

GEOTECHNICAL INVESTIGATION REPORT

- PROJECT : GEOTECHNICAL INVESTIGATION FOR THE PROPOSED CONSTRUCTION OF SMART INTEGERATED BUS TERIMAL (SIBT) AT NEW BUS STAND, ORLEANPET, PUDUCHERRY.
- PROJECT NO : AAL.1666/ NEW BUS STAND/PDY/2020-21.
- CLIENT : THE CHIEF EXECUTIVE OFFICER, PSCDL, PUDUCHERRY.
- REFERENCE : WORK ORDER NO: 1047/PSCDL/SIBT/2020/832 DATE: 12.11.2020

EXPLORATION DATE : 13.11.2020 - 19.11.2020

DATE OF REPORT : 04.12.2020

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Date: 04.12.2020

NAME OF WORK: GEOTECHNICAL INVESTIGATION FOR THE PROPOSED CONSTRUCTION OF SMART INTEGERATED BUS TERIMAL (SIBT) AT NEW BUS STAND, ORLEANPET, PUDUCHERRY.

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1. INTRODUCTION

A Geotechnical investigation for the above said work was undertaken as per the authorization given by **THE CHIEF EXECUTIVE OFFICER, PSCDL,** Puducherry.



FLOW CHART



2. <u>SCOPE OF WORK</u>

- 2.1 This geotechnical investigation has been carried out to ascertain the safe bearing capacity and to decide upon suitable foundation system for the proposed structure. It was instructed to make three number of bore holes. The BH -1 were driven upto 33.0m depth BH -2 were driven upto 31.0m depth and BH -3 were driven upto 32.0m depth terminated as per the client's instruction.
- 2.2 The allowable safe bearing capacity of the soil is calculated based on the field geotechnical investigation, soil properties, GWT and subsequent laboratory experiments.

3. FIELD INVESTIGATION

3.1 GENERAL

Mobilizations of equipment, skilled and unskilled labours are arranged at site. The various factors for the number and position of boreholes and spacing of boreholes are based on the extent of the site, nature and type of structure. Depth of borehole is concluded based on condition of soil, penetration capacity of soil, shear failure and hard strata condition. Standard Penetration Test (SPT) is conducted at various depths. The disturbed soil sample is collected from the site and transported for examination to Ashhirwaad Analytical Laboratory. The field investigation is being monitored by experienced civil engineers/ Geotechnical/ Structural Engineer.

3.2 STANDARD PENETRATION TEST (IS: 2131 – 1981)

EQUIPMENT PREPARATION

3.2.1 DRILLING EQUIPMENT



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The equipment used shall provide a clean borehole 100 to 150 mm in diameter, for insertion of the sampler ensure that the penetration test is performed on undisturbed soil and shall permit driving of the split spoon sampler to obtain penetration record and sample in accordance with procedure.

3.2.2 DRIVE WEIGHT ASSEMBLY

The drive weight assembly shall consist of driving head and a 63.5 kg weight with 75cm free fall. It is ensured that the energy of the falling weight is not reduced by friction between the drive weight and the guides. The rods to which the sampler is attached for driving should be straight, tightly coupled and straight in alignment. For driving the casting, a hammer heavier than 63.5 kg may be used.

3.2.3 CLEANING THE BOREHOLE

In case wash boring is adopted for cleaning the borehole, side discharge bits are permissible, but in no case a bottom discharge bit be permitted. In cohesive soils, the borehole may be cleaned with bailer with a flap valve.

3.2.4 OBTAINING THE SAMPLES

Test shall be made at every change in stratum or at intervals of not more than 1.5 m whichever is less. Tests may be made at lesser or greater intervals if specified or considered necessary.

The sampler shall be lowered to the bottom of the borehole. The following information shall be noted and recorded.

- (a) Depth of bottom of borehole below ground level.
- (b) Penetration of the sampler into the soil under the combined weight of sampler and rods



- (c) Water level in the borehole or casting
- (d) Depth of bottom of casting below ground level.

Labels shall be fixed to the jar or notation shall be written on the covers with the following information:

- a) Origin of sample
- b) Job designation
- c) Boring number
- d) Sample number
- e) Depth of sampling
- f) Penetration record
- g) Length of recovery
- h) Date of sampling

The jars containing samples shall be stored in suitable container for shipment. Samples should not be placed in the sun.

3.3 IS CODE FOR FIELD INVESTIGATION

SL.NO	IS CODE NUMBER	IS CODE NAME
1	IS : 1498 – 1970	Classification & Identification of soil for general engineering
	(Reaffirmed 2007)	purpose (First Revision)
2	IS : 1892 – 1979	Code of practice for sub surface investigation for
	(Reaffirmed 2002)	foundation (First Revision)
3	IS:2131 - 1981	Method of Standard Penetration Test for soil (First
	(Reaffirmed 2002)	Revision)
4	IS : 2132 – 1986	Code of practice for thin walled tube sampling of soil
	(Reaffirmed 2002)	(Second Revision)
5	IS : 4968 – 1976	Method of sub surface sounding of soil : Static cone
	(Reaffirmed 2007)	penetration (First Revision)



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3.4 SITE EXPLORATION

Subsurface exploration should be carried out in preliminary and detailed exploration. Shear strength and compressibility of the soil is determined in the detailed exploration. The method of boring for soil exploration is rotary boring. Rotary boring is effected by cutting action of the soil. The bit is carried at the end of hollow, jointed drill rods which is rotated by the chuck. A mud laden fluid is pumped continuously and fluid returns to surface in angular space. Undisturbed samples are collected at suitable intervals.



3.5 <u>SITE MAP</u>

Bore Hole No	LATITUDE	LONGITUDE
BH-1	11°55′53″N	79°48'57''E
BH-2	11°55′56.53″N	79°48′55.9″E
BH-3	11°55′58″N	79°49′0′′E

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3.6 BOREHOLE DETAILS

Three number of bore holes is driven in the field at various location of the site. As per IS: 1892 - 1979 (Reaffirmed 2002), the various driven depth of the borehole, Ground Water Table and their corresponding identifications are tabulated below

SL.NO	BOREHOLE IDENTIFICATION NUMBER	DRIVEN BOREHOLE DEPTH (m)
1.	BH-1	33.0
2.	BH-2	31.0
3.	BH-3	32.0

BOREHOLE IDENTIFICATION	GROUND WATER TABLE
NUMBER	(m)
BH-1	0.50
BH-2	0.50
BH-3	0.50

4. GEOTECHNICAL MODELLING AND OBSERVATION:

4.1 GENERAL

Various laboratory test are carried out to assess the soil as per IS code standard and calculations are done. The results of the test are tabulated and interpretation is given.

