAKED			
	-17.05 - -18.55	4.340	5.20	SOAKED		-	25.72
BH - 19	-17.90 - -18.80	4.153	5.33	SOAKED			85.55
	-18.80 - -20.10	4.722	5.14	SOAKED		-	105.54

ROCK TEST DATA UNIAXIAL COMPRESSIVE STRENGTH

Project : Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O.Chidambaranar Port

Project No. : GT - VOCPT - 088

BH No.	Depth(m)	Length (cm)	Diameter (cm)	Test Condition	Crushing Load Reading	Uniaxial Compressive Strength (MPa)	Corrected Uniaxial Compressive Strength (MPa)
BH - 20	-15.35 - -16.85	11.210	5.21	SOAKED	50.50	23.69	23.69
	-16.85 - -17.55	9.840	5.16	UNSOAKED		-	14.27
BH-21	-15.60 - -17.10	11.280	5.23	SOAKED	17.50	8.16	8.16
	-18.60 - -20.00	10.790	5.15	UNSOAKED		-	11.79
	-18.60 - -20.00	3.800	5.24	UNSOAKED		-	-
BH-22	-19.05 - -20.05	11.140	5.23	UNSOAKED	10.30	4.79	4.79
BH-23	-15.65 - -16.65	7.630	5.20	SOAKED		-	62.23
	-17.15 - -18.65	8.680	5.29	UNSOAKED		-	2.43
	-18.65 - -20.05	11.190	5.31	UNSOAKED	3.20	1.45	1.45
BH-24	-18.02 - -19.52	8.460	5.18	UNSOAKED		-	4.17
BH-25	-17.10 - -18.10	9.000	5.18	UNSOAKED		-	0.83
	-19.10 - -20.20	10.690	5.17	UNSOAKED	5.30	2.52	2.52

ROCK TEST DATA BRAZILIAN TENSILE STRENGTH

Project : Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O.Chidambaranar Port

Project No. : GT - VOCPT - 088

BH No.	Depth(m)	Length (cm)	Diameter (cm)	Test Condition	Brazillian Test Load (kN)	Brazilian Test
BH - 1	-16.70 - -18.30	4.290	5.12	SOAKED		-
BH - 3	-16.30 - -17.80	8.550	5.06	SOAKED		-
	-17.80 - -19.30	3.240	5.15	SOAKED	3.40	1.30
BH - 5	-19.00 - -20.10	10.298	5.14	SOAKED		-
BH - 8	-19.50 - -20.00	10.500	5.14	SOAKED		-
BH - 11	-17.70 - -19.20	11.140	5.12	SOAKED		-
	-19.20 - -19.70	11.170	5.06	SOAKED		-
BH - 12	-17.75 - -19.20	11.104	5.14	SOAKED		
	-19.20 - -20.20	9.040	5.16	SOAKED		-
	-19.20 - -20.20	3.060	5.14	SOAKED	9.20	3.73

ROCK TEST DATA BRAZILIAN TENSILE STRENGTH

Project : Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O.Chidambaranar Port

Project No. : GT - VOCPT - 088

BH No.	Depth(m)	Length (cm)	Diameter (cm)	Test Condition	Brazillian Test Load (kN)	Brazilian Test
BH - 13	-17.60 - -18.60	11.130	5.17	SOAKED		-
	-17.60 - -18.60	3.240	5.15	SOAKED	14.10	5.38
	-18.60 - -20.10	4.540	5.16	SOAKED		
	-18.60 - -20.10	3.280	5.15	SOAKED	3.70	1.40
BH - 14	-17.70 - -19.20	4.770	5.16	SOAKED		-
	-19.20 - -20.60	7.540	5.15	SOAKED		
BH - 15	-17.10 - -18.60	8.000	5.18	SOAKED		-
	-18.60 - -20.10	5.380	5.17	SOAKED		
BH - 16	-16.00 - -17.30	11.130	5.19	SOAKED		-
	-17.30 - -18.80	8.310	5.17	SOAKED		
BH - 17	-15.96 - -17.30	11.150	5.16	SOAKED		
	-15.96 - -17.30	5.390	5.17	SOAKED	16.20	3.70
	-18.90 - -20.30	7.290	5.24	SOAKED		

ROCK TEST DATA BRAZILIAN TENSILE STRENGTH

Project : Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O.Chidambaranar Port

Project No. : GT - VOCPT - 088

BH No.	Depth(m)	Length (cm)	Diameter (cm)	Test Condition	Brazillian Test Load (kN)	Brazilian Test
BH - 18	-15.55 - -17.05	11.176	5.18	SOAKED		-
	-15.55 - -17.05	3.210	5.18	SOAKED	23.00	8.81
	-17.05 - -18.55	4.340	5.20	SOAKED		
BH - 19	-17.90 - -18.80	4.153	5.33	SOAKED		-
	-18.80 - -20.10	4.722	5.14	SOAKED		

ROCK TEST DATA BRAZILIAN TENSILE STRENGTH

Project : Conducting Borehole Investigation in the Inner Harbour basin and Approach Channel at V.O.Chidambaranar Port

Project No. : GT - VOCPT - 088

BH No.	Depth(m)	Length (cm)	Diameter (cm)	Test Condition	Brazillian Test Load (kN)	Brazilian Test(Mpa)
BH - 20	-15.35 - -16.85	11.210	5.21	SOAKED		-
	-16.85 - -17.55	9.840	5.16	UNSOAKED		-
BH-21	-15.60 - -17.10	11.280	5.23	SOAKED		-
	-18.60 - -20.00	10.790	5.15	UNSOAKED		-
	-18.60 - -20.00	3.800	5.24	UNSOAKED	0.90	0.29
BH-22	-19.05 - -20.05	11.140	5.23	UNSOAKED		-
BH-23	-15.65 - -16.65	7.630	5.20	SOAKED		-
	-17.15 - -18.65	8.680	5.29	UNSOAKED		-
	-18.65 - -20.05	11.190	5.31	UNSOAKED		-
BH-24	-18.02 - -19.52	8.460	5.18	UNSOAKED		-
BH-25	-17.10 - -18.10	9.000	5.18	UNSOAKED		-
	-19.10 - -20.20	10.690	5.17	UNSOAKED		-