weight, diameter and height of undisturbed samples of 3.65 cm diameter and 7.5 cm height. The formula adopted for determining the bulk density was;

$$\text{bulk density} = \frac{\text{weight of sample}}{\text{volume of sample}}$$

The dry density was then determined as follows;

$$\text{dry density} = \frac{\text{bulk density}}{1 + w}$$

where w = the natural moisture content of the sample.

- Liquid limit
  Both this test and the plastic limit test were carried out as per IS 2720 (P-V), 1970
- Plastic limit
- Sieve analysis
  The sieve analysis was done in accordance with IS: 2720 (P-IV), 1975. This standard also covered the following test.
- Hydrometer analysis
- Unconfined compressive strength
  The Indian Standard; IS 2720 (P-X), 1973 was applied to conduct this test.

(3) Field Survey Results

The results of the field survey are summarized in Fig. T-2. 1.2 and Table T-2.1.1. Fig. T-2.1.2 shows the soil layers classification, N values obtained from the SPT, and the unconfined compression strengths in kg/cm^2 obtained from the laboratory testing.Table T-2.1.1 shows a description of the various soil layers and their thicknesses. In general the soil layers, as observed from the soil investigation at the ten bore holes, can be classified as follows;

Layer I: Grayish yellow or bluish gray soft silty clay at depths ranging from 0.4m to 17.0m.

Layer II: Bluish gray, bluish/yellowish gray, or grayish blue medium stiff silty clay (with traces of

SOIL INVESTIGATION RESULTS AT TEN BOREHOLE LOCATIONS

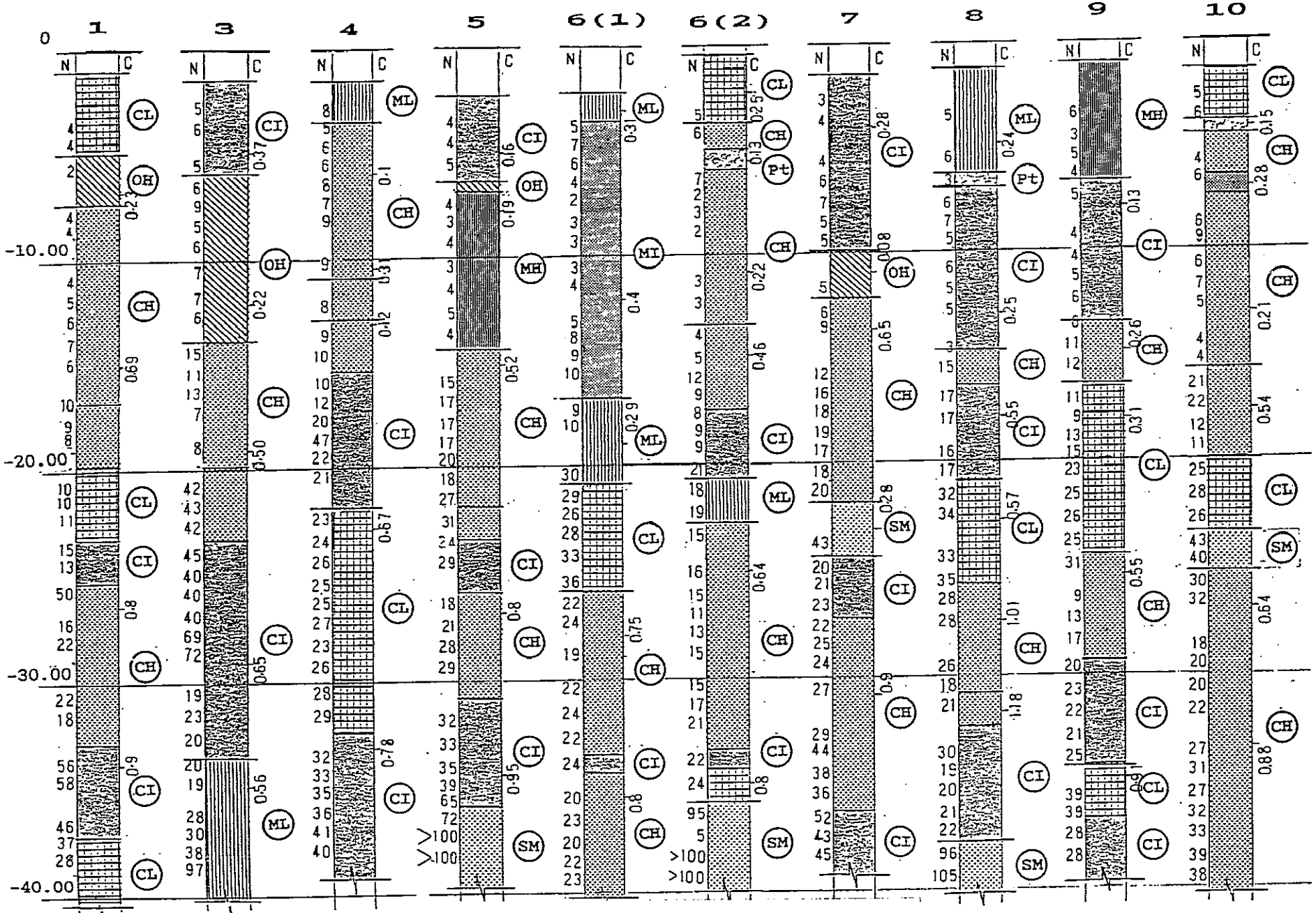


Figure T-2.1.2 Study Bore Holes Profiles

Table T-2.1.1(A) Study Bore Holes Sub-soil Layers Description

Layer	Bore Hole 1		Bore Hole 3		Bore Hole 4		Bore Hole 5		Bore Hole 6(1)	
	Depth (m)	Layer Description	Depth (m)	Layer Description	Depth (m)	Layer Description	Depth (m)	Layer Description	Depth (m)	Layer Description
I	1.00	Fill	1.50	Fill	1.50	Fill containing brick bats, fine sand, etc.	2.20	Fill	2.10	Fill containing brick bats, fine sand, etc.
II	4.00	Thick silty clay layer of low compressibility in soft state	4.50	Intermediate plasticity and low compressibility	2.00	Sandy silt layer in loose state	4.20	Medium stiff silty clay layer of low compressibility and intermediate plasticity	14.90	Thick clayey silt of soft to medium stiff consistency and low to intermediate plasticity, and intermediate compressibility
III	2.40	Silty clay with organic matter in the form of decomposed wood having very high moisture content as well as liquid limit	8.00	Organic clay in the form of decomposed wood of soft to very soft consistency and high plasticity and compressibility	7.50	Silty clay of high compressibility, with the top portion having soft consistency while that near the bottom is of medium stiff consistency	8.10	Thin lense (0.45m) of very soft organic silt in form of decomposed wood, followed by thick deposit of soft clayey silt with traces of decomposed wood, of high compressibility and plasticity	4.00	Non-plastic silt
IV	33.14 min.	Silty clay with variable compressibility. Top 18m high to intermediate plasticity and soft to medium stiff consistency. Below that material has stiff to very stiff consistency	19.70	Silty clay with high to intermediate plasticity and stiff consistency	2.00	Silty clay containing organic matter in the form of decomposed wood having very soft consistency	21.10	Silty clay where consistency increases from medium stiff to stiff to to stiff to hard with increase in depth and high to intermediate plasticity	5.00	Stiff sandy silty clay of low plasticity and compressibility
V			6.30 min.	Dense to very dense sandy silt of low plasticity and medium to stiff consistency	9.00	Silty clay with variable consistency. Intermediate compressibility and stiff consistency in the upper portion and very stiff consistency near the bottom	4.40 min.	Very dense silty sand	14.00 min.	Stiff to very stiff silty clay with high to intermediate plasticity and compressibility
VI					18.00 min.	Silty clay with some sand and very stiff consistency. Upper portion material has low compressibility while lower portion material is of intermediate compressibility				
VII										

Table T-2.1.1(B) Study Bore Holes Sub-soil Layers Description

Layer	Bore Hole 6(2)		Bore Hole 7		Bore Hole 8		Bore Hole 9		Bore Hole 10	
	Depth (m)	Layer Description	Depth (m)	Layer Description	Depth (m)	Layer Description	Depth (m)	Layer Description	Depth (m)	Layer Description
I	0.40	Fill	1.50	Fill containing brick bats, rubbish, etc.	1.20	Fill	1.00	Fill containing brick bats, coal ash, etc.	1.40	Fill
II	3.35	Thick silty clay of soft consistency	8.50	Silty clay of intermediate compressibility with soft consistency	5.10	Clayey silt of soft consistency and low plasticity	5.70	Clayey silt of high plasticity and soft consistency	2.50	Mixed soil containing various percentage of silt, sand and clay
III	9.75	Thick silty clay containing organic matter in the form of decomposed wood, of high compressibility and soft consistency	12.00	Silty clay of high compressibility. Top 2.2m contains organic matter in form of decomposed wood and has very soft consistency. LL in the lower part is greater than 50 but consistency is very stiff	0.70	Thin lense of black peat	6.50	Silty clay with intermediate compressibility and soft consistency, containing organic matter in the form of decomposed wood	11.90	Silty clay with organic matter in the form of decomposed wood and peat of very soft to soft consistency and intermediate to high compressibility
IV	7.30	Silty clay of medium stiff consistency and high compressibility	2.50	Non-plastic sandy silt	7.80	Soft silty clay with occaisonal presence of decomposed and intermediate plasticity	3.00	Silty clay with high plasticity and soft consistency	4.30	Silty clay of medium stiff consistency and high plasticity
V	2.10	Non-plastic sandy silt in medium dense state	15.50 min.	Silty clay of variable compressibility with very stiff consistency	23.20	Silty clay of consistency increasing from medium stiff to very stiff with increase in depth, varying degree of plasticity, and intermediate to high compressibility	8.00	Silty clay of low plasticity and medium consistency	3.40	Silty clay with low compressibility
VI	13.10	Silty clay of stiff consistency and varying compressibility. Top portion has high compressibility while lower part has low compressibility			2.00 min.	Dense silty sand	10.00	Silty clay with high plasticity and stiff consistency in the upper part, and intermediate plasticity and very stiff consistency in the lower part	1.80	Non-plastic dense silty sand
VII	4.00 min.	Dense to very dense non-plastic silty sand					5.50 min.	Silty clay with intermediate plasticity and very stiff consistency	14.70 min.	Silty clay of stiff consistency, intermediate compressibility and high plasticity

sand, kankar, and brown patch) at depths ranging from 7.50m to 21.0m. At bore hole #5 this layer was observed just 2.0m below the ground surfaces for a depth of about 4m.

Layer III: Bluish gray, or yellowish brown stiff silty clay (with traces of sand, kankar, and yellow/brown patch) at depths ranging from 12.20m to 40.5m.

Layer IV: Yellowish/gray or yellowish/brown stiff sandy silt clay or silty sand at depths of 15.0m to 40.0m.

The following Figs. T-2.1.3 to T-2.1.12 show the results of the field surveys and laboratory tests for each borehole conducted under this Study.

2.1.3 Review of Previous Studies

(1) Calcutta Mass Transit Study (1970-1971)

a. Study Extent

This study was undertaken in connection with the feasibility study for the Calcutta metro transport project, the first underground metro to be constructed in India. The study involved the undertaking of 50 bore holes along the north/south line of the metro (Chowringhee - Jawaharlal Nehru - Chittaranja Avenue - B. Bose Ave.) of nominal diameter 150mm to 200mm. Thirty other bore holes were executed in the city center, and seven were done in the River Hooghly bed. Undisturbed samples were collected and laboratory tests were conducted.

b. Data related to this Study

Of the 80 bore holes investigated under the study holes 18 and 19A are at Rabindra Sadan intersection #5, holes 22, 23 and 24 are at Park Street intersection #8, holes 25, 26 and 27 are at Esplanade intersection #2 and hole 37A is in the vicinity of Shyambazar intersection #4. Figure T-2.13 shows the soil classification of these bore holes.

BORELOG DATA SHEET

Job No. CON/9111166 — Bore Hole No. BH-1

Location A.J.C. Bose Road at Moulali — R. L. +99.48M

Method of Boring Auger and Mud Rotary Circulation — Dia of Boring 150mm

Water Struck 2.10M. — S. W. L. 1.85M.

Date of Commencement 15.11.91 — Date of Completion 19.11.91

DESCRIPTION OF STRATA	DEPTH FROM G.L (M)		Type	SAMPLES: DEPTH (M) From	To	U.D.S./S.P.T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value
Filled up with brick bats etc.	1.00									
Greyish yellow soft silty clay		(CL)	D	2.00	-	-	-	-	-	-
			P	3.00	3.45	1	2	2	-	4
			P	4.00	4.45	1	2	2	-	4
	5.00		P	5.00	5.45	1	1	1	-	2
Greyish black soft silty clay with traces of decomposed wood		(OH)	U	6.00	6.50	-	-	-	-	-
	7.40		P	7.00	7.45	1	2	2	-	4
Bluish grey medium stiff silty clay			P	8.00	8.45	1	2	2	-	4
			P	9.00	9.45	2	2	3	-	5
			P	10.0	10.45	2	2	2	-	4
			P	11.0	11.45	2	2	3	-	5
		(CH)	P	12.0	12.45	2	2	4	-	6
			P	13.0	13.45	2	3	4	-	7
			P	14.0	14.45	2	3	3	-	6
			U	15.0	15.50	-	-	-	-	-
			P	16.0	16.45	4	6	7	-	13
	17.0		P	17.0	17.45	2	4	5	-	9
Bluish grey stiff silty clay with traces of sand, kankar and yellow patch			P	18.0	18.45	3	3	5	-	8
		(CH)	P	19.0	19.45	3	3	6	-	9

Code: U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Water Sample

Figure T-2.1.3(a) Bore Hole 1: Borelog (1)

BORELOG DATA SHEET

Job No. CON/9111166 — Bore Hole No. BH-1

Location A.J.C. Bose Road at Moulali — R. L. +99.48M

Method of Boring Auger and Mud Rotary Circulation — Dia of Boring 150mm

Water Struck 2.10M. — S. W. L. 1.85M.