4.2 LIST OF IS CODE

4.2.1 LABORATORY IS CODE

SL.NO IS CODE NUMBER		IS CODE NAME				
1	IS: 2720 – 1983 (Part – 1)	Methods of test for soil :Preparation of dry soil				
	(Reattirmed 2006)	sample for various test (Second Revision)				

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ASHHIRWAAD ANALYTICAL LABORATORY

(NABL Accredited Laboratory TC - 8619) (A Unit of Ashhirwaad Associates - Regd. No. 18/2000)

(Approved by Government of India) **Civil Engineering Consultancy Services**



- Geotechnical Investigation * Structural consultancy ٠ ÷
- Survey and contouring * Load testing on Piles
 - Material testing NDT Services "A Total Solution Provider In Civil Engineering Services"
- ISO/IEC 17025:2005

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Methods of test for soil : Determination of water IS 2720 - 1980 (Part - 2) 2 (Reaffirmed 2010) content (Second Revision) 3 IS 2720 - 1980 (Part - 3) Methods of test for soil : Determination of (SECTION - 1) (Reaffirmed specific gravity : Fine grained soil (First Revision) 2002) IS 2720 - 1980 (Part - 3) Methods of test for soil : Determination of 4 (SECTION - 2) (Reaffirmed specific gravity : Fine, Medium, Coarse grained 2002) soil (First Revision) 5 IS 2720 - 1985 (Part - 4) Methods of test for soil : Grain size (Reaffirmed 2006) analysis(Second Revision) 6 IS 2720 – 1985 (Part – 5) Methods of test for soil : Determination of liquid (Reaffirmed 2006) and plastic limit (Second Revision) 7 IS 2720 - 1985 (Part - 15) Methods of test for soil : Determination of (Reaffirmed 2006) consolidation properties (First Revision) IS 1809 - 1972 Methods of test for soil : Glossary of terms & 8 (Reaffirmed 2006) symbols relating to soil engineering (Third Revision)

4.2.2 FOUNDATION IS CODE

SL.NO	IS CODE NUMBER	IS CODE NAME
1	IS : 1080 – 1986 (Reaffirmed 2002)	Code of practice for design and construction of shallow foundation on soil (other than raft, ring and shell) (Second Revision)
2	IS 1904 : 1968 (Reaffirmed 2006)	Code of practice for design and construction of foundation on soil :General requirement (Third Revision)
3	IS 6403 – 1981 (Reaffirmed 2002)	Code of practice for determination of bearing capacity of shallow foundation (First Revision)



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4.2.3 SEISMIC IS CODE

SL.NO	IS CODE NUMBER	IS CODE NAME
1	IS 1893 – 2002 (Reaffirmed	Criteria for Earthquake Resistant design of
	2007)	Structures(Fifth Revision)

4.3 <u>RESULT:</u>

Laboratory tests the following soil profiles for the boreholes as observed is detailed

below:

<u>BH -1</u>

The details of soil stratification are presented in the bore - log and their interpretation is shown below



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<u>BH -2</u>

The details of soil stratification are presented in the bore - log and their interpretation is shown below





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<u>BH -3</u>

The details of soil stratification are presented in the bore - log and their interpretation is shown below





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5. CHEMICAL TEST:

Chemical tests were performed on water samples collected from bore holes for determining pH value and chloride. The results are given in a tabular form below:

SL.NO	Particulars	Results	Stipulations of IS 456-2000, IS 3025(Part 32) (Water for Construction Purpose)
1.	pH value	7.8	6.5 – 8.5
2.	Chloride (Cl)	255.6mg/l	500 (for RCC) - 2000 mg/l (for PCC)

Table 5.1 As per IS 3025 (Part 11 & 32), IS 456-2000.

It is seen that the values are within the permissible limit (As per IS 456-2000). So no special cement will be required for foundation concrete.

6. <u>SBC RECOMMENDATIONS:</u>

Based on the soil stratification obtained during the geotechnical exploration and consequent laboratory experiment data's, the safe pile carrying capacities for following deep foundation are recommended and tabulated below.

6.1 Considering the in-situ conditions, PILE FOUNDATION is recommended at
31.0m depth for the Proposed Construction Of Smart Integrated Bus Terminal (SIBT) at New Bus Stand, Orleanpet, Puducherry.



Location: BH:1

Date: 04.12.2020

- 6.2 The recommended pile foundation may be of "Bored cast in situ pile"(Friction Cum End Bearing Pile) with casing while driving the pile and pouring the concrete. The casing pipe has to be removed slowly and carefully while placing the concrete after giving proper compaction.
- 6.3 The calculated safe pile carrying capacities of different diameters for 31.0m depth of "pile" are tabulated below.

Method: Static Analysis

Length of pile	: 31.0m	IS Co	de: IS 2911(I	Part1/Sec	2): 2010
Diameter of Pile (m) (1)	Frictional Resistance (Tonnes) (2)	EndTotal PileBearingCapacityCapacity(Tonnes)(Tonnes)(4)=(2+3)		Factor of Safety (5)	Safe Pile Capacity (Tonnes) (6)=(4)/(5)
0.60	193.65	114.21	307.87	2.5	103
0.65	209.79	144.91	354.70	2.5	118
0.75	242.07	221.86	463.93	2.5	155
0.90	290.48	381.98	672.46	2.5	224
1.0	322.76	523.02	845.78	2.5	282

SAFE PILE LOAD CARRYING CAPACITY Table 6.3.1

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TENSION CARRYING CAPACITY OF PILE

Table 6.3.2

Method: Static Analysis

IS Code: IS 2911(Part1/Sec 2): 2010

SI. No.	Bore Hole No.	Length of Pile (m)	Tension Carrying Capacity of Pile (Tons) Diameter of Pile (m)					
			0.60	0.65	0.75	0.90	1.0	
1.	BH-1	31.0	99.36	109.62	131.05	165.47	189.94	

LATERAL LOAD CAPACITY OF PILE

Table 6.3.3 Method: Static Analysis IS Code: IS 2911(Part1/Sec 2 & sec 4): 2010

Length	Analysis	Diameter of Pile (m)						
(m)		0.60	0.65	0.75	0.90	1.0		
31.0	Depth of Fixity (m)	4.85	5.17	5.79	6.70	7.29		
	Fixed End Moment (kN/m²)	288.5	378.7	616.1	1145.1	1638.5		
	Lateral Load (Tons)	9.64	11.87	17.23	27.68	36.40		



SAFE PILE LOAD CARRYING CAPACITY

Ref: AAL/8363/GT-Report/P.No.1666/New Bus Stand /Pdy/2020-21

Table 6.3.4						
Location : BH Length of pile	:2 e: 31.0m	Method: Static Analysis IS Code: IS 2911(Part1/Sec 2): 2010				
Diameter of Pile (m) (1)	Frictional Resistance (Tonnes) (2)	End Bearing Capacity (Tonnes) (3)	Total Pile Capacity (Tonnes) (4)=(2+3)	Factor of Safety (5)	Safe Pile Capacity (Tonnes) (6)=(4)/(5)	
0.60	114.33	142.24	256.57	2.5	86	
0.65	123.86	180.67	304.53	2.5	101	
0.75	142.91	277.11	420.02	2.5	140	
0.90	171.50	478.03	649.53	2.5	216	
1.0	190.55	655.18	845.73	2.5	282	



TENSION CARRYING CAPACITY OF PILE

Table 6.3.5

Method: Static Analysis

IS Code: IS 2911(Part1/Sec 2): 2010

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ci		Length	Tensi	on Carryir	ng Capacit	y of Pile (To	ons)									
51. No.	Bore Hole No.	of Pile (m)	Diameter of Pile (m)													
		(,	0.60	0.65	0.75	0.90	1.0									
1.	BH-2	31.0	67.63	75.25	91.39	117.88	137.06									

LATERAL LOAD CAPACITY OF PILE Table 6.3.6

Method: Static Analysis IS Code: IS 2911(Part1/Sec 2 & sec 4): 2010

Length			Dia	meter of P	ile (m)	
of Pile (m)	Analysis	0.60	0.65	0.75	0.90	1.0
	Depth of Fixity (m)	5.13	5.47	6.13	7.10	7.72
31.0	Fixed End Moment (kN/m²)	257.2	337.7	549.3	1021.1	1461.0
	Lateral Load (Tons)	8.12	10.0	14.50	23.30	30.65



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			-		
Location : BH	1:3		L	ength of	pile: 31.0m
Diameter of Pile (m) (1)	Frictional Resistance (Tonnes)	End Bearing Capacity (Tonnes)	Total Pile Capacity (Tonnes)	Factor of Safety	Safe Pile Capacity (Tonnes)
(-/	(2)	(3)	(4)=(2+3)	(5)	(6)=(4)/(5)
0.60	103.12	142.97	246.09	2.5	82
0.65	111.72	181.60	293.31	2.5	98
0.75	128.90	278.53	467.44	2.5	136
0.90	154.69	480.50	635.18	2.5	212
1.0	171.87	658.57	830.44	2.5	277

SAFE PILE LOAD CARRYING CAPACITY Table 6.3.7

TENSION CARRYING CAPACITY OF PILE

Table 6.3.8

ci		Length	Ten	sion Carry	ying Capa	city of Pile (1	ons)							
No.	Bore Hole No.	of Pile (m)	Length of Pile (m) 31.0 111.88	Dia	Diameter of Pile (m)									
		()		0.65	0.75	0.90	1.0							
1.	BH-3	31.0	111.88	122.00	142.59	174.40	196.21							

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LATERAL LOAD CAPACITY OF PILE Table 6.3.9 Method: Static Analysis IS Code: IS 2911(Part1/Sec 2 & sec 4): 2010

Length	Analusia		Diame	eter of Pile	(m)	
(m)	Anaiysis	0.60	0.65	0.75	0.90	1.0
	Depth of Fixity (m)	5.02	5.36	6.01	6.95	7.56
31.0	Fixed End Moment (kN/m ²)	268.3	352.2	572.9	1064.9	1523.6
	Lateral Load (Tons)	8.65	10.65	15.45	24.82	32.64

- 6.3.10 The Recommended piles has to be terminated at a depth of 31.0m, which needs to be confirmed by conducting necessary SPT during piling and it should be ensured that the SPT values at 31.0m depth are greater than/equal to the observed values of N≥50 during the field investigation made on 13.11.2020 18.11.2020.
- 6.3.11 It is highly recommended to conduct routine Pile Load Test to confirm the actual Pile Carrying Capacity and to conduct PI (Pile Integrity Test) to check the quality of driven piles. The Grade of Pile concrete mix shall be of M₃₀ conforming to IS 456: 2000 (Design Mix).



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- 6.4 For the sub structure [RCC] the environmental exposure condition may be considered as **'Severe'** and all the precautions as laid by the relevant code of practice for the design of structures may be adopted.
- 6.5 The entire recommendations as above are based on three bore holes executed as per the Clients directions and at the location as shown by the client's representative as per terms of reference. The uniformity or otherwise of the soil delineation and strength profile over the entire site shall be verified during execution, If there are any variations the same shall be reported to us for review and further advice.

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7. APPENDICES:

7.1 SAFE BEARING CAPACITY CALCULATIONS:

7.1.1 <u>PILE FOUNDATION:</u> The pile carrying capacity is calculated as per IS 2911 (part 1/Sec 2):2010 [Reaffirmed 2002] [Code of practice for design and construction of pile foundations: Part 1 Concrete piles, Section 2 Bored cast in-situ piles (CED 43: Soil and Foundation Engineering

7.2. <u>SAFE BEARING CAPACITY CALCULATION FORMULAE:</u> 7.2.1 <u>FOR PILE FOUNDATION:</u>

For Piles in Granular Soils:

The Ultimate Bearing Capacity (Qu) = $A_p(\frac{1}{2} \quad D \quad \gamma N_{\gamma} + P_D N_q) +$

 $\sum_{i=1}^{n} K_i P_{Di} \tan \delta_i A_{Si}$

Safe Load Carrying Capacity (QS) = Qu/F.S

Net Safe Load Carrying Capacity (Qns) = QS > Wt of Pile

Where,

A_P	=	Cross sectional area of pile tip, in m ²
D	=	Diameter of pile Shaft, in m
γ	=	Effective unit weight of soil at pile tip, in KN/m ²
P _D	=	Effective over burden pressure at pile tip, in KN/ m^2
N_γ and N_q	=	Bearing capacity factors depending upon the angle of internal friction \emptyset at pile tip



·	$\sum_{i=1}^{n}$	=	summation of layers 1 to n in which pile is installed and which contribute to positive skin friction;
	K _i	=	Co efficient of earth pressure applicable for the i th layer
	P _{Di}	=	Effective over burden pressure for the i^{th} layer where i varies from 1 to n pile toe
	ð	=	angle of wall friction between pile and soil for the i th layer in degree
	A _{Si}	=	Surface area of pile shaft in the i^{th} layer in m ²

For Piles in Cohesive Soils:

The Ultimate Bearing Capacity (Qu) = $A_p N_C C_P$) + $\sum_{i=1}^n \alpha_i C_i A_{Si}$

Where,

Ap	=	Cross sectional area of pile tip, in m ²
N _C	=	Bearing capacity factors, may be taken as 9
C _P	=	Average Cohesion at plie tip, in KN/m ²
$\sum_{i=1}^{n}$	=	Summation for layers 1 to n in which pile is installed and which contribute to positive skin friction;
α_i	=	Adhesion factor for the i th layer depending on the consistency of soil,
C_i	=	Average cohesion for the i^{th} layer, in KN/m ² , and
A _{Si}	=	Surface area of pile shaft in the i^{th} layer in m ²





Fig. 1 – Site Photo Showing the Soil Exploration Work.

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	I	ULR : TC86192000	0000417F							BO	RE LOG	- 1/3	-										ISO/II	C 17025	5:2005
Proiect	No:	AAL.1666/Pdv/2020	Date:	13.1	1.2020	Location:	New	Bust	and. I	Puduche	rrv.				Index	nron	artias (º	6)	Sh	ear		Gradativ	n nrone	arties (%)	,
BH. No :		1	GWT (m):	0	.50				,		~	(%)			maex	prop		•)	parar	neters		Diadatic	n prop	1100 (70)	,
D	epth	of boring (m) :		33.00		Graphi	cal R	Repres	sentat	tion of	onsistenc	e content) t/m ³	(¹ M)	(M)	(°)×ə	lex (lc)	ex(Cs)	Direc te	t shear est		Sie	ve anal	/sis	
Depth	ε	Classification	Thickness	Dep	oth of	Sta	ndaro	d Pen	etrati	on	o la	sture	ťy (imit	limit	y ind	yind	llind	۴)	(se		Ind	and	р	<u>ک</u> و
Below	tratu	of	of	Samp	olina(m)		Test	t Data	(N)		ripti	io I	Densi	quid	astic	sticit	stenc	SWB	g/cm	egree	avel	Se Sc	sm	Sa	ဇီင
C I	oil s		L aven (m)	upe		NValue	40		20	40 50	Desc	atura		Ē	ä	Pla	onsis	Free	У С	ip)	G	Coar	/ediu	Fine	sit
GL	s	SOII	Layer (m)	005	0.5	N Value	10	J 20	30	40 50		z					0						~		
1.0					1.0	-					-														
-		Fill up earth	2.40		1.5	4					Loose	12	1.41		Non ·	- Plast	ic	Nil	0.082	28º25'	4.29	1.71	72.86	18.86	2.29
2.0					2.0		1																		
				-	2.5	6					Stiff														
3.0					3.0	-					_	-													
					3.5	5					Stiff	55	1.21	72	35	37	0.46	100	0.205	4º15'	0.00	0.00	0.00	0.00	100.00
4.0		Silty clay			4.0						-														
5.0		(CL-CH)	4.10		4.5	6					Stiff														
5.0					5.5	6					Stiff	42	1.07	70	35	35	0.80	100	0.210	2º15'	0.00	0.00	0.00	0.00	100.00
6.0					60	0	+				otin						0.00		0.2.10	2.0	0.00	0.00	0.00	0.00	
					6.5	2	+				Very Loose														
7.0				-	7.0		1																		
		Sand			7.5	2					Loose	27	1.05		Slight	ly Plas	tic	40	0.125	11º55'	0.00	0.00	23.02	30.95	46.03
8.0		(SW)	2.50		8.0		1																		
		with clay			8.5	4					Loose														
9.0					9.0		Ī																		
		Silty clay	1.00		9.5						Very														
10.0		(CL-CH)			10.0	3					Loose	47	1.21	68	28	40	0.53	90	0.158	7º15'	0.00	0.00	0.00	5.22	94.78
Legend																	Logged	by							
	SP	Poorly graded sand		GW-We	ell gaded g	ravel	MI- (Clayey	/ silt		GWT - G	round	Water	Fable		Rebo	ound				Junior E	Ingineer			
	SW	Well graded sand		GP- Poor	ly graded gi	ravel		DS - Distr	ubed Sa	imple		*	Self F	Pentratio	n -	<i></i> -									
	SM-	SW- Silty sand		ML-Silt	or clayey s dav	ay siii Ch- high Plasticity clay CDS - Undisturbed sample CKK- Core Recovery Ratio (for Rock) Ch						Checked by General Manager													
Proiect N	No: A	AL.1625/2020			uay	"A Total Solution Provider in Civil Engineering"								General Manager 27/40											