Date of Commencement 15.11.91 — Date of Completion 19.11.91

DESCRIPTION OF STRATA	DEPTH FROM G.L (M)		SAMPLES: Type	DEPTH (M) From	DEPTH (M) To	U.D.S./S.P.T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value
Filled up with brick bats etc.	1.00		D	2.00	-	-	-	-	-	-
Greyish yellow soft silty clay		(CL)	P	3.00	3.45	1	2	2	-	4
			P	4.00	4.45	1	2	2	-	4
	5.00		P	5.00	5.45	1	1	1	-	2
Greyish black soft silty clay with traces of decomposed wood			U	6.00	6.50	-	-	-	-	-
		(OH)	P	7.00	7.45	1	2	2	-	4
	7.40		P	8.00	8.45	1	2	2	-	4
Bluish grey medium stiff silty clay			P	9.00	9.45	2	2	3	-	5
			P	10.0	10.45	2	2	2	-	4
			P	11.0	11.45	2	2	3	-	5
		(CH)	P	12.0	12.45	2	2	4	-	6
			P	13.0	13.45	2	3	4	-	7
			P	14.0	14.45	2	3	3	-	6
			U	15.0	15.50	-	-	-	-	-
			P	16.0	16.45	4	6	7	-	13
	17.0		P	17.0	17.45	2	4	5	-	9
Bluish grey stiff silty clay with traces of sand, kankar and yellow patch			P	18.0	18.45	3	3	5	-	8
		(CH)	P	19.0	19.45	3	3	6	-	9

Code: U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Water Sample

Figure T-2.1.3(a) Bore Hole 1: Borelog (2)

BORELOG DATA SHEET

Job No. CON/9111166 — Bore Hole No. BH-1

Location A.J.C.Bose Road at Moulali — R. L. +99.48M.

Method of Boring Auger and Mud Rotary Circulation — Dia of Boring 150mm

Water Struck 2.10M. — S. W. L. 1.85M.

Date of Commencement 15.11.91 — Date of Completion 19.11.

DESCRIPTION OF STRATA	DEPTH FROM G.L (M)		Type	SAMPLES: DEPTH (M) From	To	U.D.S./S.P.T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value
		(CH)	P	20.0	20.45	3	3	7	-	10
			P	21.0	21.45	3	4	6	-	10
		(CL)	P	22.0	22.45	4	4	7	-	11
			P	23.0	23.45	5	5	10	-	15
			P	24.0	24.45	4	6	7	-	13
		(CI)	P	25.0	25.45	9	18	32	-	50
			U	26.0	26.50	-	-	-	-	-
			P	27.0	27.45	5	8	8	-	16
			P	28.0	28.45	5	10	12	-	22
		(CH)	P	29.0	29.45	5	9	12	-	21
			P	30.0	30.45	7	8	14	-	22
			P	31.5	31.95	6	7	11	-	18
			P	33.0	33.45	16	22	34	-	56
			U	33.5	34.0	-	-	-	-	-
		(CI)	P	34.5	34.95	15	23	35	-	58
			P	36.0	36.45	11	18	28	-	46
	37.5		P	37.5	37.95	8	15	22	-	37
Yellowish/brownish grey stiff sandy silty clay		(CL)	P	40.09	40.54	7	11	17	-	28

Code: U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Sa

Figure T-2.1.3(a) Bore Hole 1: Borelog (3)

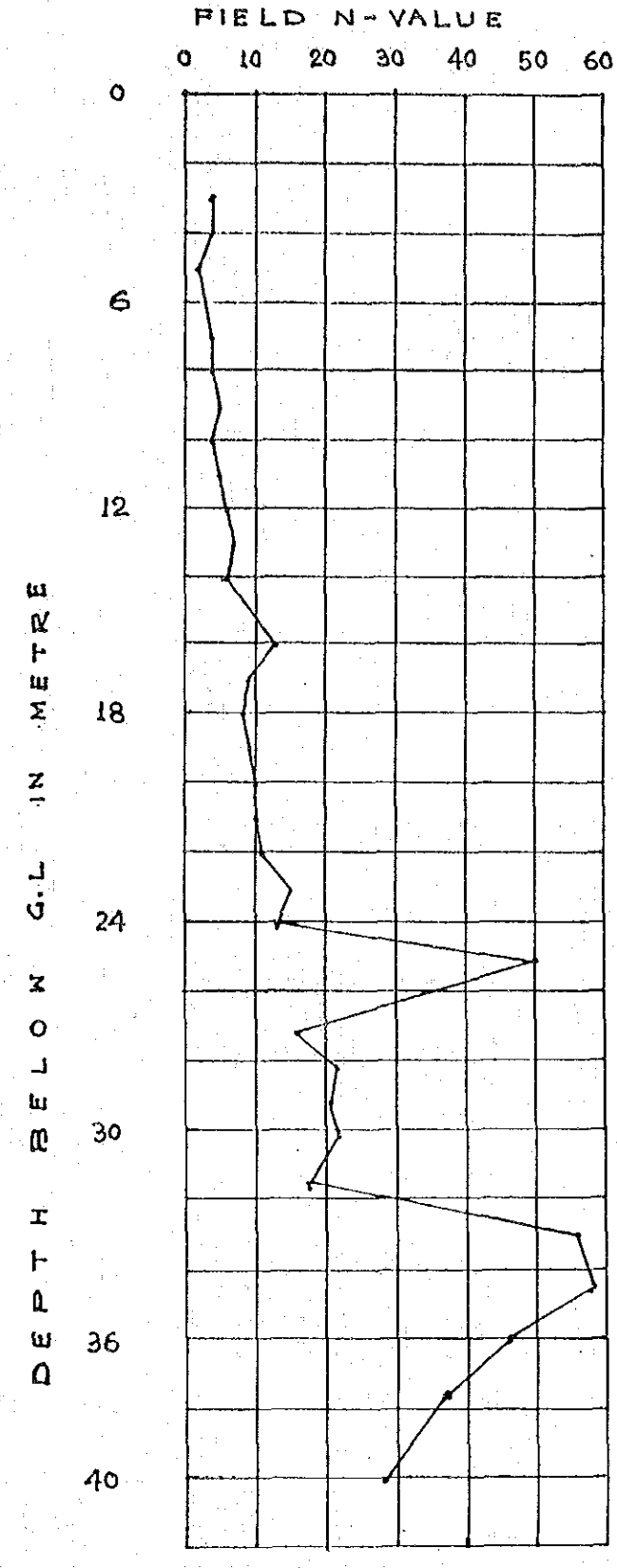
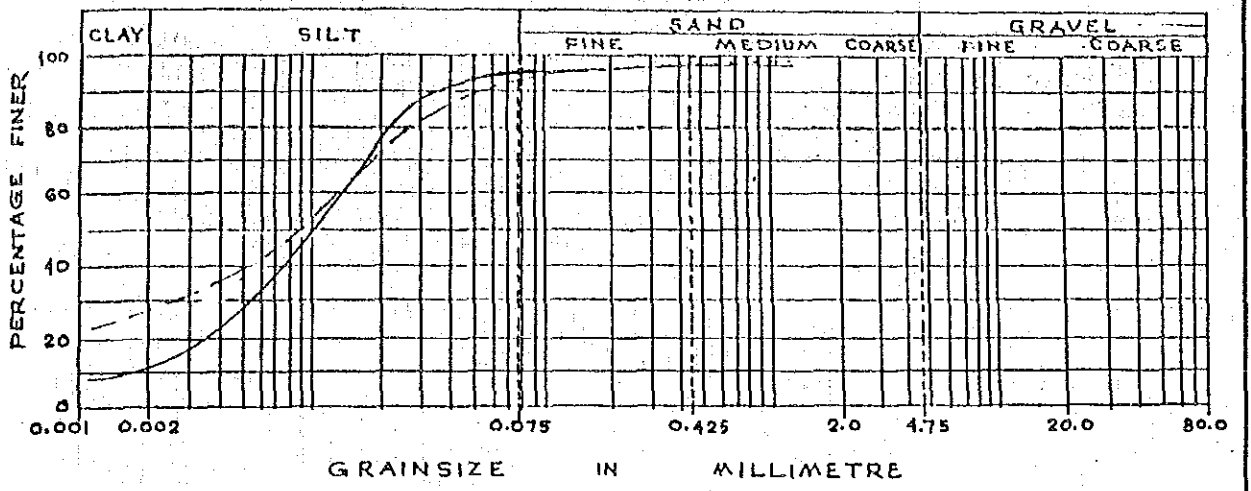


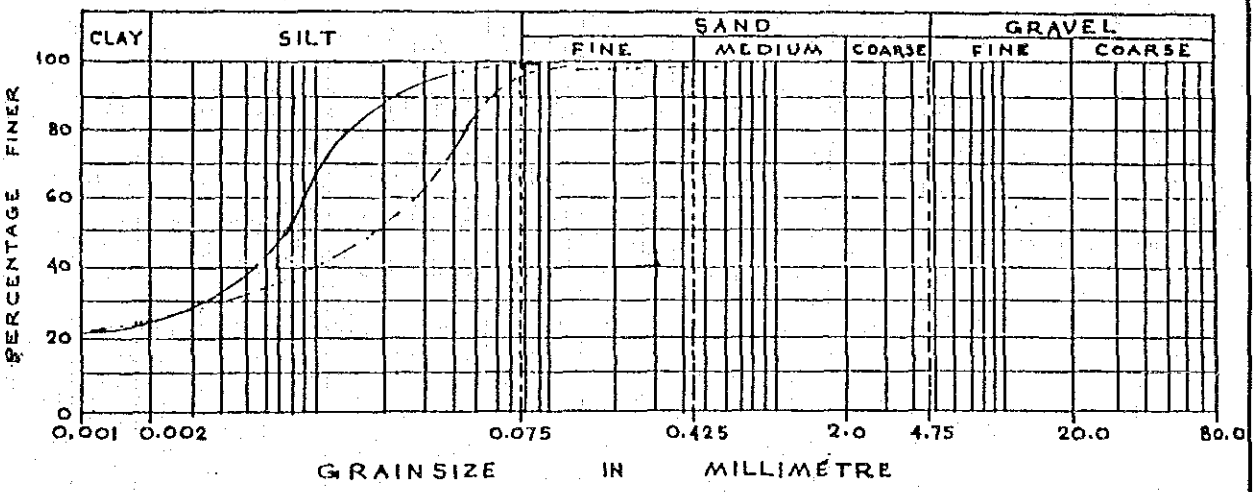
Figure T-2.1.3(b) Bore Hole 1: Distribution of 'N' Value with Depth

Depth below G.L. in 'M'	Description	Standard Penetration resistance 'N' Value	Grain Size Analysis			Density & Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s
			Gravel (%)	Sand (%)	Silt & Clay (%)	Natural Moisture Content (%)	Bulk Density (gms./c.c)	Dry Density (gms./c.c)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C kg/cm²	ϕ Degree	
4.00 to 4.45	Greyish yellow soft silty clay	-	-	1.1	98.9	27.4	-	-	31.2	22.6	8.6	-	-	-	-
6.00 to 6.50	Greyish black soft silty clay with traces of decomposed wood	-	-	3.7	96.3	30.3	1.382	0.766	87.8	62.3	25.5	UC	0.225	-	2.58
15.0 to 15.5	Bluish grey medium to stiff silty clay	-	-	6.5	93.5	32.0	1.904	1.442	58.6	20.5	38.1	UC	0.59	-	2.72
26.0 to 26.5	Bluish grey stiff silty clay with traces of sand, kankar and yellow patch	-	-	0.3	99.7	26.5	1.978	1.564	51.2	20.5	30.7	UC	0.80	-	2.71
33.5 to 34.0	-do-	-	-	2.8	97.2	23.5	1.993	1.614	40.5	20.4	20.1	UC	0.90	-	2.69
37.5 to 37.95	Yellowish/brownish grey stiff sandy silty clay	-	-	19.2	80.8	18.3	-	-	30.0	16.4	13.6	-	-	-	-

Figure T-2.1.3(c) Bore Hole 1: Soil Properties Classification by Layers



BORE HOLE	DEPTH	SYMBOL
BH-1	6.00 to 6.50m.	————
BH-1	15.00 to 15.5m.	– – – – – – –



BORE HOLE	DEPTH	SYMBOL
BH-1	26.0 to 26.5m.	
BH-1	33.5 to 34.0m.	