	1	JLR : TC86192000	0000417F						BO	RE LOG	- 1/3											ISO/IE	C 17025	5:2005
Project	No:	AAL.1666/Pdy/2020	Date:	13.1	1.2020	Location:	New	Bustan	d, Puduche	rry.			-	Index	prope	erties (%	%)	Sh stre	ear ength		Gradatio	on prope	rties (%))
BH. NO	: epth	1 of boring (m) :	GWT (m):	33.00	.50	Graphi	cal R	epresei	ntation of	onsistency	ire content) t/m ³	(w)	(M)	ex(l₀)	lex (lc)	ex(Cs)	Direc	t shear est		Sie	ve analy	ysis	
Depth Below	stratum	Classification of	Thickness of	Dep Samp	th of ling(m)	Sta	ndaro Test	d Penetr Data (N	ation I)	scription /c	tural moistu (%)	Density (-iquid limit	Plastic limit	lasticity ind	sistency inc	x e swell ind	(kg/cm²)	degrees)	Gravel	irse sand	ium sand	le sand	lt & clay
GL	Soil	soil	Layer (m)	UDS	DS	N Value	10	20	30 40 50	å	R		-	-	•	Š	Å.	Ŭ	J	0	ð	Med	Ē	·07
11.0					10.5 11.0	4	•			Medium	39	1.31	65	31	34	0.76	100	0.131	3º8'	0.00	0.00	0.00	11.25	88.75
12.0		Silty Clay (CL-CH)	4.00		12.0	4				Medium														
13.0		(02 01)			12.5 13.0	6				Stiff	43	1.20	72	36	36	0.81	50	0.195	4º41'	0.00	0.00	0.00	8.9	91.11
14.0					13.5 14.0	48				Dense	20	1.73		Non ·	- Plast	ic	Nil	0.113	30º45'	0.00	5.91	69.55	23.18	1.36
15.0					14.5 15.0	50 _(3cm↑)				Very Dense														
16.0					15.5 16.0	54					16	1.88		Non ·	- Plast	ic	Nil	0.073	31º32'	0.00	6.25	74.67	17.76	1.32
17.0		Sand	0.00		16.5 17.0	40				Dense														
18.0		(SW)	6.00		17.5 18.0	50 _(7cm↑)				Very Dense	16	1.82		Non ·	- Plast	ic	Nil	0.068	31º10'	0.00	5.49	67.51	25.74	1.27
19.0					18.5 19.0	50 _(7cm†)				Very Dense														
20.0					19.5 20.0	50 _(8cm†)				Very Dense	13	1.92		Non ·	- Plast	ic	Nil	0.025	32º39'	0.00	4.35	71.5	23.19	0.97
Legend	SP SW SM-	Poorly graded sand Well graded sand SW- Silty sand		GW- We GP- Poorl ML - Silt c	II gaded g	ravel ravel ilt	MI- C CI - S CH-	Clayey si Sandy cla High Pla	lt y asticity clay	GWT - G DS - Dist	Fround V rubed Sa	Water T ample	able	* CRR-	Rebc Self F	ound Pentratic	und			Logged by Junior Engineer				
Stri-Strive Still Stand Mile-Still Of Cla SC- Clayey sand CL- Silty day Project No: AAL 1625/2020						"A Total Solution Provider in Civil Engineering"								General Manager 28/40										



	τ	JLR : TC86192000	0000417F	7F BORE LOG - 1/3													ISO/IEC	: 17025	:2005						
Project	No:	AAL.1666/Pdy/2020	Date:	13.11	1.2020	Location:	New	v Bus	tand	, Puducher	ry.				Index	prope	erties (%	6)	Sh stre	ear ength	(Gradatic	on prope	rties (%)
BH. No	:	1	GWT (m):	0.	.50	-					<u></u>	붊				r —			parar	neters					
D	epth	of boring (m) :		33.00		Graphi	cal F	Repre	esent	ation of	onsister	lre cont) t/m³	('M)	(M)	ex(l₀)	lex (lc)	ex(Cs)	Direc te	t shear est		Sie	ve analy	/sis	
Denth	ш	Classification	Thickness	Den	th of	Sta	ndar	d Po	netra	tion	0/u	oistí (%)	y(imit	limit	/ind	y inc	l ind	(;	(si		nd	pue	Þ	ž
Delau	atu	classification		Comm	un on	Juli	т	4 D - 4			iptic	al	ansit	uid I	stic	ticity	enci	swe	/cm²	gree		ß	υsε	Sar	k cla
Below	l sti	or	or	Samp	ling(m)		Tes	t Data	a (N)		esci	atrun	ä	Liq	Pla	Plas	Isist	66	(Kg	(de	Ğ	Sars	diu	je	ait 8
GL	Soi	soil	Layer (m)	UDS	DS	N Value	10	0 20	30	40 50		z				_	Š	ш	0			8	Me	Ľ	
					20.5																	ļ			
21.0					21.0	48					Dense														
		Sand	2.60		21.5																				
22.0		(SVV)			22.0	29					Medium	19	1.61		Non	- Plast	ic	Nil	0.030	30º45'	1.32	2.63	83.33	12.7	0.00
					22.5																				
23.0				-	23.0	7	_				Stiff														
					23.5		Ī																		
24.0					24.0	8					Stiff	47	1.18	75	35	40	0.7	100	0.165	5°25'	0.00	0.00	0.00	0.00	100.00
					24.5		ľ	,																	
25.0		Silty clay	4 40		25.0	8					Stiff														
		(CL-CH)			25.5		Ī																		
26.0				-	26.0	8					Stiff	51	1.02	71	36	35	0.57	40	0.206	8º20'	0.00	0.00	0.00	2.88	97.12
					26.5		•	\langle														 			
27.0					27.0	13		Ν			Medium											 			
					27.5			\mathbf{h}														 			
28.0		Sand	0.00		28.0	16					Medium	15	1.21		Slight	ly Plas	stic	50	0.105	10º25'	0.00	3.88	81.23	13.59	1.29
		(SW) with clay	2.00	-	28.5						Von											 			
29.0				-	29.0	54					Dense														
		Sand (SW)		-	29.5						Vani														
30.0		with Pebbles	1.00		30.0	58					Dense	9	1.85		Non	- Plast	ic	Nil	0.058	31º10'	20.09	26.34	44.64	8.04	0.89
Legend			ļ	1 1		<u> </u>		1	1		•	4		<u> </u>					Į		Logged	by	<u> </u>		
	SP	Poorly graded sand		GW-We	ll aaded a	ravel	MI-	Clave	v silt		GWT - G	iround \	Nater T	able		Rebo	ound				Junior E	Ingineer			
	SW	Well graded cand		GP- Poort	v graded g	avel	CL	Sanda	v clav		DS - Diet	rubed Se	ample		*	Self F	Pentratio	n				-			
	SM-S	SW- Silty sand		ML- Silt c	or clayey si	ilt	CH-	High	Plas	ticity clay	UDS - UI	ndisturk	ed sam	nple	CRR-	Core	Recover	ry Ratio	o (for Ro	ock)	Checked by				
	SC-	Clayey sand		CL-Silty	day	g sint of the high hasholdy clay of the single of the of the of the technic (of techni			General Manager																
Proiect N	No: A	AL.1625/2020		"A Tot	al So	olution	n Pro	vider in Civ	il Enginee	rina"												29/40			