Figure T-2.1.3(d) Bore Hole 1: Grain Size Distribution Curve

BORELOG DATA SHEET

Job No. CON/9111166
Location Gariahat Road at Gariahat Intersection
Method of Boring Auger and Mud Rotary Circulation
Water Struck 1.50M.
Date of Commencement 19.11.91

Bore Hole No. BH-3
R. L. +99.53M.
Dia of Boring 150mm
S. W. L. 1.50M.
Date of Completion 25.11.91

DESCRIPTION OF STRATA	DEPTH FROM G. L. (M)	Lithology	Type	SAMPLES: DEPTH (M) From	To	U. D. S. / S. P. T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value	REM
Filled up soil with brick bats, fine sand etc.											
	1.50		D	1.50	2.00	-	-	-	-	-	
Bluish grey soft silty clay			P	2.00	2.45	5	3	2	-	5	
			P	3.00	3.45	4	3	3	-	6	
		(Cl)	U	4.00	4.50	-	-	-	-	-	
			P	5.00	5.45	2	2	3	-	5	
	6.00		P	6.00	6.45	3	3	3	-	6	
Blackish grey soft to very soft organic clay in the form of decomposed wood			P	7.00	7.45	2	4	5	-	9	
			P	8.00	8.45	1	2	3	-	5	
			P	9.00	9.45	2	3	3	-	6	
		(OH)	P	10.0	10.45	2	3	4	-	7	
			U	11.0	11.5	-	-	-	-	-	
			P	12.0	12.45	3	4	3	-	7	
			P	13.0	13.45	2	3	3	-	6	
	14.0		P	14.0	14.45	4	5	10	-	15	
Bluish/yellowish grey stiff silty clay with traces of sand			P	15.0	15.45	4	4	7	-	11	
		(Cl)	P	16.0	16.45	4	5	8	-	13	

Code: U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Water Sample

Figure T-2.1.4(a) Bore Hole 3: Borelog (1)

BORELOG DATA SHEET

Job No. CON/9111166
Location Gariahat Road at Gariahat Intersection
Method of Boring Auger and Mud Rotary Circulation
Water Struck 1.50M.
Date of Commencement 19.11.91

Bore Hole No. BH-3
R. L. +99.53M.
Dia of Boring 150mm
S. W. L. 1.50M.
Date of Completion 25.11.91

DESCRIPTION OF STRATA	DEPTH FROM G. L. (M)	Lithology	Type	SAMPLES: DEPTH (M) From	To	U. D. S. / S. P. T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value	REM
			P	17.0	17.45	5	4	3	-	7	
			U	18.0	18.50	-	-	-	-	-	
			P	19.0	19.45	2	3	5	-	8	
	20.0	(CH)	P	20.0	20.45	10	17	25	-	42	
Yellowish/bluish grey stiff silty clay with brown patch			P	21.0	21.45	11	19	24	-	43	
			P	22.0	22.45	13	19	23	-	42	
			P	23.00	23.45	13	21	24	-	45	
			P	24.0	24.45	11	19	21	-	40	
			P	25.0	25.45	12	18	22	-	40	
			P	26.0	26.45	20	32	37	-	69	
			P	27.0	27.45	18	33	39	-	72	
		(CI)	U	28.0	28.50	-	-	-	-	-	
			P	29.0	29.45	6	8	11	-	19	
			P	30.0	30.45	7	9	14	-	23	
			P	31.0	31.45	6	7	13	-	20	
			P	32.0	32.45	5	8	12	-	20	
	33.7		P	33.0	33.45	6	7	12	-	19	

Code: U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Water Sample

Figure T-2.1.4(a) Bore Hole 3: Borelog (2)

BOREHOLE DATA SHEET

Job No. CON/9111166
Location Gariahat Road at Gariahat Intersection
Method of Boring Auger and Mud Rotary Circulation
Water Struck 1.50M.
Date of Commencement 19.11.91

Bore Hole No. BH-3
R. L. +99.53M.
Dia of Boring 150mm
S. W. L. 1.50M.
Date of Completion 25.11.91

DESCRIPTION OF STRATA	DEPTH FROM G. L. (M)	Lithology	Type	SAMPLES: DEPTH (M) From	To	U. D. S. / S. P. T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value	REM
Bluish grey sandy silt		(ML)	U	34.0	34.50	-	-	-	-	-	
			P	35.0	35.45	11	13	15	-	28	
			P	36.0	36.45	10	14	16	-	30	
			P	37.0	37.45	11	14	17	-	31	
			P	38.0	38.45	12	15	18	-	33	
			P	39.0	39.45	15	17	21	-	38	
			P	40.0	40.45	25	45	52	-	97	

Code: U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Water Sample

Figure T-2.1.4(a) Bore Hole 3: Borelog (3)

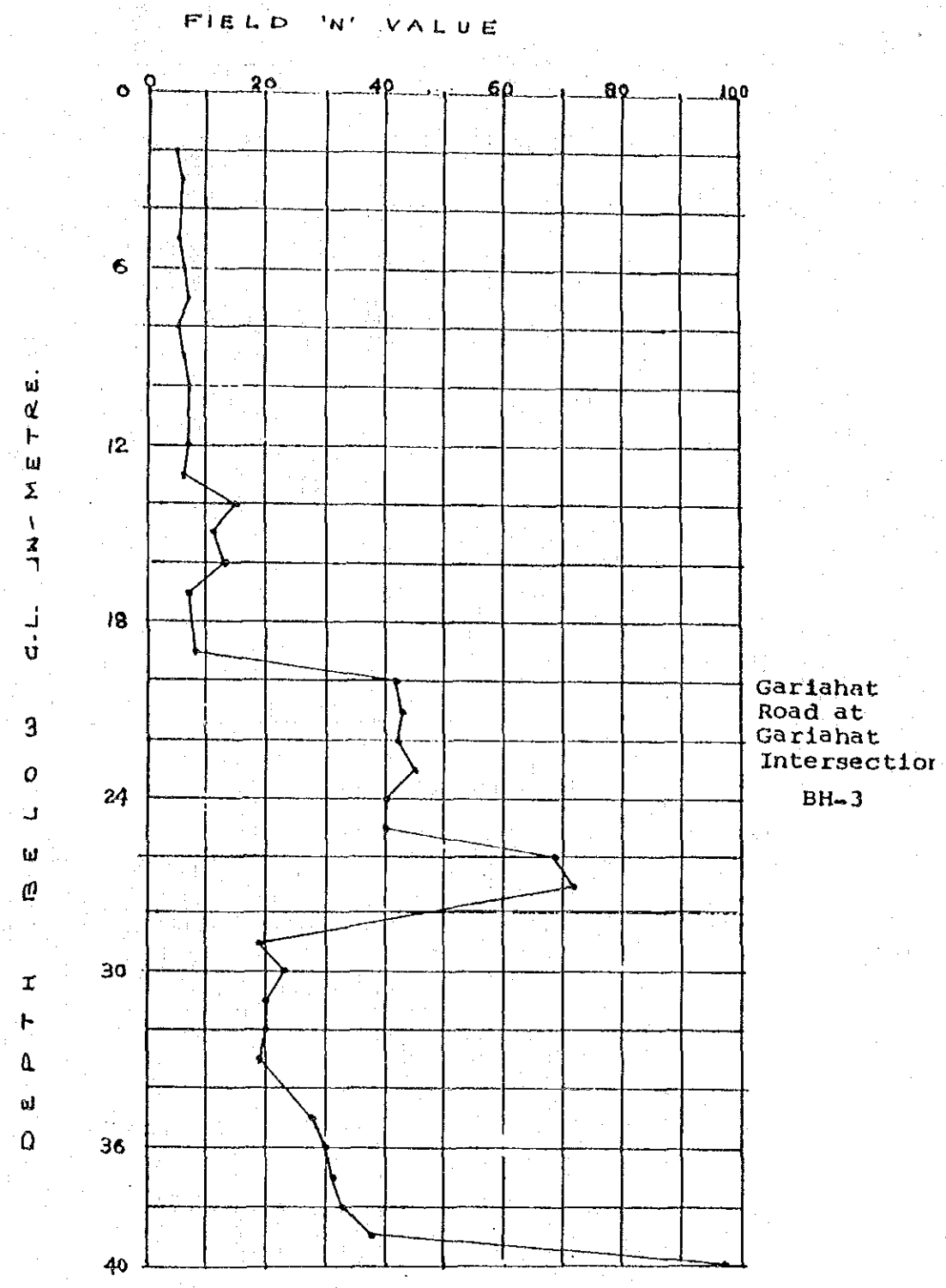
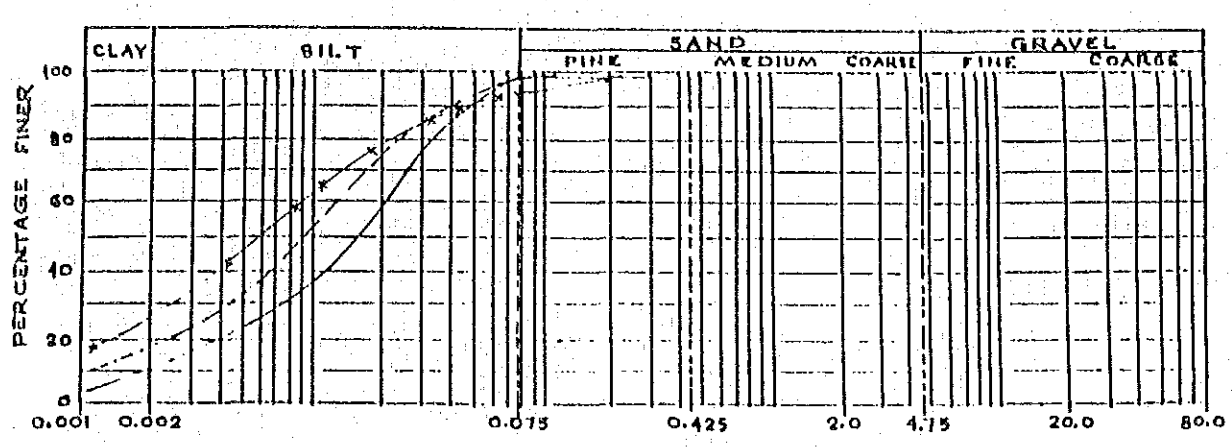


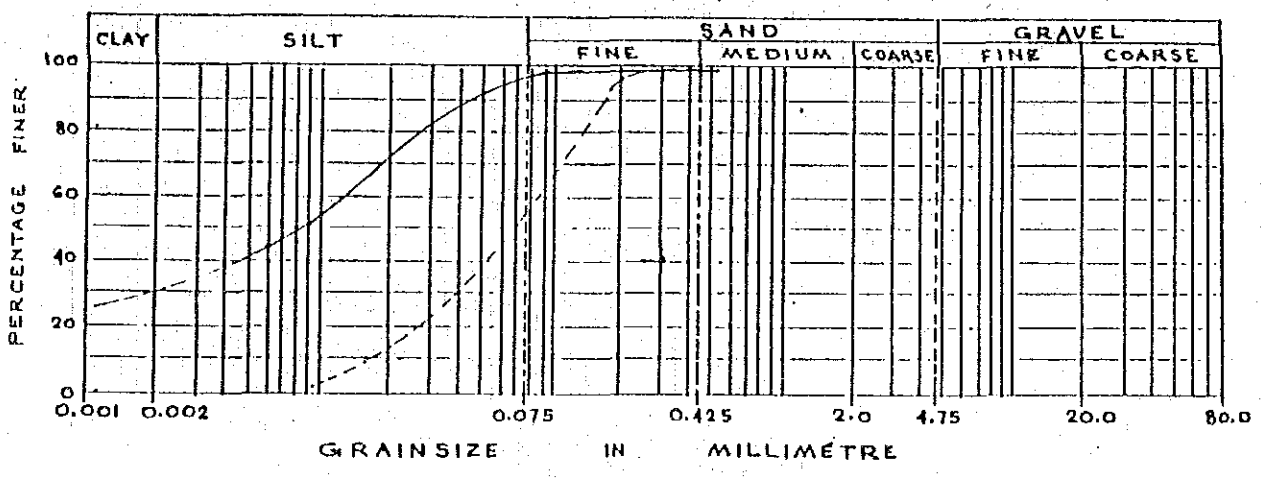
Figure T-2.1.4(b) Bore Hole 3: Distribution of 'N' Value with Depth

Bore Hole No.	Depth below G.L. in 'M'	Description	Standard Penetration resistance 'N' Value	Grain Size Analysis			Density & Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s
				Gravel (%)	Sand (%)	Silt & Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/c.c)	Dry Density (gms/c.c)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kg/cm²)	ϕ (Degree)	
BH - 3	4.00 to 4.50	Bluish grey soft silty clay		-	0.5	99.5	31.8	1.827	1.386	35.7	23.6	12.1	UC	0.367	-	2.68
	11.0 to 11.5	Blackish grey very soft organic clay in the form of decomposed wood		-	0.8	99.2	90.8	1.432	0.776	92.2	50.8	41.4	UC	0.22	-	2.55
	18.0 to 18.5	Bluish/yellowish grey stiff silty clay with traces of sand		-	5.3	94.2	29.7	1.858	1.433	53.5	22.9	30.6	UC	0.50	-	2.70
	28.0 to 28.5	Yellowish/bluish grey stiff silty clay with brown patch		-	1.8	98.2	29.0	1.898	1.471	49.5	21.4	28.1	UC	0.65	-	2.70
	34.0 to 34.5	Bluish grey sandy silt		-	45.0	55.0	28.5	1.979	1.462	31.8	26.8	5.0	UC	0.56	-	2.64
	40.0 to 40.45	-do-		-	17.0	83.0	24.8	-	-	28.0	23.9	4.1	-	-	-	-

Figure T-2.1.4(c) Bore Hole 3: Soil Properties Classification by Layers



BORE HOLE	DEPTH	SYMBOL
BH-3	4.0 to 4.50m.	———
BH-3	11.0 to 11.5m.	— - - - — - - - —
BH-3	18.0 to 18.5m.	——x——x——



BORE HOLE	DEPTH	SYMBOL
BH-3	28.0 to 28.5m.	———
BH-3	34.0 to 34.5m.	— — — — — —

Figure T-2.1.4(d) Bore Hole 3: Grain Size Distribution Curve

BORELOG DATA SHEET

Job No. CON/9111166 — Bore Hole No. BH-4

Location Bidhan Sarani at Shyambazar Crossing — R. L. +99.44 M.

Method of Boring Auger and Mud Rotary Circulation — Dia of Boring 150mm

Water Struck 1.50M. — S. W. L. 1.50M.

Date of Commencement 13.11.91 — Date of Completion 16.11.91

DESCRIPTION OF STRATA	DEPTH FROM G. L. (M)	Lithology	Type	SAMPLES: DEPTH (M) From	To	U. D. S. / S. P. T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value
Filled up soil with brick bats, fine sand etc.	1.50									
Bluish grey micaceous sandy silt		(ML)	P	2.50	2.95	1	4	4	-	8
	3.50		P	3.50	3.95	2	2	3	-	5
Bluish grey soft to medium stiff silty clay			P	4.50	4.95	2	3	3	-	6
			P	5.50	5.95	2	3	3	-	6
			U	6.50	6.90	-	-	-	-	-
			P	7.50	7.95	3	3	5	-	8
			P	8.50	8.95	3	3	4	-	7
		(CH)	P	9.50	9.95	3	5	4	-	9
			U	10.5	10.90	-	-	-	-	-
	11.0									
Blackish grey soft silty clay with traces of decomposed wood			P	11.5	11.95	4	4	5	-	9
			U	12.5	12.90	-	-	-	-	-
	13.0									

Code: U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Water Sample

Figure T-2.1.5(a) Bore Hole 4: Borelog (1)

BORELOG DATA SHEET

Job No.. CON/9111166
Location... Bidhan Sarani at Shyambazar Crossing
Method of Boring.. Auger and Mud Rotary Circulation
Water Struck.... 1.50M.
Date of Commencement... 13.11.91

Bore Hole No..... BH-4
R. L..... +99.44 M.
Dia of Boring..... 150mm
S. W. L..... 1.50M.
Date of Completion... 16.11.91

DESCRIPTION OF STRATA	DEPTH FROM G. L. (M)	Lithology	Type	SAMPLES: U. D. S. / S. P. T. DEPTH (M) From	To	0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value	RE
Greyish blue stiff sandy silty clay with rusty patch and kankar		(CI)	P	13.5	13.95	2	3	5	-	8	
			P	14.5	14.95	2	4	5	-	9	
			P	15.5	15.95	4	5	5	-	10	
			P	16.5	16.95	5	5	5	-	10	
			P	17.5	17.95	5	6	6	-	12	
			P	18.5	18.95	9	9	11	-	20	
			P	19.5	19.95	9	19	28	-	47	
			P	20.5	20.95	6	10	12	-	22	
			P	21.5	21.95	4	8	13	-	21	
	22.0										
Yellowish grey medium stiff to stiff sandy silty clay			U	22.5	22.90	-	-	-	-	-	
			P	23.5	23.95	7	8	15	-	23	
			P	24.5	24.95	7	9	15	-	24	
		(CL)	P	25.5	25.95	7	8	18	-	26	
			P	26.5	26.95	8	9	16	-	25	
			P	27.5	27.95	9	9	16	-	25	
			P	28.5	28.95	10	11	16	-	27	

Code: U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Water Sample

Figure T-2.1.5(a) Bore Hole 4: Borelog (2)

BORELOG DATA SHEET

Job No.. CON/9111166
Location ..Bidhan Sarani at Shyambazar Crossing
Method of Boring...Auger and Mud Rotary Circulation
Water Struck.....1.50M.
Date of Commencement.....13.11.91

Bore Hole No.....BH-4
R. L.....+99.44 M.
Dia of Boring.....150mm
S. W. L.....1.50M.
Date of Completion.....16.11.91

DESCRIPTION OF STRATA	DEPTH FROM G. L. (M)	Lithology	Type	SAMPLES: DEPTH (M) From	To	U. D. S. / S. P. T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value
		(CL)	P	29.5	29.95	9	9	14	-	23
			P	30.5	30.95	10	10	16	-	26
			P	31.5	31.95	11	12	16	-	28
			P	32.5	32.95	11	13	16	-	29
			U	33.5	33.90	-	-	-	-	-
			P	34.5	34.95	12	15	17	-	32
		(CI)	P	35.5	35.95	12	16	17	-	33
			P	36.5	36.95	11	16	19	-	35
			P	37.5	37.95	12	18	18	-	36
			P	38.5	38.95	12	18	23	-	41
			P	39.5	39.95	12	17	23	-	40

Code: U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Water Sample

Figure T-2.1.5(a) Bore Hole 4: Borelog (3)

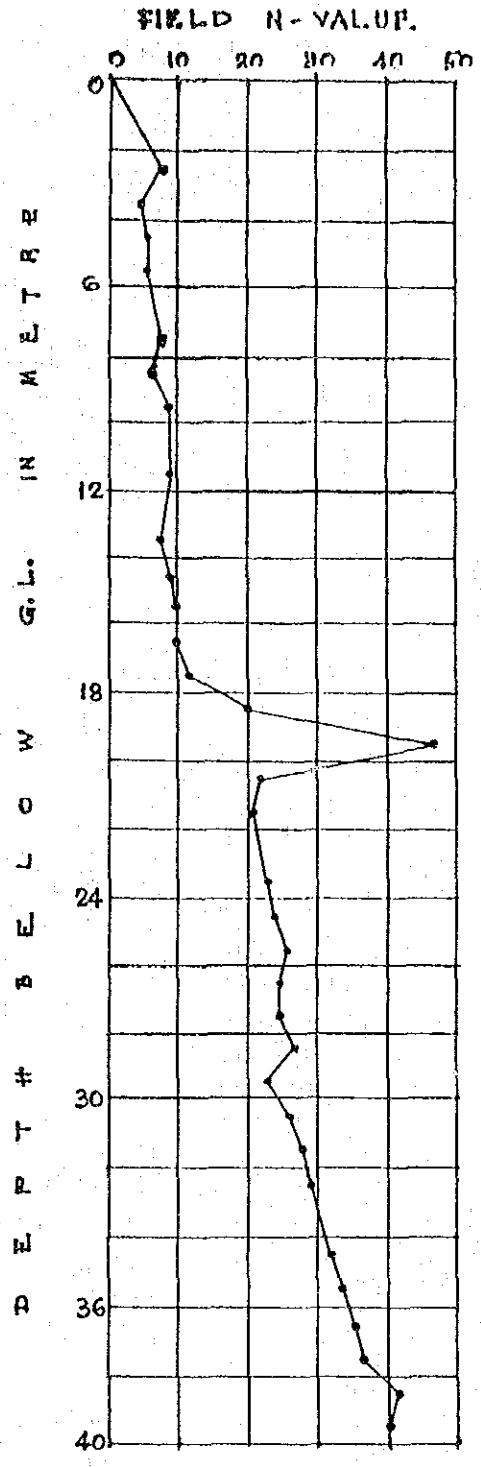
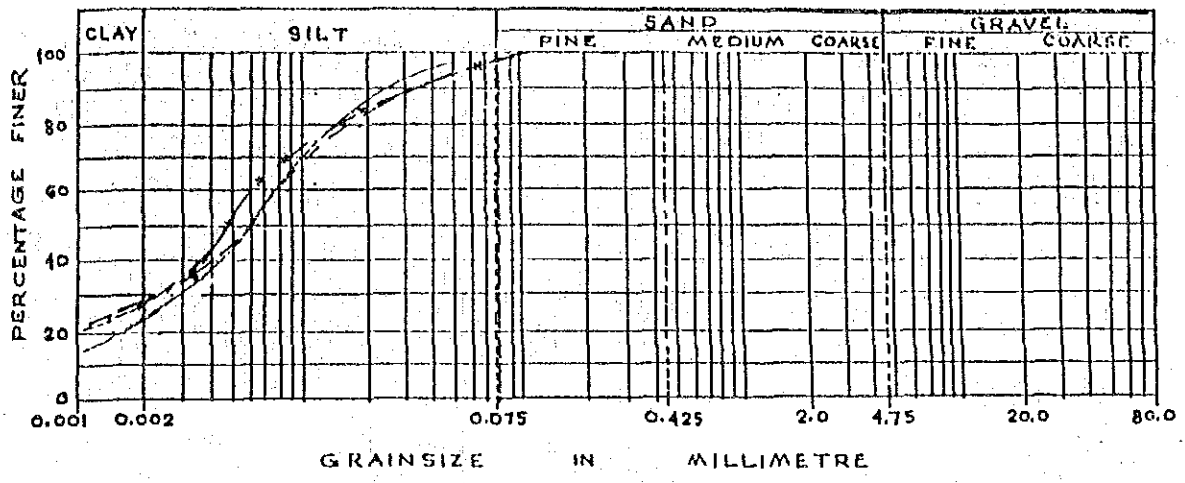


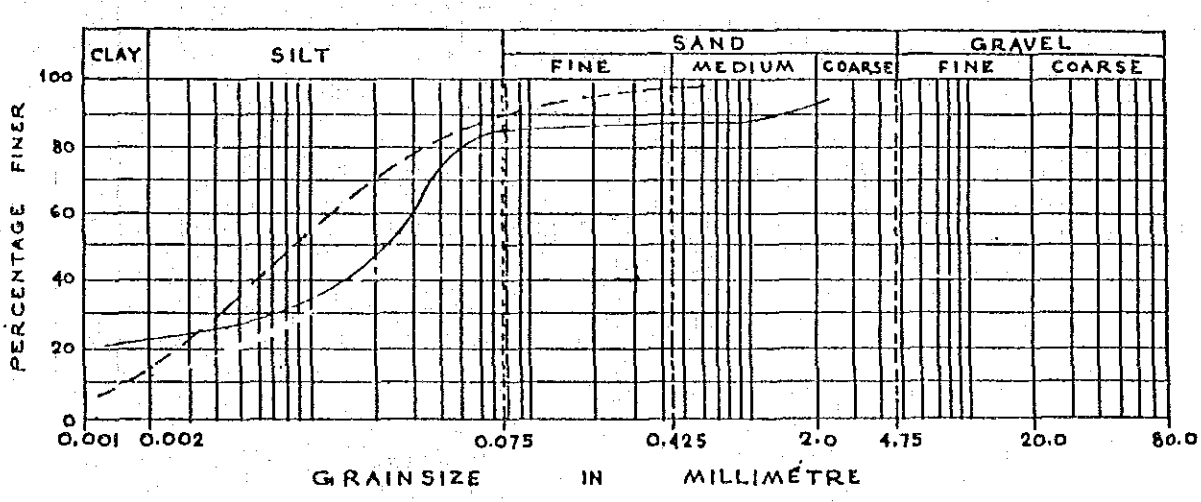
Figure T-2.1.5(b) Bore Hole 4: Distribution of 'N' Value with Depth

Bore Hole No.	Depth below G.L. in 'M'	Description	Standard Penetration resistance 'N' Value	Grain Size Analysis			Density & Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s
				Gravel (%)	Sand (%)	Silt & Clay (%)	Natural Moisture Content (%)	Bulk Density (gms./c.c)	Dry Density (gms./c.c)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kg/cm²)	ϕ (Degree)	
BH - 4	2.50 to 2.95	Bluish grey micaceous sandy silt		-	38.0	62.0	28.6	-	-	NON PLASTIC			-	-	-	-
	6.50 to 6.90	Bluish grey soft to medium stiff silty clay		-	0.40	99.6	49.6	1.677	1.121	59.2	29.6	29.6	UC	0.10	-	2.70
	10.5 to 10.9	-do-		-	0.70	99.3	42.4	1.781	1.251	66.3	30.7	35.6	UC	0.305	-	2.68
	12.5 to 12.9	Blackish grey soft silty clay with traces of decomposed wood		-	0.50	99.5	55.3	1.592	1.025	65.7	30.5	35.2	UC	0.12	-	2.68
	18.5 to 18.95	Greyish blue stiff-sandy silty clay with rusty patch and kankar		5.0	36.0	59.0	25.5	-	-	39.8	23.0	16.8	-	-	-	-
	22.5 to 22.9	Yellowish grey medium stiff to stiff sandy silty clay		-	10.0	90.0	27.6	1.896	1.486	34.5	20.8	13.7	UC	0.665	-	2.65
	33.5 to 33.9	-do-		-	15.4	84.6	26.7	1.938	1.529	48.7	22.0	26.7	UC	0.775	-	2.68

Figure T-2.1.5(c) Bore Hole 4: Soil Properties Classification by Layers



BORE HOLE	DEPTH	SYMBOL
BH-4	6.5 to 6.9m.	———
BH-4	10.5 to 10.9m.	– – – –
BH-4	12.5 to 12.9m.	—×—×—×—



BORE HOLE	DEPTH	SYMBOL
BH-4	22.5 to 22.9m.	– – – –
BH-4	33.5 to 33.9m.	———

Figure T-2.1.5(d) Bore Hole 4: Grain Size Distribution Curve

BORELOG DATA SHEET

Job No. CON/9111166
Location A.J.C.Bose Road and Chowringhee Road Crossing
Method of Boring Auger and Mud Rotary Circulation
Water Struck 1.65M.
Date of Commencement 18.11.91

Bore Hole No. BH-5
R. L. +99.22M
Dia of Boring 150mm
S. W. L. 1.65M.
Date of Completion 22.11.91

DESCRIPTION OF STRATA	DEPTH FROM G. L. (M)	Lithology	Type	SAMPLES: DEPTH (M) From	To	U. D. S. / S. P. T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value
Filled up soil with brick-bats, sand etc.	2.20		P	3.00	3.45	1	2	2	-	4
Light bluish grey medium stiff silty clay		(CI)	P	4.00	4.45	1	2	2	-	4
			U	5.00	5.50	-	-	-	-	-
			P	6.00	6.45	1	2	3	-	5
	6.40		D	6.50	6.60	-	-	-	-	-
Blackish grey very soft organic silt in the form of decomposed wood		(OH)	U	6.70	7.10	-	-	-	-	-
	6.85		P	7.50	7.95	2	2	2	-	4
Light blackish grey soft clayey siltwith traces of decomposed wood			P	8.50	8.95	1	1	2	-	3
			P	9.50	9.95	1	2	2	-	4
		(MH)	P	10.5	10.95	1	1	2	-	3
			P	11.5	11.95	1	2	2	-	4
			P	12.5	12.95	1	2	3	-	5
			P	13.5	13.95	2	2	2	-	4
	14.5		U	14.5	14.95	-	-	-	-	-
Bluish/yellowish grey medium stiff silty clay			P	15.5	15.95	3	6	9	-	15
		(CH)	P	16.5	16.95	4	7	10	-	17

Code : U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Water Sample

Figure T-2.1.6(a) Bore Hole 5: Borelog (1)

BORELOG DATA SHEET

Job No. CON/9111166
Location A.J.C.Bose Road and Chowringhee Road Crossing
Method of Boring Rotary Circulation Auger and Mud
Water Struck 1.65M.
Date of Commencement 18.11.91

Bore Hole No. BH-5
R. L. +99.22M
Dia of Boring 150mm
S. W. L. 1.65M.
Date of Completion 22.11.91