ULR: TC86192000000417F





	BOF	RE LOG	- 1/3							
Location:	New Bustand, Puducher	ry.			Index	prope	erties (?	6)	She strer	ar atl
		5	Ħ			• •	•	,	param	ete
		ŝ	臣 문	e			-	_		

Projec	No:	AAL.1666/Pdy/2020	Date:	13.1 ⁻	.2020	Location:	New	Busta	tand, I	Puduche	rry.				Index	prope	erties (%	%)	stre	ength		Gradatio	on prope	erties (%)
BH. No	:	1	GWT (m):	0	.50						S	ant a						-	para	neters				-	-
	epth	of boring (m) :		33.00		Graphi	cal Re	epres	senta	tion of	onsisten	ure conte) t/m³	(W)	(M)	tex(l _e)	dex (lc)	ex(Cs)	Direc te	t shear est		Sie	ve analy	/sis	
Depth Below	tratum	Classification	Thickness	Dep	th of ling(m)	Sta	ndard Test	Pene Data	etrati	on	ription /o	ral moist (%))ensity (quid limit	astic limit	sticity inc	stency in	swell inc	g(cm²)	egrees)	avel	se sand	um sand	sand	& clay
GL	Soil s	soil	Layer (m)	UDS	DS	N Value	10	20	30	40 50	Desc	Natu		Ċ	ä	Pla	Consi	Free	у С	ip)	Q	Coar	Mediu	Fine	sit
					30.5						Von														
31.0					31.0	100 _(5cm↑)					Dense	7	1.71		Non	- Plast	ic	Nil	0.030	32º10'	10.04	18.47	64.66	6.83	0.00
		Sand (SW)	3.00		31.5	-					Very														
32.0	_	with Pebbles			32.0	100 _(15cm[†])					Dense														
					32.5	_					Verv														
33.0					33.0	100 _{(18cm1})					Dense	8	1.87		Non	- Plast	ic	Nil	0.045	32º31'	32.74	27.38	25.60	13.1	1.19
Legend	:																				Logged	by			
	SP	Poorly graded sand	ll gaded g	ravel	MI- C	layey	y silt		GWT - G	round \	Vater T	able		Rebo	und				Junior E	Engineer					
	SW	Well graded sand	y graded gi	avel	CI - Sa	andy c	clay		DS - Distr	ubed Sa	mple		*	Self P	entratic	n									
	SM-S	SW- Silty sand		ML- Silt o	or clayey s	ilt	CH- F	High F	Plastic	city clay	UDS - Ur	ndisturb	ed sam	nple	CRR-	Core	Recove	ry Rati	o (for Ro	ock)	Checke	d by			
	SC- (Clayey sand	ay																Genera	l Manage	er				
Project	No: AA	L.1666/2020		"A Tot	al Soli	ution	Provi	ider in Civ	il Enginee	ring"												30/40			



		<u>ULR : TC86192000</u>	<u>0000418F</u>						В	ORE LOG	- 2/3													
Project	No:	AAL.1666/Pdy/2020	Date:	17.11	1.2020	Location:	New	Bustar	nd, Puducl	erry.		1		Index	prope	rties (%	6)	Sł stre	near ength		Gradatio	on prope	erties (%))
BH. No		2	GWT (m):	0.	.50					5	t S						r	para	neters					
D	epth	of boring (m) :		31.00		Graphi	cal R	eprese	ntation of	onsisten	e conten) t/m ³	(M)	(M)	ex(l,)	ex (l _c)	ex(Cs)	Direc te	t shear est		Sie	eve analy	/sis	
Depth	tum	Classification	Thickness	Dep	th of	Sta	ndard	l Penet	ration	tion /c	oisture	sity (d limit	ic limit	aity ind	ncy ind	vell ind	m ^e)	ees)	e	sand	sand	and	clay
Below	straf	of	of	Samp	ling(m)		Test	Data (N	N)	, crip	alm	Den	iqui	lasti	astic	ister	esw	kg (legr	a v	ŝ	m	s o	t & c
GL	Soil	soil	Layer (m)	UDS	DS	N Value	10	20	30 40 50	Ğ	Natur			<u>а</u>	đ	Cons	Fre	ő	<u> </u>	0	Soa	Medi	Ę	sij
					0.5																			
1.0					1.0					Verv													ļ	
		Fill un earth	3.00		1.5	2				Loose														
2.0		r in up our in	0.00		2.0					Very														
					2.5	3				Loose														
3.0					3.0																		ļ	
		O'lte alars			3.5	4				Medium	35	1.11	65	31	34	0.88	50	0.180	7º48'	0.00	0.00	0.00	4.78	95.22
4.0	0 Silty clay 1.65																						 	
	(CL-CH)					17				Medium	58	1.21	72	35	37	0.38	100	0.281	8º48'	0.00	0.00	0.00	8.52	91.48
5.0				-	5.0																			
					5.5	20		N		Medium														
6.0					6.0			Ι																
					6.5	17				Medium	13	1.65		Non -	Plasti	с	Nil	0.061	28º22'	0.76	2.80	71.76	23.41	1.27
7.0					7.0																			
		Sand	5 35		7.5	22				Medium														
8.0		(SW)	0.00		8.0			\															 	
					8.5	31			V	Dense	19	1.64		Non -	Plasti	с	Nil	0.013	30°45'	0.00	0.00	72.29	27.17	0.57
9.0					9.0																			
					9.5																			
10.0	10.0				10.0	4				Medium													 	
Legend																				Logged	by			
	SP	Poorly graded sand		GW-We	ll gaded g	ravel	MI- C	layey s	silt	GWT - G	Ground	Water 1	Table		Rebo	und				Junior E	Engineer			
	sw	Well graded sand		GP- Poorl	ly graded g	ravel	CI - S	andy cla	ay	DS - Dist	rubed Sa	ample		*	Self P	entratio	n							
	SM-	SW- Silty sand		ML- Silt o	or clayey s	ilt	CH-I	High Pla	- asticity clay	UDS - U	ndisturl	bed san	nple	CRR-	Core	Recove	ry Rati	o (for Ro	ock)	Checke	d by			
	SC-	Clayey sand		CL-Silty	day															Genera	I Manag	er		
Project I	No: A	AL.1625/2020				"A Tot	tal Sol	lution P	rovider in (ivil Enginee	ering"												31/40	