DESCRIPTION OF STRATA	DEPTH FROM G. L. (M)	Lithology	Type	SAMPLES: DEPTH (M) From	To	U. D. S. / S. P. T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value	REM
			P	17.5	17.95	5	7	10	-	17	
			P	18.5	18.95	4	6	11	-	17	
		(CH)	P	19.5	19.95	5	7	13	-	20	
			P	20.5	20.95	6	6	12	-	18	
			P	21.5	21.95	7	10	17	-	27	
	22.0		P	22.5	22.95	7	13	18	-	31	
Brownish/yellowish grey stiff silty clay			P	24.5	24.95	7	10	14	-	24	
		(CI)	P	25.5	25.95	8	12	17	-	29	
			U	26.5	27.00	-	-	-	-	-	
			P	27.5	27.95	5	8	10	-	18	
		(CH)	P	28.5	28.95	7	9	12	-	21	
			P	29.5	29.95	8	12	16	-	28	
			P	30.5	30.95	7	11	14	-	25	
	31.0		P	31.5	31.95	8	16	18	-	34	
Yellowish grey hard silty clay			P	32.5	32.95	10	15	21	-	36	
		(CI)	U	33.5	34.0	-	-	-	-	-	
			P	34.5	34.95	8	12	25	-	37	

Code : U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Water Sample

Figure T-2.1.6(a) Bore Hole 5: Borelog (2)

BORELOG DATA SHEET

Job No. CON/9111166
Location. A.J.C.Bose Road and Chowringhee Road Crossing
Method of Boring. Auger and Mud Rotary Circulation
Water Struck. 1.65M.
Date of Commencement. 18.11.91

Bore Hole No. BH-5
R. L. +99.22M.
Dia of Boring. 150mm.
S. W. L. 1.65M.
Date of Completion. 22.11.91

DESCRIPTION OF STRATA	DEPTH FROM G. L. (M)	Lithology	Type	SAMPLES: DEPTH (M) From	To	U. D. S. / S. P. T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value
	35.6	(CI)	P	35.5	35.95	9	13	26	-	39
Yellowish grey very dense silty sand			P	36.5	36.95	23	28	37	-	65
		(SM)	P	37.5	37.95	23	29	43	-	72
			P	38.5	38.80	39	105	-	-	>100
			P	40.0	40.30	51	117	-	-	>100

Code : U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Wa Sampl

Figure T-2.1.6(a) Bore Hole 5: Borelog (3)

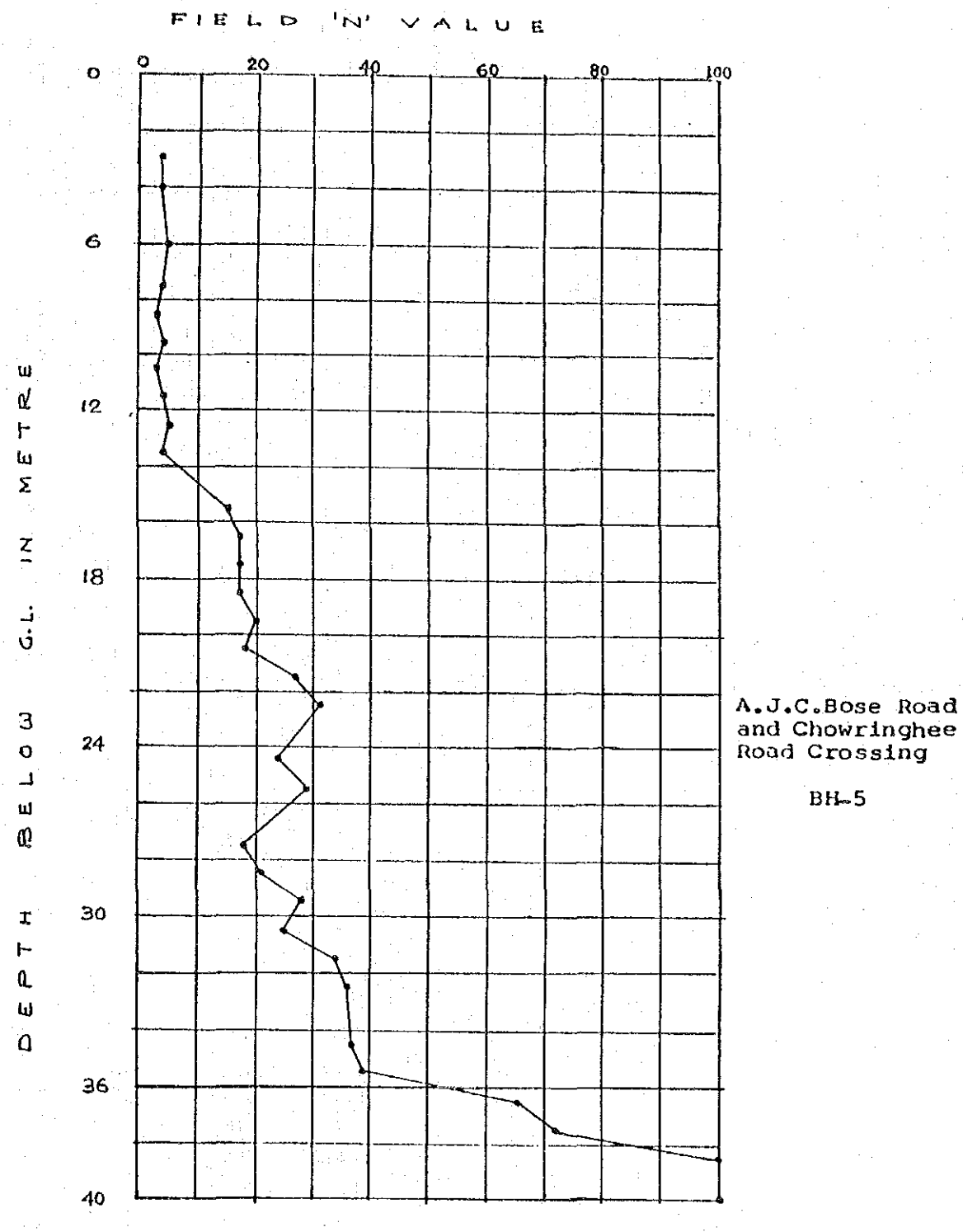
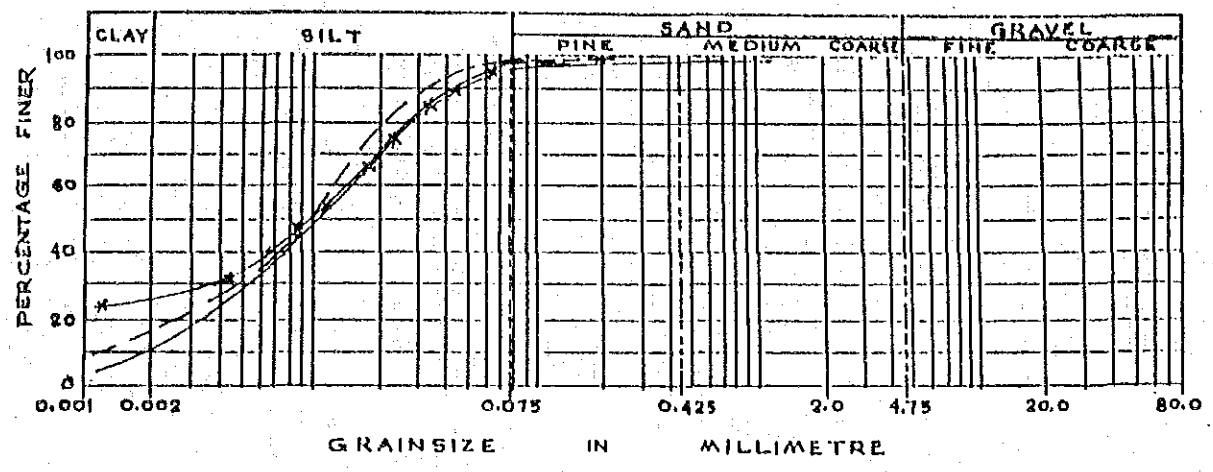


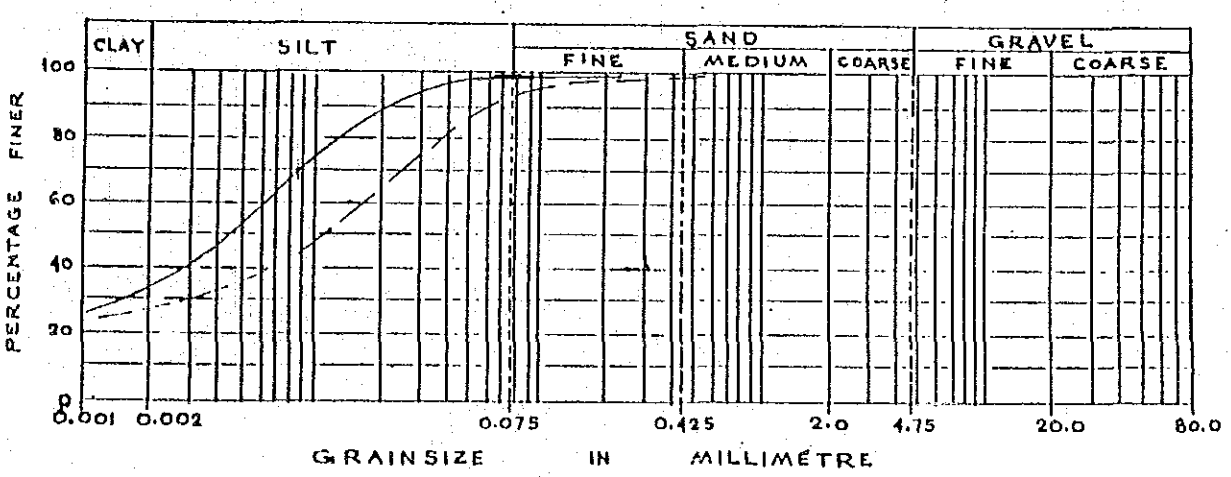
Figure T-2.1.6(b) Bore Hole 5: Distribution of 'N' Value with Depth

Bore Hole No.	Depth below G.L. in 'M'	Description	Standard Penetration resistance 'N' Value	Grain Size Analysis			Density & Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s
				Gravel (%)	Sand (%)	Silt & Clay (%)	Natural Moisture Content (%)	Bulk Density (gms./c.c)	Dry Density (gms./c.c)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kg/cm²)	ϕ (Degree)	
BH - 5	5.00 to 5.50	Light bluish grey medium stiff silty clay		-	2.6	97.4	28.2	1.859	1.450	35.5	21.5	14.0	UC	0.26	-	2.68
	6.70 to 7.10	Blackish grey very soft organic silt in the form of decomposed wood		-	0.4	99.6	78.2	1.426	0.800	82.6	46.6	36.0	UC	0.19	-	2.583
	12.5 to 12.95	Light blackish grey soft clayey silt with traces of decomposed wood		-	0.8	99.2	69.1	-	-	80.6	39.0	41.6	-	-	-	-
	14.5 to 14.95	Bluish/yellowish grey medium stiff silty clay		-	0.4	99.6	29.8	1.864	1.436	51.6	18.9	32.7	UC	0.52	-	2.70
	26.5 to 27.0	Brownish/yellowish grey stiff silty clay		-	0.2	99.8	31.4	1.906	1.450	62.8	22.2	40.6	UC	0.80	-	2.72
	33.5 to 34.0	Yellowish grey hard silty clay		-	6.5	93.5	20.2	2.041	1.698	42.0	16.9	25.1	UC	0.95	-	2.71
	38.5 to 38.8	Yellowish grey very dense silty sand		-	86.0	14.0	21.6	-	-	NON	PLASTIC		-	-	-	-

Figure T-2.1.6(c) Bore Hole 5: Soil Properties Classification by Layers



BORE HOLE	DEPTH	SYMBOL
BH - 5	5.0 to 5.50m	———
BH - 5	6.7 to 7.10m	– – – – – –
BH - 5	14.5 to 14.95m.	——×——×——



BORE HOLE	DEPTH	SYMBOL
BH - 5	26.5 to 27.0m.	———
BH - 5	33.5 to 34.0m.	– – – – – –

Figure T-2.1.6(d) Bore Hole 5: Grain Size Distribution Curve

BORELOG DATA SHEET

Job No. CON/9111166
Location. A.J.C.Bose Road and Auckland Place Crossing
Method of Boring. Rotary Circulation Auger and Mud
Water Struck 3.00M.
Date of Commencement 18.11.91

Bore Hole No. BH-6(1)
R. L. +99.50M
Dia of Boring 150mm.
S. W. L. 2.50M.
Date of Completion 23.11.91

DESCRIPTION OF STRATA	DEPTH FROM G.L (M)	Lithology	Type	SAMPLES: DEPTH (M) From	To	U.D.S./S.P.T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value
Filled up soil with brick bats fine sand etc.	2.10									
Bluish grey soft to medium stiff clayey silt		(ML)	U	2.50	2.95	-	-	-	-	-
			P	3.00	3.45	2	2	3	-	5
			P	4.00	4.45	3	3	4	-	7
			P	5.00	5.45	3	3	3	-	6
			P	6.00	6.45	2	2	2	-	4
			P	7.00	7.45	1	1	1	-	2
			P	8.00	8.45	1	1	2	-	3
			P	9.00	9.45	1	1	2	-	3
		(MI)	P	10.0	10.45	1	1	2	-	3
			P	11.0	11.45	1	2	2	-	4
			U	12.0	12.50	-	-	-	-	-
			P	13.0	13.45	1	2	3	-	5
			P	14.0	14.45	3	4	4	-	8
			P	15.0	15.45	3	4	5	-	9
			P	16.6	16.45	4	4	6	-	10

Code : U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Wa Samp

Figure T-2.1.7(a) Bore Hole 6(1): Borelog (1)

BORELOG DATA SHEET

Job No. CON/9111166
Location. A.J.C.Bose Road and Auckland Place Crossing
Method of Boring. Auger and Mud Rotary Circulation
Water Struck. 3.00M.
Date of Commencement. 18.11.91

Bore Hole No. BH-6 (1)
R. L. +99.50M
Dia of Boring. 150mm.
S. W. L. 2.50M.
Date of Completion. 23.11.91

DESCRIPTION OF STRATA	DEPTH FROM G. L. (M)	Lithology	Type	SAMPLES: DEPTH (M) From	To	U. D. S. / S. P. T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value
	17.0		P	17.0	17.45	4	4	5	-	9
Yellowish brown silt with little clay as binder			P	18.0	18.45	4	5	5	-	10
		(ML)	U	19.0	19.50	-	-	-	-	-
			P	20.0	20.45	9	12	18	-	30
	21.0		P	21.0	21.45	9	12	17	-	29
Yellowish grey stiff sandy silty clay			P	22.0	22.45	8	10	16	-	26
			P	23.0	23.45	7	12	16	-	28
		(CL)	P	24.0	24.45	10	14	19	-	33
			P	25.0	25.45	12	15	21	-	36
	26.0		P	26.0	26.45	7	8	14	-	22
Yellowish grey stiff silty clay with traces of kankar and rusty patch			P	27.0	27.45	8	8	16	-	24
			U	28.0	28.50	-	-	-	-	-
			P	29.0	29.45	7	8	11	-	19
		(CH)	P	30.0	30.45	8	9	13	-	22
			P	31.0	31.45	10	10	14	-	24
			P	32.0	32.45	9	10	12	-	22
			P	33.0	33.45	10	11	13	-	24

Code : U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Wa Sampl

Figure T-2.1.7(a) Bore Hole 6(1): Borelog (2)

BORELOG DATA SHEET

Job No. CON/9111166
Location A.J.C.Bose Road and Auckland Place Crossing
Method of Boring Auger and Mud Rotary Circulation
Water Struck 3.00M.
Date of Commencement 18.11.91

Bore Hole No. BH-6(1)
R. L. +99.50M.
Dia of Boring 150mm.
S. W. L. 2.50M.
Date of Completion 23.11.91

DESCRIPTION OF STRATA	DEPTH FROM G. L. (M)	Lithology	Type	SAMPLES: DEPTH (M) From	To	U. D. S. / S. P. T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value
		(CI)	U	34.0	34.50	-	-	-	-	-
			P	35.0	35.45	8	10	10	-	20
			P	36.0	36.45	9	11	12	-	23
		(CH)	P	37.0	37.45	7	9	11	-	20
			P	38.0	38.45	7	11	11	-	22
			P	39.0	39.45	9	11	12	-	23
			P	40.0	40.45	9	11	11	-	22

Code : U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Wat Sampl

Figure T-2.1.7(a) Bore Hole 6(1): Borelog (3)

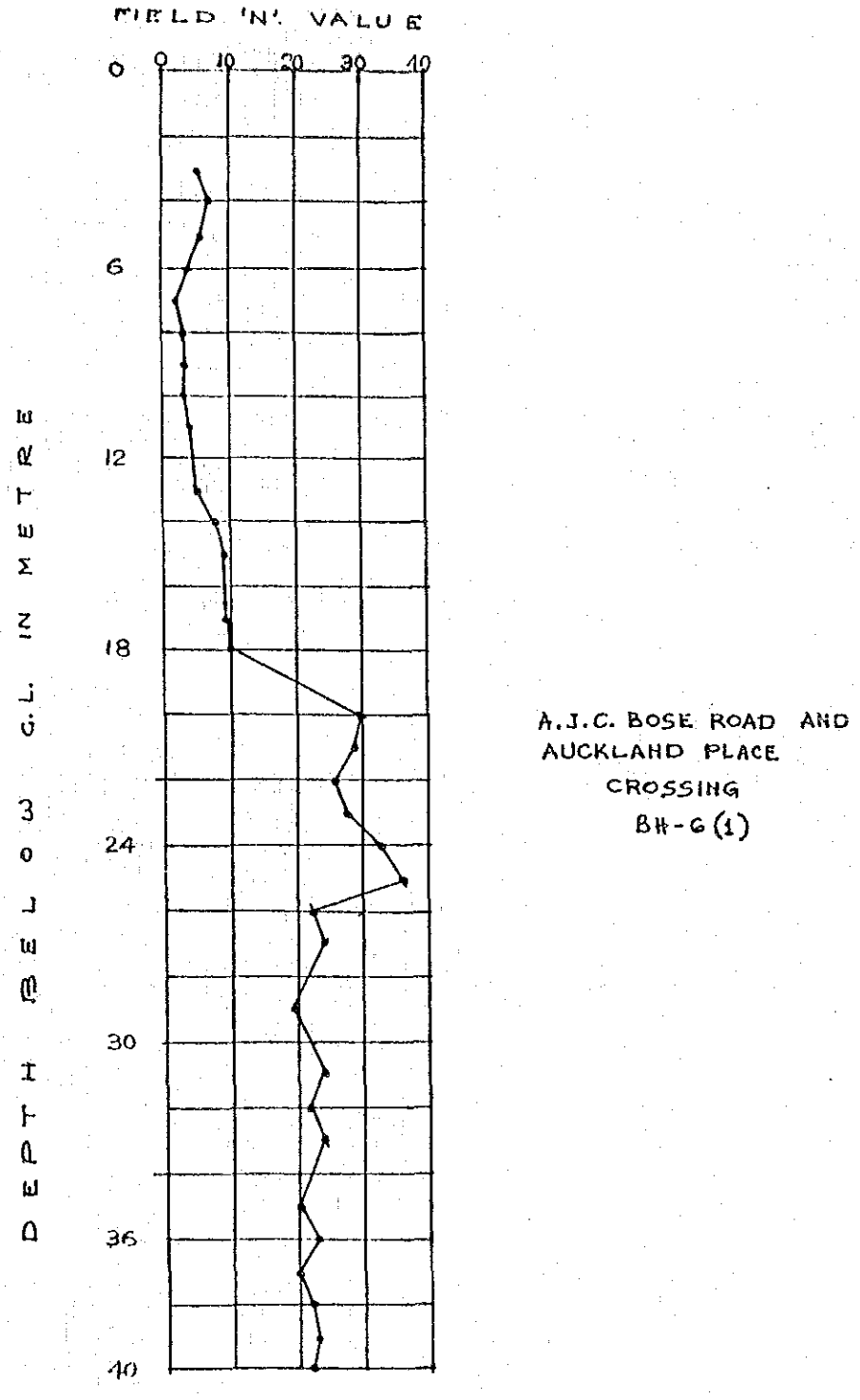
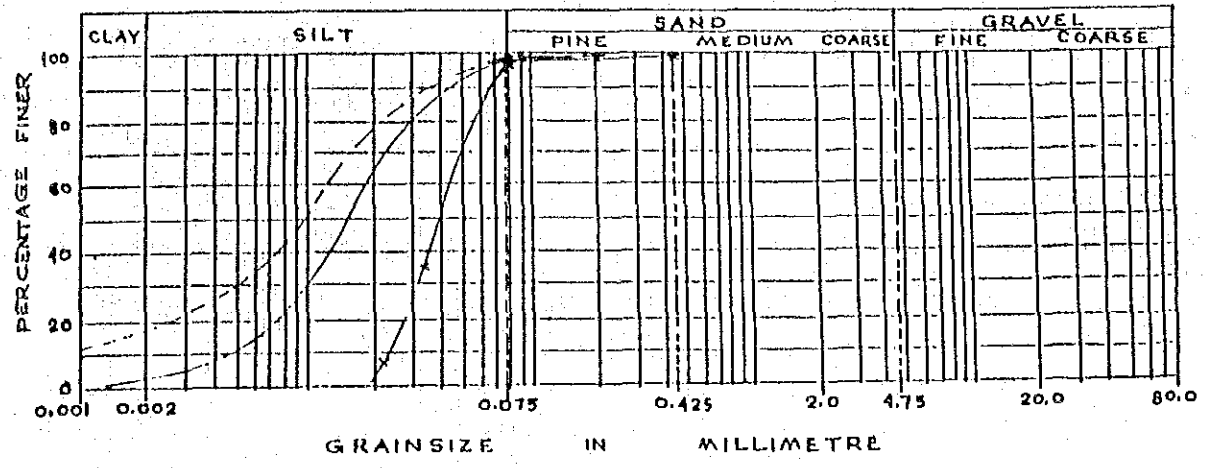


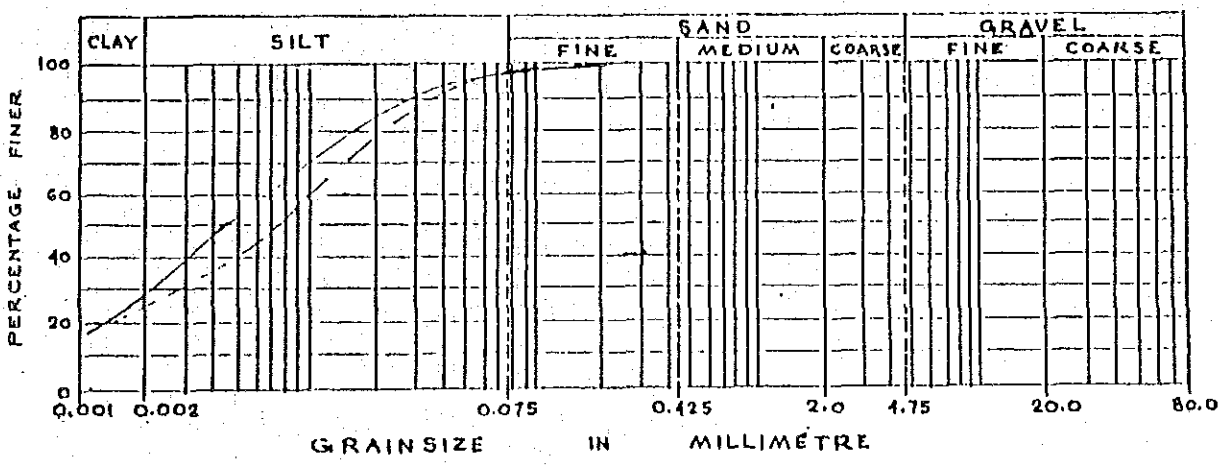
Figure T-2.1.7(b) Bore Hole 6(1): Distribution of 'N' Value with Depth

Bore Hole Nos.	Depth below G.L. in 'M'	Description	Standard Penetration resistance 'N' Value	Grain Size Analysis			Density & Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s
				Gravel (%)	Sand (%)	Silt & Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (Kg/cm²)	ϕ (Degree)	
BH-6(1)	2.50 to 2.95	Bluish grey clayey silt		-	1.7	93.3	29.2	1.905	1.397	NON - PLASTIC			UC	0.31	-	2.64
	12.0 to 12.5	Bluish grey soft to medium stiff clayey silt		-	0.4	99.6	34.7	1.811	1.344	47.8	29.2	18.6	UC	0.40	-	2.70
	19.0 to 19.5	Yellowish brown silt with little clay as binder		-	1.3	98.7	24.6	1.818	1.459	NON - PLASTIC			UC	0.29	-	2.62
	25.0 to 25.45	Yellowish grey stiff sandy silty clay		-	14.0	86.0	21.5	-	-	30.4	19.0	11.4	-	-	-	-
	29.0 to 29.5	Yellowish grey stiff silty clay with traces of kankar and rusty patch		-	1.2	98.8	29.9	1.911	1.471	51.0	22.2	28.8	UC	0.75	-	2.63
	34.7 to 34.5	-do-		-	1.1	98.9	24.3	1.941	1.562	47.2	20.1	27.1	UC	0.80	-	2.67
	40.0 to 40.45	-do-		-	2.2	97.8	23.3	-	-	69.4	16.6	52.8	-	-	-	-

Figure T-2.1.7(c) Bore Hole 6(1): Soil Properties Classification by Layers



BORE HOLE	DEPTH	SYMBOL
BH-6(1)	2.5 to 2.95m.	————
BH-6(1)	12.0 to 12.5m.	– – – – –
BH-6(1)	19.0 to 19.5m.	—x—x—x—



BORE HOLE	DEPTH	SYMBOL
BH-6(1)	28.0 to 28.5m	————
BH-6(1)	34.0 to 34.5m.	– – – – – – –

Figure T-2.1.7(d) Bore Hole 6(1): Grain Size Distribution Curve

BORELOG DATA SHEET

Job No. CON/9111166
Location A.J.C.Bose Road and Sarat Bose Road Crossing
Method of Boring Auger and Mud Rotary Circulation
Water Struck 2.50M
Date of Commencement 17.11.91.

Bore Hole No. BH - 6 (2)
R. L. +99.35M
Dia of Boring 150mm
S. W. L. 2.50M.
Date of Completion 21.11.91

DESCRIPTION OF STRATA	DEPTH FROM G.L (M)	Lithology	Type	SAMPLES: DEPTH (M) From	To	U.D.S./S.P.T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value
Filled up soil	0.40									
Yellowish grey very soft silty clay with traces of sand		(CL)	U	2.50	3.00	-	-	-	-	-
	3.75		P	3.00	3.45	1	2	3	-	5
Blackish grey very soft silty clay with decomposed wood		(CH)	P	4.00	4.45	2	3	3	-	6
			U	5.00	5.50	-	-	-	-	-
Peat like layer between 5.0m. to 6.0m.)		(Pt)	P	6.00	6.45	2	3	4	-	7
			P	7.00	7.45	1	1	1	-	2
			P	8.00	8.45	1	1	2	-	3
			P	9.00	9.45	1	1	1	-	2
		(CH)	U	10.0	10.50	-	-	-	-	-
			P	11.0	11.45	1	1	2	-	3
			P	12.0	12.45	1	1	2	-	3
			P	13.0	13.45	1	1	3	-	4
	13.5		P	14.0	14.45	2	2	3	-	5
Greyish blue medium stiff silty clay with traces of sand and kankar			U	15.0	15.50	-	-	-	-	-
		(CH)	P	16.0	16.45	4	6	6	-	12
			P	17.0	17.45	3	4	5	-	9

Code : U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Wat Sample

Figure T-2.1.8(a) Bore Hole 6(2): Borelog (1)

BORELOG DATA SHEET

Job No. CON/9111166 — Bore Hole No. BH – 6 (2)

Location. A.J.C.Bose Road and Sarat Bose Road Crossing — R. L. +99.35M.

Method of Boring. Auger and Mud Rotary Circulation — Dia of Boring. 150mm

Water Struck. 2.50M. — S. W. L. 2.50M.