		ULR : TC86192000	0000418F							BOI	RE LOG	- 2/3													AND PROPERTY.
Project	No:	AAL.1666/Pdy/2020	Date:	17.1	1.2020	Location:	New	Bustanc	l, Pud	ucher	ry.	•	1		Index	prope	erties (%	6)	Shear : parar	strength neters		Gradatio	on prope	erties (%)
BH. No	:	2	GWT (m):	0	.50						5	ŝ			-										
D	epth	of boring (m) :		31.00		Graphi	cal Re	presen	tation	of	onsisten	e conten) t/m³	(W)	(M)	ex(l,)	ex (lc)	ex(Cs)	Direc te	t shear est		Sie	eve analy	ysis	
Depth	m	Classification	Thickness	Dep	oth of	Sta	ndard	Penetra	tion		tion /c	oisture	sity (d limit	climit	ity ind	ind	ell ind	n²)	ees)	ه ا	sand	sand	and	lay
Below	strat	of	of	Samp	ling(m)		Test	Data (N)	1		crip	alm	Ğ	iquic	lasti	stic	sten	e SW	QC C	egr	rave	Se	Ű.	ы С	80
~	oil	11		1150	50	NUValua	40		o 40	50	Des D	atur			4	Ĕ	onsi	Fre	Ű	P)	G	Doar	ledi	Ē	silt
GL	s	SOII	Layer (m)	005	05	N Value	10	20 3	0 40	50		z					0					•	2		
					10.5	-																		I	
11.0					11.0	2					Soft														
					11.5													-							
12.0		Silty Clay	4.00		12.0	3					Medium	61	1.11	75	35	40	0.10	90	0.195	8º18'	0.00	0.00	0.00	2.8	97.23
		(CL-CH)			12.5		I																		
13.0					13.0	4					Medium														
					13.5		1																		
14.0				14.0	8					Stiff	50	1.02	78	36	42	0.67	100	0.262	4º41'	0.00	0.00	0.00	0.00	100.00	
					14.5		Ĩ			-					-										
15.0					15.0	9					Very stiff														
					15.5		Ť																		
16.0					16.0	7					Stiff	58	1 07	72	31	41	0.34	100	0 250	4º10'	0.00	0.00	0.00	0.00	100
					16.5		+		_			00	1.07		01		0.01	100	0.200		0.00	0.00	0.00	0.00	100
17.0					17.0						C+i#							-							
17.0		(CH)	6.00		17.0	/					Suii														-
					17.5	-	\rightarrow													000 41					
18.0					18.0	10			_		Very stiff	57	1.12	70	35	35	0.37	100	0.210	2°34	0.00	0.00	0.00	0.00	100
					18.5	-	_/				-														
19.0					19.0	6	4				Stiff														
			19.5																						
20.0			20.0	5					Stiff	53	1.04	78	36	42	0.6	100	0.180	6º16'	0.00	0.00	0.00	0.00	100.00		
Legend	:																				Logged	by			
	SP	Poorly graded sand		GW-We	ll gaded gi	ravel	MI- C	layey sil			GWT - G	round	Nater T	able		Rebo	und				Junior E	Ingineer			
	SW	Well graded sand		GP- Poor	y graded gr	avel	CI - S	andy clay			DS - Distr	ubed Sa	mple		*	Self F	entratio	n							
	SM-	SW- Silty sand		ML- Silt	or clayey s	ilt	CH- H	ligh Plas	sticity of	clay	UDS - Ur	disturb	ed sam	ple	CRR-	Core	Recove	ry Ratio	o (for Ro	ck)	Checke	d by			
	SC-	Clayey sand																	Genera	I Manage	ər				
Project I	No: A	AL.1625/2020		"A Tot	al Solu	ution Pro	vider i	in Civi	I Engineer	ing"												32/40			



		<u>ULR : TC86192000</u>	0000418F						BOI	RE LOG	- 2/3											ISO/IEC	17025	2005
Projec	t No:	AAL.1666/Pdv/2020	Date:	18.11	1.2020	Location:	New	Bustand.	Puducher	rv.				Index	nrone	ortioe (9	4	Shear	strength		Gradati	on nrong	artiae (%	
BH. No	:	2	GWT (m):	0	.50					<u>ج</u>	Ħ			muex	piope	1105 (7	0)	parai	neters		Grauatio	on prope	nues (70)	,
	Depth	of boring (m) :		31.00		Graphi	cal R	epresenta	ation of	onsistenc	ure conter) t/m³	('M)	(M)	tex(l,)	iex (Ic)	ex(Cs)	Direc te	t shear est		Sie	eve analy	ysis	
Depth	ratum	Classification	Thickness	Dep	th of	Sta	ndaro	d Penetrat	ion	ription /c	al moisti (%)	ensity (uid limit	stic limit	ticity inc	tency inc	swell ind	ycm?)	grees)	avel	e sand	msand	sand	& clay
Delow	oil st	01	01	Samp	iing(iii)		rest	Data (N)		Cesci	h atur	ă	Ë	На	Plas	nsis	Free	C(kc	ep)	Ğ	oars	ediu	-lne	silt a
GL	š	soil	Layer (m)	UDS	DS	N Value	10	20 30	40 50	-	2					റ്റ	-	-			0	Σ		
					20.5	-				4														
21.0					21.0	7	•			Dense														
					21.5																			
22.0					22.0	8				Medium	48	1.27	75	32	43	0.63	100	0.256	2º53'	0.00	0.00	0.00	1.56	98.44
		Clau			22.5													-					L	
23.0		(CH)	5.50		23.0	6				Stiff														
					23.5																			
24.0					24.0	8				Stiff	58	1.11	76	32	36	0.39	90	0.238	4º21'	0.00	0.00	0.00	0.00	100.00
					24.5																			
25.0					25.0	4				Stiff														
					25.5		/																	
26.0					26.0	18				Stiff	23	1.58		Slight	ly Plas	tic	60	0.152	14º21'	6.22	4.00	69.78	19.1	0.89
					26.5																			
27.0		Sand		-	27.0	31				Medium	8	1.25		Slight	ly Plas	tic	60	0.192	10º22'	39.49	22.56	32.31	5.64	0
		(SW) with clay	3.00		27.5				▶					Ŭ	ĺ									
28.0		with oldy			28.0	21				Medium	16	1.32		Slight	lv Plas	tic	50	0.213	17º44'	7 64	3 71	64 63	22 71	1.31
20.0	-			·	28.5	21				moulain	10	1.52		Oligin	ly i iao		50	0.210		7.04	0.71	04.00	22.11	1.01
20.0				-	20.0	. 02				Very	12	1.00		Non	Plact		NII	0.069	32010'	22.7	2 56	54.00	9.6	1.05
29.0	-			-	29.0	03				Dense	13	1.99		NOT	- Fiasi		INII	0.000	02 10	32.1	3.50	54.09	0.0	1.05
20.0		Sand (SW)	1 50	-	29.5	05				Very														
30.0	-	with Pebbles	1.00	-	30.0	95				Dense														
					30.5	100				Very	40	1.00		Nen	Diast		NU	0.040	22042	40.05	4.00	40.4	0.07	4.00
					31.0	100 _(4cm[†])				Dense	16	1.92		NON	- Plast	IC	INII	0.016	33°1	42.00	4.00	42.4	9.07	1.23
Legend	:														D.L.					Lugged	Dy			
	SP	Poorly graded sand		GW-We	II gaded gr	avel	MI- C	Clayey silt		GWT - G	round \	Vater T	able		Kebc	und				JUNIOFE	ingineer			
	SW	Well graded sand		GP- Poorl	ly graded gr	avel	CI - S	Sandy clay		DS - Distr	ubed Sa	mple		*	Self F	entratio	n N Dotie	for D-	olı)	Chaolis	dhu			
	SIVI-	Clavev sand		CL-Silty	n ciayey si dav	il i	СП-	nign Plast	icity clay	005 - Ur	IUISturb	ea sam	ihie	UKK-	Core	Recove	y Ratio	I (I OF RO	СК)	Genera	u by I Manadi	er		
Project	No: A	AL.1666/2020		01 0.ity	"A Tot	al Sol	ution Prov	ider in Civil	Engineeri	ing"									20.1010			33/40		





(NABL Accredited Laboratory - TC-8619)