Date of Commencement. 17.11.91 — Date of Completion. 21.11.91

DESCRIPTION OF STRATA	DEPTH FROM G. L. (M)	Lithology	Type	SAMPLES: DEPTH (M) From	To	U. D. S. / S. P. T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value
		(CI)	P	18.0	18.45	3	4	4	–	8
			P	19.0	19.45	2	3	6	–	9
			P	20.0	20.45	3	4	5	–	9
	20.8		P	21.0	21.45	9	10	11	–	21
Brownish grey medium dense sandy silt		(ML)	P	22.0	22.45	8	8	10	–	18
	22.9		P	23.0	23.45	7	8	11	–	19
Greyish blue stiff silty clay with traces of kankar and yellow spot			P	24.0	24.45	7	7	8	–	15
			U	25.0	25.5	–	–	–	–	–
			P	26.0	26.45	6	8	8	–	16
			P	27.0	27.45	7	7	8	–	15
		(CH)	P	28.0	28.45	4	5	6	–	11
			P	29.0	29.45	5	6	7	–	13
			P	30.0	30.45	5	7	8	–	15
			P	31.0	31.45	6	7	8	–	15
			P	32.0	32.45	6	8	9	–	17
			P	33.0	33.45	7	9	12	–	21
		(CI)	P	34.0	34.45	8	10	12	–	22
		(CL)	U	35.0	35.5	–	–	–	–	–

Code : U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Water Sample

Figure T-2.1.8(a) Bore Hole 6(2): Borelog (2)

BORELOG DATA SHEET

Job No.. CON/9111166 — Bore Hole No.. BH - 6(2)

Location .. A.J.C.Bose Road and Sarat Bose Road Crossing — R. L.. +99.35M.

Method of Boring.. Auger and Mud Rotary Circulation — Dia of Boring.. 150 mm

Water Struck.. 2.50M. — S. W. L.. 2.50M.

Date of Commencement.. 17.11.91 — Date of Completion.. 21.11.91

DESCRIPTION OF STRATA	DEPTH FROM G. L. (M)	Lithology	Type	SAMPLES: DEPTH (M) From	To	U. D. S. / S. P. T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value	REI
		(CL)	P	35.5	35.95	9	10	14	-	24	
	36.0										
Brownish yellow dense fine/medium silty sand			P	37.0	37.45	14	45	50	-	95	
			P	38.0	38.45	21	45	50	-	5	
		(SM)	P	39.0	39.26	28	70	blows for 11cm penetration		>100	
			P	40.0	40.21	15	60	blows for 6cm. penetration		>100	

Code: U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Water Sample

Figure T-2.1.8(a) Bore Hole 6(2): Borelog (3)

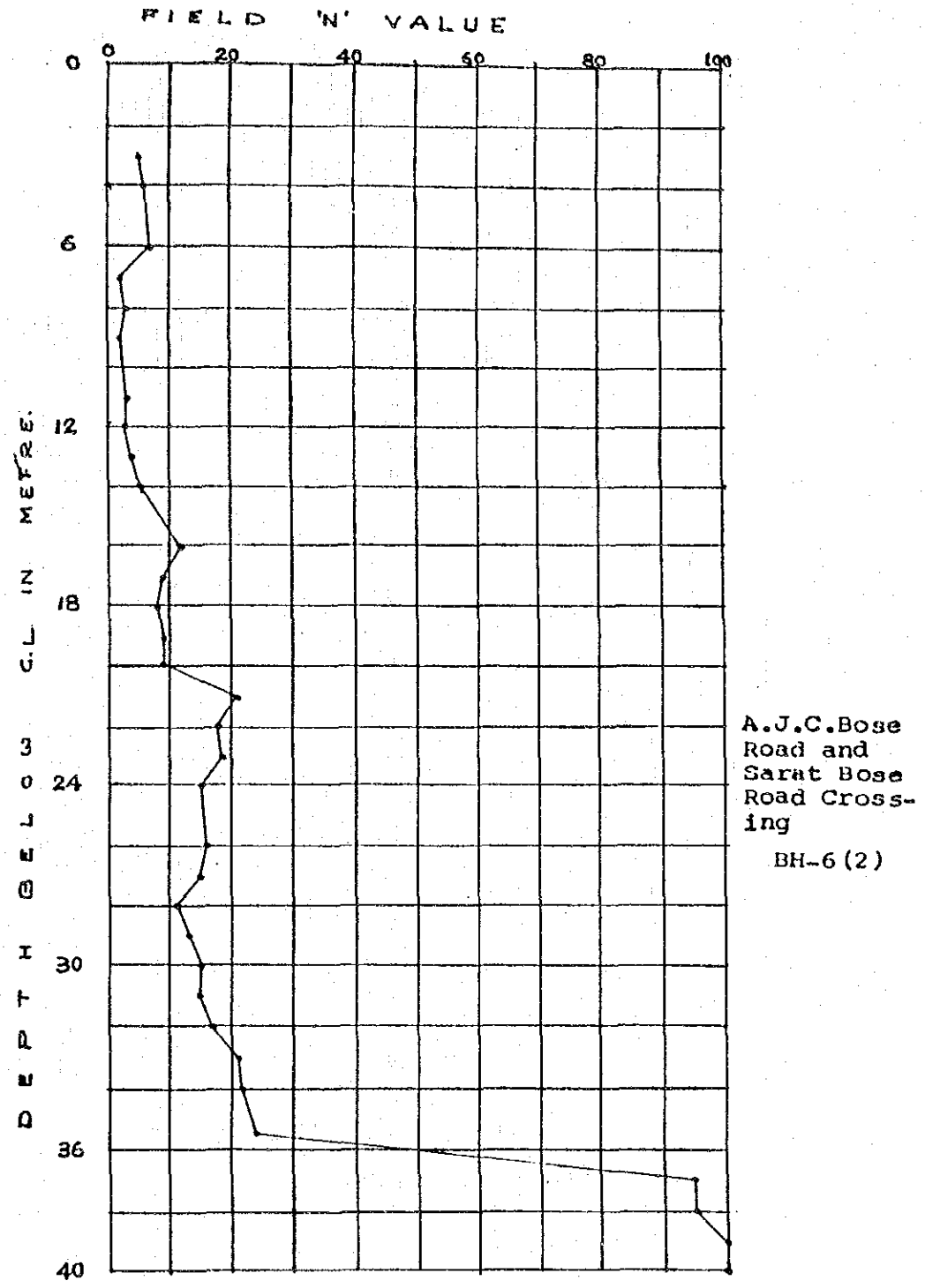
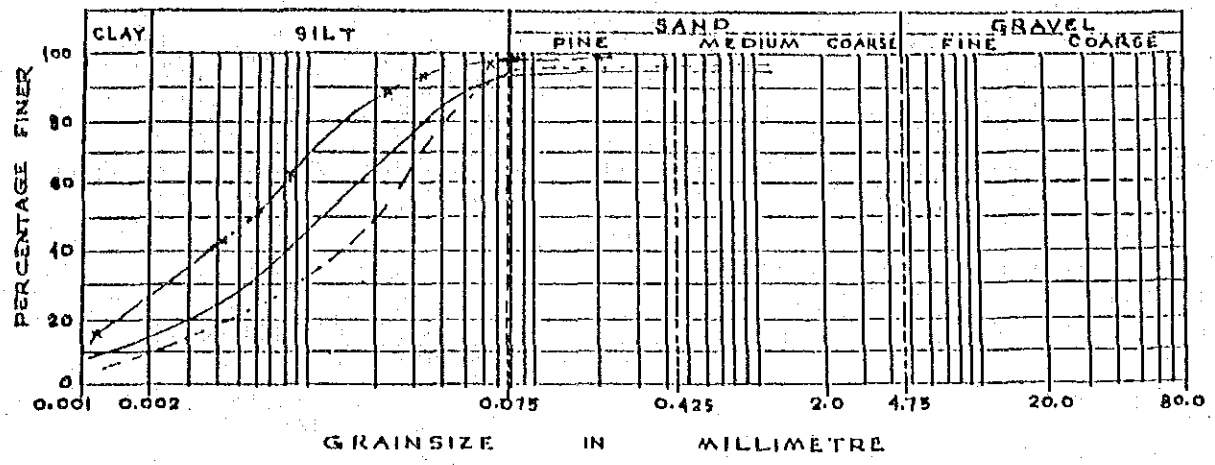


Figure T-2.1.8(b) Bore Hole 6(2): Distribution of 'N' Value with Depth

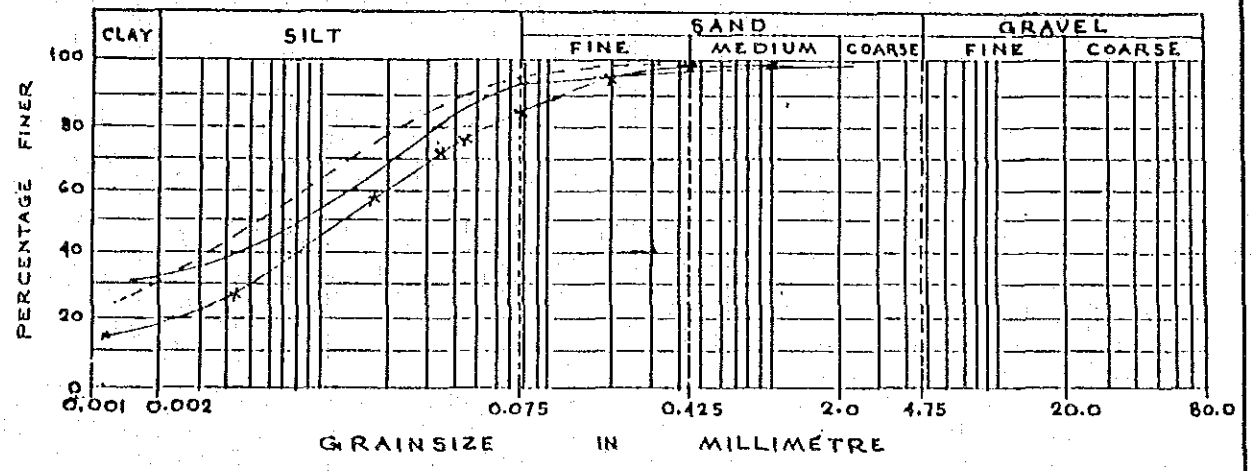
Bore Hole No.	Depth below G. L. in 'M'	Description	Standard Penetration resistance 'N' Value	Grain Size Analysis			Density & Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s
				Gravel (%)	Sand (%)	Silt & Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/c.c)	Dry Density (gms/c.c)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kg/cm²)	ϕ (Degree)	
BH - 6(2)	2.50 to 3.00	Yellowish grey very soft silty clay with traces of sand		-	7.3	92.7	31.3	1.813	1.381	33.4	15.9	17.5	UC	0.25	-	2.68
	5.00 to 5.50	Peat		-	6.0	94.0	211.0	1.121	0.360	222.4 *59.6	163.8 41.6	58.6 18.0	UC	0.13	-	2.57
	10.0 to 10.5	Blackish grey very soft silty clay with decomposed wood		-	0.5	99.5	61.2	1.548	0.960	68.3	33.3	35.0	UC	0.22	-	2.55
	15.0 to 15.5	Greyish blue medium stiff silty clay with traces of sand and kankar		-	7.0	93.0	32.1	1.663	1.410	57.9	21.3	36.6	UC	0.46	-	2.69
	21.0 to 21.45	Brownish grey medium dense sandy silt		-	27.0	73.0	26.3	-	-	NON - PLASTIC			-	-	-	-
	25.0 to 25.5	Greyish blue stiff silty clay with traces of kankar and yellow spot		-	5.3	94.7	24.4	1.981	1.592	55.8	21.2	34.6	UC	0.64	-	2.70
	35.0 to 35.5	-do-		-	14.9	85.1	17.3	2.127	1.813	32.4	15.6	16.8	UC	0.80	-	2.71
	38.0 to 38.45	Brownish yellow dense fine/medium silty sand		-	76.0	24.0	22.4	-	-	NON - PLASTIC			-	-	-	-

*on oven dried sample

Figure T-2.1.8(c) Bore Hole 6(2): Soil Properties Classification by Layers



BORE HOLE	DEPTH	SYMBOL
BH-6(2)	2.5 to 3.00m.	———
BH-6(2)	5.0 to 5.50m.	— — — — —
BH-6(2)	10.0 to 10.5m.	——×——×——



BORE HOLE	DEPTH	SYMBOL
BH-6(2)	15.0 to 15.50m.	———
BH-6(2)	25.0 to 25.50m.	— — — — —
BH-6(2)	35.0 to 35.50m.	——×——×——

Figure T-2.1.8(d) Bore Hole 6(2): Grain Size Distribution Curve

BORELOG DATA SHEET

Job No. CON/9111166 — Bore Hole No. BH-7

Location. A.P.C.Roy Road at Maniktala Crossing — R. L. +99.435M.

Method of Boring. Auger and Mud Rotary Circulation — Dia of Boring. 150mm

Water Struck. 1.60m. — S. W. L. 1.55m.

Date of Commencement. 12.11.91 — Date of Completion. 12.11.91

DESCRIPTION OF STRATA	DEPTH FROM G. L. (M)		Type	SAMPLES: DEPTH (M) From	To	U. D. S. / S. P. T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value	REM
Filled up with soil, brick bats etc.											
	1.50		D	1.50	2.00	-	-	-	-	-	
Brownish/bluish grey soft to medium stiff silty clay			P	2.00	2.45	1	1	2	-	3	
			P	3.00	3.45	1	2	2	-	4	
			U	4.00	4.50	-	-	-	-	-	
			P	5.00	5.45	1	2	2	-	4	
		(CI)	P	6.00	6.45	2	3	3	-	6	
			P	7.00	7.45	3	3	4	-	7	
			P	8.00	8.45	1	2	3	-	5	
			P	9.00	9.45	2	2	3	-	5	
	10.0		U	10.0	10.50	-	-	-	-	-	
Blackish grey very soft silty clay with little percentage of decomposed wood		(OH)	P	11.0	11.45	2	2	3	-	5	
	12.2		P	12.0	12.45	2	3	3	-	6	
Greyish blue stiff silty clay with traces of kankar			P	13.0	13.45	3	4	5	-	9	
			U	14.0	14.50	-	-	-	-	-	
		(CI)	P	15.0	15.45	5	6	6	-	12	
			P	16.0	16.45	7	8	8	-	16	

Code : U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Water Sample

Figure T-2.1.9(a) Bore Hole 7: Borelog (1)

BORELOG DATA SHEET

Job No. CON/9111166

Location. A.P.C.Roy Road at Maniktola Crossing

Method of Boring. Auger and Mud Rotary Circulation

Water Struck. 1.60m.