		ULR : TC86192000	<u>0000419F</u>				-			BO	<u>RE LOG</u>	- 3/3									-		IGONE	0 11023	
Project	No	AAL.1666/Pdy/2020	Date:	19.1 ⁻	1.2020	Location:	New	Busta	and, P	uduche	rry.		1		Index	prope	rties (%	6)	Sh stre	ear ength		Gradatio	on prop∉	erties (%))
BH. No	:	3	GWT (m):	0	.50						5	%)							parar	neters					
D	epth	n of boring (m) :		32.00		Graphi	cal R	epres	entatio	on of	onsisten	e content) t/m³	(¹ w)	(M)	ex(l°)	ex (lc)	ex(Cs)	Direc te	t shear est		Sie	ve analy	ysis	
Depth	tum	Classification	Thickness	Dep	th of	Sta	ndaro	d Pene	etratio	n	tion /c	pistur	sity (d limit	ic limit	aity inc	ncy inc	vell ind	m ^e)	ees)	el	sand	sand	and	slay
Below	stra	of	of	Samp	ling(m)		Test	Data	(N)		scrip	alr	Be	iqui	lasti	astic	ister	e sv	kg/c	legr	av Aav	ŝ	E.	s o	t & c
GL	Soil	soil	Layer (m)	UDS	DS	N Value	10	20	30	40 50	ă	Natu			4	Ы	Cons	Fre	ŭ	5)	0	Coa	Medi	Ец	<u>ਲ</u> :
					0.5																				
1.0			0.05		1.0						Verv														
		Fill up earth	2.65		1.5	4					Loose	13	1.64		Non ·	Plasti	с	Nil	0.034	24º36'	16.05	23.46	46.42	13.09	0.99
2.0					2.0						_														
		Cilturalay			2.5	5					Stiff	45	1.19	71	35	36	0.72	90	0.201	8º18'	6.01	8.71	72.37	12.01	0.90
3.0		(CL-CH)	0.55		3.0																				
			3.5	4					Medium	42	1.29	75	36	39	0.85	100	0.185	4º41'	0.00	0.00	0.00	0.00	100.00		
4.0				4.0		١																			
			4.5	6					Stiff																
5.0		Clau			5.0		Ī				Verv														
		(Clay	3.80		5.5	9					stiff	48	1.02	72	32	40	0.60	90	0.221	5º11'	0.00	0.00	0.00	2.87	97.13
6.0					6.0		1				Mana														
				·	6.5	11					stiff														
7.0					7.0			1									-	-			-				
				-	75	14					Medium	20	1 64		Non .	Plasti	с С	Nil	0.03	30045'	0.00	3 18	69.55	24 55	2 73
8.0					80			4				20	1.01			1 1000	0		0.00	00 10	0.00	0.10	00.00	21.00	2.70
0.0		Sand	2 50	·	0.0	21					Medium														
0.0		(SW)	2.00		0.0	21					Wealdin												┣───┦		
9.0			9.0	-					-																
40.0			9.5				\downarrow	-	NA - diama								0.405	004.01	0.40		77.00	40.04	0.74		
10.0		Clay (CH)	0.50		10.0	24					wedium	57	1.15		Non ·	Plasti	С	Nil	0.195	6°16′	3.19	0.80	77.66	10.64	0.71
Legend																					Logged	bу 			
	SP	Poorly graded sand		GW- We	Il gaded g	ravel	MI- C	Clayey	silt		GWT - G	round	Water T	Table		Rebo	und				Junior E	ngineer			
	SW	Well graded sand		GP-Poor	ly graded gi	avel	CI - S	Sandy o	clay		DS - Distr	ubed S	ample		*	Self P	entratio	n			.				
	SM	-SW- Silty sand		ML-Silt (or clayey s dav	llt	CH-	High F	lastici	y clay	UDS - Ur	ndisturi	oed sam	nple	CRR-	Core	Recove	ry Rati	o (for Ro	DCK)	Checke	d by I Manaa	or		
Project	30. No: 1			uay	"A Tot	al So	lution	Provid	or in Civ		rina"									Genela	riviariag	51	34/40		
FIUJECU	NO. /	HAL. 1000/2020				A 101	a 30	uuuun	FIOVID		/ii ⊏nyinee	mg												34/40	



	τ	LR : TC86192000	0000419F						В	ORE LOG	- 3/3											ISO/IE	3 17025	:2005
Project N	lo:	AAL.1666/Pdy/2020	Date:	19.11	1.2020	Location:	New	Busta	nd, Puducl	nerry.		1		Index	prope	erties (%	6)	Sh stre	ear ength	(Gradatio	on prope	erties (%	,)
BH. No :		3	GWT (m):	0.	.50					5	뷺							parar	neters	<u> </u>				
Dej	pth o	of boring (m) :		31.00		Graphi	cal Re	eprese	entation of	onsister	lre conte) t/m³	('w	(M)	ex(l₀)	lex (lc)	ex(Cs)	Direct te	t shear est		Sie	ve analy	ysis	
Denth	ε	Classification	Thickness	Den	th of	Sta	ndard	Pono	tration	o/u	(%) (%)	ž	ij	limit	/ind	v ind	lind	((s		pu	pue	g	Ā
Below	ratu	classification	-f	Comp	(11 01 lin a(m)	Jai	Teet	Dete		iptic	alm	ansit	uid I	stic	ticity	ienc.	swe	/cm²	gree	see	esa	u Sč	Sar	k Cla
Delow	il st	01	01	Samp	iing(iii)		Test	Dala	(N)		latur	ă	Ľ	Pla	Plas	nsist	8	C(kc	eb)	Ğ	oars	sdiu	ine	sit 2
GL	ŝ	soil	Layer (m)	UDS	DS	N Value	10	20	30 40 50		2					8		•		ļ!	ð	۳ ۲		
					10.5																			
11.0					11.0	4				Medium	n													
		Silty Clay			11.5		Ĭ																	
12.0		(CL-CH)	3.50		12.0	7				Stiff	61	1.15	78	36	42	0.4	90	0.206	7º45'	0.00	0.00	0.00	0.0	100.00
					12.5		I																	
13.0					13.0	8				Stiff														
					13.5																			
14.0					14.0	17		\mathbf{n}		Medium	n 23	1.60		Non ·	- Plast	ic	Nil	0.058	31º10'	1.75	7.42	64.63	24.89	1.31
					14.5																			
15.0					15.0	25				Medium	ı													
		Sand	4.00		15.5																			
16.0		(SW)	4.00		16.0	29				Medium	¹ 14	1.7		Non ·	- Plast	ic	Nil	0.064	31º32'	1.23	4.10	66.39	26.64	1.64
					16.5				1															
17.0					17.0	34				Dense														
				-	17.5																			
18.0				1 1	18.0	7				Stiff	56	1.18	75	35	40	0.48	90	0.287	2º3'	0.00	0.00	0.00	2.56	97.44
					18.5		Ĩ																	
19.0		Clay	2.50		19.0	5				Stiff	45	1.21	71	36	35	0.74	100	0.21	2º34'	0.00	0.00	0.00	0.00	100
		(CH)		-	19.5	-					_					-		-						
20.0				-	20.0	12	-			Very stiff														
Legend:			1			<u> </u>	0	•				Į	ļ							Logged	by		·	
ç	SP	Poorly graded sand		GW- We	ll aaded a	ravel	MI- C	lavev	silt	GWT - (Ground	Water 1	Table		Rebo	und				Junior E	Engineer			
	SW -	Well graded sand		GP- Poort	v graded g	ravel	CI - S	andvo	 lav	DS - Die	trubed S	ample		*	Self F	Pentratic	n			1	-			
5	SM-S	SW- Silty sand		ML- Silt o	or clayey s	ilt	CH-F	High P	lasticity clay	UDS - U	Indistur	bed san	nple	CRR-	Core	Recove	ry Ratio	o (for Ro	ock)	Checke	d by			
S	SC- (Clayey sand		CL- Silty of	day			-												Genera	l Manage	er		
Project No	o: AA	AL.1666/2020				"A Tot	al Sol	ution F	Provider in C	ivil Engine	ering"												35/40	



		<u>ULR : TC86192000</u>	0000419F			1			BOI	KE LOG	- 3/3													
Projec	t No:	AAL.1666/Pdy/2020	Date:	18.1	1.2020	Location:	New	Bustan	d, Puduche	rry.		1		Index	prope	erties (9	%)	Shear para	strength meters		Gradati	on prope	erties (%	·)
BH. No	:	3	GWT (m):	0	.50	-				Ś	nt (%			1	1									
	Depth	of boring (m) :		31.00		Graphi	ical R	epresen	tation of	onsiste	e contei) t/m³	(Jw	(%)	ex(l,)	ex (lc)	ex(Cs)	Direc	t shear est		Sie	eve anal	ysis	
Denth	E	Classification	Thickness	Der	th of	Sta	ndard	Donotr	ation	0/u	sture	Ň	init	<u>i</u> į	/ind	/ind	lind		(s		pu	nd	Þ	Ŋ
Delaw	ratu	classification	-f	Comm		Sta	Teet		\ \	iptic	i	ansit	uidI	stic	ticit	enci	swel	/cm²	gree	sel	eSa	าระ	Sar	k do
Delow	il sti	or	or	Samp	ning(m)		Test	Data (N)	- CC	ural	ă	Ē	На	Plas	Isist	ie.	BA)	iep)	Ğ	ars	diu	ine	silt 8
GL	s	soil	Layer (m)	UDS	DS	N Value	10	20 3	0 40 50		R					8	ш.	Ŭ			ð	Ň	<u> </u>	•,
					20.5																			
21.0					21.0	10				Very Stiff	:													
					21.5																			
22.0					22.0	6				Stiff	58	1.15	68	32	36	0.28	100	0.205	5º42'	0.00	0.00	0.00	0.0	100.00
					22.5		Ī																	
23.0					23.0	7				Stiff														
		Clay	7.00		23.5		Ī																	
24.0		(CH)	24.0	6				Stiff	48	1.13	76	32	44	0.64	90	0.180	10º22'	0.00	0.00	0.00	0.56	99.44		
			24.5		Ń																			
25.0					25.0	9				Very Stiff														
					25.5		Ì																	
26.0					26.0	8				Stiff	51	1.01	70	35	35	0.54	80	0.271	7°55'	0.00	0.00	0.00	1.87	98.13
					26.5																			
27.0					27.0	28				Medium	14	1 68		Non	- Plast	ic	Nil	0.058	31º10'	1 36	4 52	84 16	9.5	0.45
20					27.5	20			₹									0.000				00		
28.0		Cond			28.0	27				Dense													<u> </u>	
20.0	-	(SW)	2.00		20.0	57				Dense													<u> </u>	
00.0					20.5				+	Very	10	4.05		Nez	Diast	L	NU	0.000	22020'	70.70	0.0	44.40	0.00	0.00
29.0		Sand		_	29.0	90				Dense	10	1.65		Non	- Plast		INII	0.028	32-39	78.72	3.2	14.19	3.66	0.23
		(SW)	1.00	29.5					Very													<u> </u>		
30.0		with Pebbles			30.0	97				Dense													<u> </u>	
Legend	:																			Logged	by			
SP Poorly graded sand GW- Well gaded gravel MI- Clayey silt GWT - Ground Wat													able		Rebo	und				Junior E	Engineer			
	SW	Well graded sand		GP- Poor	ly graded gr	avel	CI - S	Sandy clay	,	DS - Distr	ubed S	ample		*	Self F	Pentratio	n							
SM-SW-Silty sand ML-Silt or clayey silt CH-High Plasticity clay UDS - Undisturbed sample CRR- Core Recovery Ratio (for Rock) Checked by SC_Clayey cand CL_Silty day CH-High Plasticity clay UDS - Undisturbed sample CRR- Core Recovery Ratio (for Rock) Checked by																								
Drojact	SU-					wider in Civ		ina"									Genera	i wanag	ei	26/40				
Project	1NO: A	AL. 1000/2020				A 101	ai 301	iution Pro	svider in CIV	n ⊏ngineei	ing												30/40	



ASHHIRWAAD ANALYTICAL LABORATORY, PUDUCHERRY

	τ	LR : TC86192000	0000419F							BOI	RE LOG	- 3/3											ISO/IEC	C 17025:	2005
Projec	No:	AAL.1666/Pdy/2020	Date:	19.1 <i>°</i>	1.2020	Location:	New	Bustan	d, Puc	duche	rry.				Index	prope	erties (%	6)	Sh stre	near ength		Gradatio	on prope	erties (%))
BH. No	:	3	GWT (m):	0	.50						Ś	ent							parar	neters					
	epth o	of boring (m) :		32.00		Graphi	cal Re	epresei	ntation	n of	onsiste	ure cont) t/m³	(^T M)	(M):	lex(l₀)	dex (lc)	lex(Cs)	Direc te	t shear est		Sie	eve analy	ysis	
Depth	atum	Classification	Thickness	Dep	th of	Sta	ndard	Peneti	ation		iption /c	al moist (%)	nsity (uid limit	stic limit	ticity inc	tency in	swell inc	(cm²)	grees)	vel	e sand	n sand	sand	k clay
Below	l stı	of	of	Samp	ling(m)		Test	Data (N	I)		scr	atura	ä	Liq	Plas	Jas	Isist	8	;(kg	(deć	G	ars	diur	ше	iit 8
GL	Soi	soil	DS	N Value	10	20	30 40	50	ă	Ž				-	Cor	H	0			8	Me	Ŀ	S		
					30.5						Ι														
31.0		Sand (SW)	2 00		31.0	100 _(6cm[†])					Very Dense	12	1.93		Non -	· Plasti	с	Nil	0.016	33º1'	40.99	2.70	41.44	11.71	3.15
		with Pebbles	2.00		31.5						Very														
32.0					32.0	100(11cm)					Dense														
Legen	d:																				Logged	by			
	SP	Poorly graded sand		GW- We	ll gaded gi	avel	MI- C	layey si	lt		GWT - G	round	Nater T	able		Rebou	und				Junior E	Engineer			
	SW	Well graded sand	rly graded	gravel	CI - S	andy cl	ay		DS - Dist	rubed \$	Sample		*	Self P	entratio	n									
	SM-S	SW- Silty sand	or clayey s	ilt	CH- F	ligh Pla	sticity	clay	UDS - Ur	ndisturk	oed sam	ple	CRR-	Core F	Recove	ry Rati	o (for Ro	ock)	Checke	d by					
	SC- (Clayey sand		CL- Silty	clay																Genera	I Manag	er		
Project	No: AA	AL.1666/2020				"A Tot	al Solu	ution Pr	ovider	in Civ	il Enginee	ring"												37/40	

(NABL Accredited Laboratory - TC-8619)



BH - 1 GRAIN SIZE DISTRIBUTION CURVE

Project. No: AAL.1666/2020 "A Total Solution Provider in Civil Engineering" 38/40



BH - 2 GRAIN SIZE DISTRIBUTION CURVE

Project. No: AAL.1666/2020 "A Total Solution Provider in Civil Engineering" 39/40



BH - 3 GRAIN SIZE DISTRIBUTION CURVE

Project. No: AAL.1666/2020 "A Total Solution Provider in Civil Engineering" 40/40