Date of Commencement. 12.11.91

Bore Hole No. BH-7

R. L. +99.435M.

Dia of Boring. 150mm

S. W. L. 1.55m.

Date of Completion. 17.11.91

DESCRIPTION OF STRATA	DEPTH FROM G. L. (M)		Type	SAMPLES: DEPTH (M) From	To	U. D. S. / S. P. T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value	RE
			P	17.0	17.45	7	8	10	-	18	
			P	18.0	18.45	6	8	11	-	19	
		CH	P	19.0	19.45	5	8	9	-	17	
			P	20.0	20.45	6	9	9	-	18	
			P	21.0	21.45	8	10	10	-	20	
			U	22.0	22.40	-	-	-	-	-	
	22.0										
Greyish yellow sandy silt		SN	P	23.0	23.45	11	17	26	-	43	
			P	24.0	24.45	9	10	10	-	20	
	24.5										
Yellowish/brownish grey stiff silty clay			P	25.0	25.45	8	9	12	-	21	
		CI	P	26.0	26.45	9	11	12	-	23	
			P	27.0	27.45	8	10	12	-	22	
			P	28.0	28.45	8	12	13	-	25	
			P	29.0	29.45	8	10	14	-	24	
			P	30.0	30.45	9	12	15	-	27	
		CH	U	31.0	31.50	-	-	-	-	-	
			P	32.0	32.45	14	14	15	-	29	
			P	33.0	33.45	18	22	22	-	44	

Code : U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Water Sample

Figure T-2.1.9(a) Bore Hole 7: Borelog (2)

BORELOG DATA SHEET

Job No. CON/9111166

Location. A.P.C.Roy Road at Manikbala Cranation.

Method of Boring. Auger and Mud Rotary Circulation

Water Struck. 1.60m.

Date of Commencement. 12.11.91

Bore Hole No. BH-7

R. L. +99.435M.

Dia of Boring. 150mm

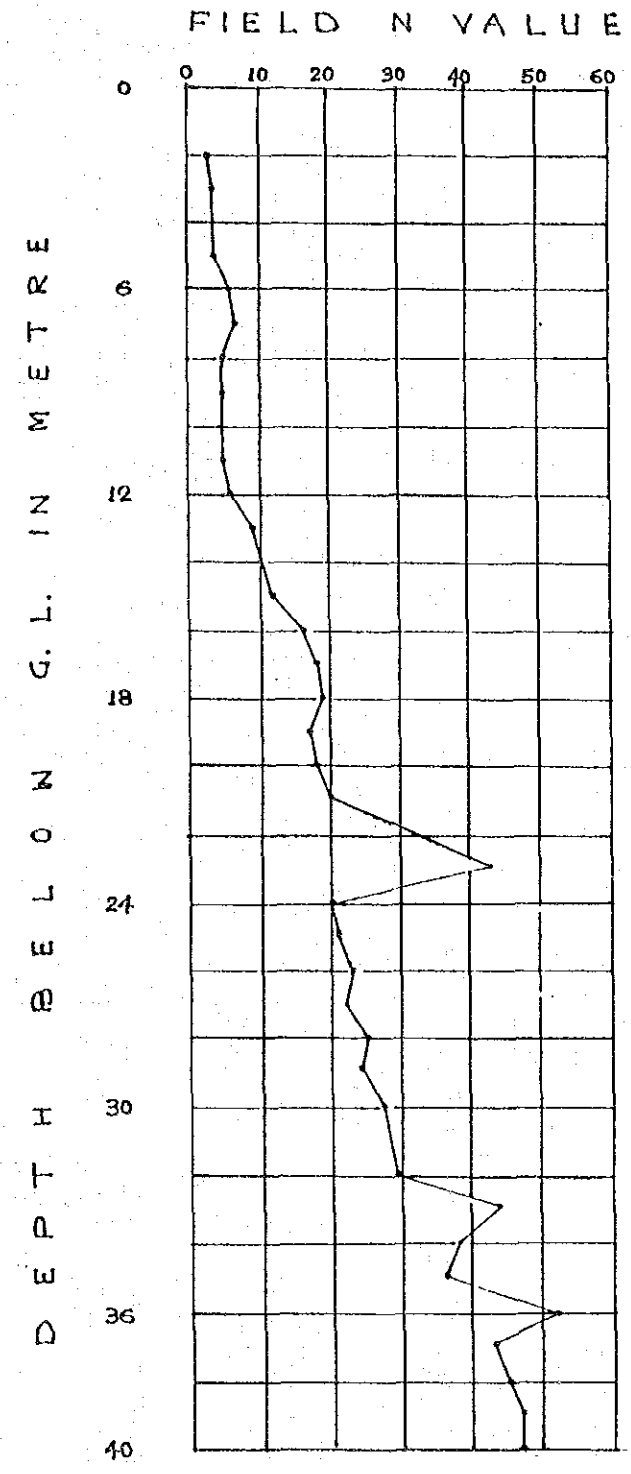
S. W. L. 1.55m.

Date of Completion. 17.11.91

DESCRIPTION OF STRATA	DEPTH FROM G. L. (M)		Type	SAMPLES: DEPTH (M) From	To	U. D. S. / S. P. T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value	REM
			P	34.0	34.45	11	17	21	-	38	
		(CH)	P	35.0	35.45	9	15	21	-	36	
			P	36.0	36.45	14	21	31	-	52	
			P	37.0	37.45	17	22	21	-	43	
		(CI)	P	38.0	38.45	16	22	23	-	45	
			P	39.0	39.45	16	21	26	-	47	

Code : U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Water Sample

Figure T-2.1.9(a) Bore Hole 7: Borelog (3)



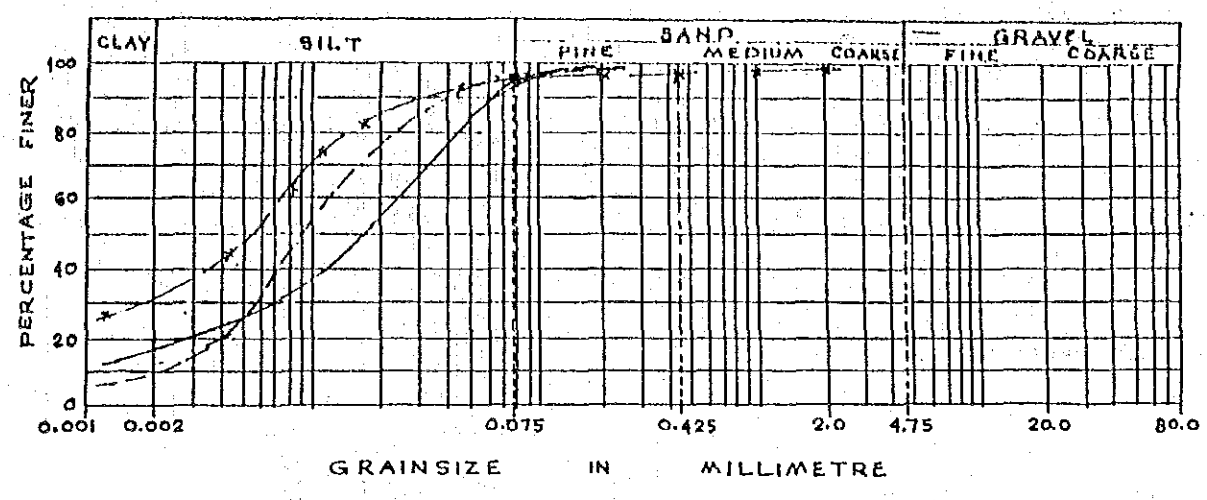
A.P.C.Roy Road at
Maniktola Crossing

BH-7

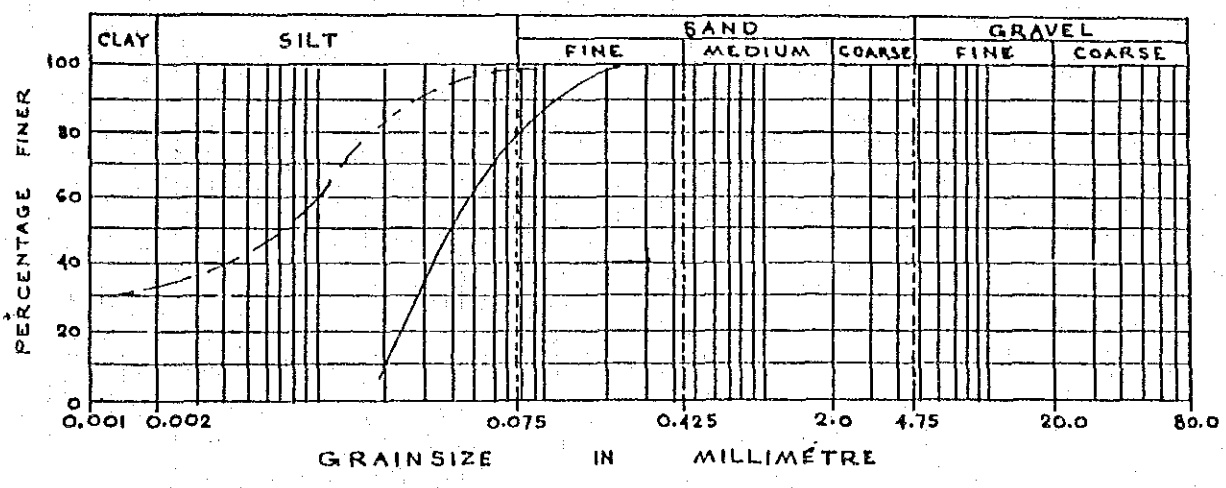
Figure T-2.1.9(b) Bore Hole 7: Distribution of 'N' Value with Depth

Bore Hole No.	Depth below G. L. in 'M'	Description	Standard Penetration resistance 'N' Value	Grain Size Analysis			Density & Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s
				Gravel (%)	Sand (%)	Silt & Clay (%)	Natural Moisture Content (%)	Bulk Density (gms./c.c)	Dry Density (gms./c.c)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kg/cm²)	ϕ (Degree)	
BH - 7	4.00 to 4.50	Brownish/bluish grey soft to medium stiff silty clay		-	5.7	94.3	29.0	1.717	1.331	39.8	18.3	21.5	UC	0.275	-	2.68
	10.0 to 10.5	Blackish grey very soft silty clay with little percentage of decomposed wood		-	2.3	97.7	84.0	1.478	0.803	93.5	53.9	39.6	UC	0.078	-	2.54
	14.0 to 14.5	Greyish blue stiff silty clay with traces of kankar		-	3.5	96.5	31.2	1.875	1.429	62.8	23.3	39.5	UC	0.65	-	2.71
	22.0 to 22.4	Greyish yellow sandy silt		-	21.0	79.0	28.5	1.932	1.503	NON - PLASTIC			UC	0.283	-	2.66
	31.0 to 31.5	Yellowish/brownish grey stiff silty clay		-	1.4	98.6	24.4	1.935	1.555	55.6	22.3	33.3	UC	0.90	-	2.68

Figure T-2.1.9(c) Bore Hole 7: Soil Properties Classification by Layers



BORE HOLE	DEPTH	SYMBOL
BH-7	4.0 to 4.50m.	————
BH-7	10.0 to 10.5m.	- - - - - -
BH-7	14.0 to 14.5m.	—x— —x— —x—



BORE HOLE	DEPTH	SYMBOL
BH-7	22.0 to 22.4m.	————
BH-7	31.0 to 31.5m.	- - - - - -

Figure T-2.1.9(d) Bore Hole 7: Grain Size Distribution Curve

BORELOG DATA SHEET

Job No.. CON/9111166 ..... Bore Hole No..... BH – 8

Location ..Park Street and Chowringhee Crossing ..... R. L..... + 99.18M.

Method of Boring...Rotary Auger and Mud Circulation ..... Dia of Boring..... 150mm.

Water Struck..... 2.10M. ..... S. W. L..... 2.00M

Date of Commencement..22.11.91.. Date of Completion..... 25.11.91

DESCRIPTION OF STRATA	DEPTH FROM G. L. (M)	Lithology	Type	SAMPLES: DEPTH (M) From	To	U.D.S./S.P.T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value	RE
Filled up soil with brick bats, sand etc.	1.20										
Bluish grey soft clayey silt		ML	P	3.00	3.45	2	3	2	–	5	
			U	4.00	4.50	–	–	–	–	–	
			P	5.00	5.45	2	3	3	–	6	
			P	6.00	6.45	2	2	1	–	3	
	6.30										
Black peat		Pt	D	6.50	–	–	–	–	–	–	
	7.00		P	7.00	7.45	2	3	3	–	6	
Bluish grey soft silty clay with occasional traces of decomposed wood			P	8.00	8.45	2	3	4	–	7	
			P	9.00	9.45	1	2	3	–	5	
			P	10.0	10.45	2	3	3	–	6	
		CI	P	11.0	11.45	1	2	3	–	5	
			P	12.0	12.45	2	2	3	–	5	
			U	13.0	13.50	–	–	–	–	–	
			P	14.0	14.50	1	1	2	–	3	
	14.8										
		CH									

Code: U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Water Sample

Figure T-2.1.10(a) Bore Hole 8: Borelog (1)

BORELOG DATA SHEET

Job No. CON/9111166 — Bore Hole No. BH - 8

Location Park Street and Chowringhee Crossing — R. L. +99.18M.

Method of Boring Auger and Mud Rotary Circulation — Dia of Boring 150mm.

Water Struck 2.10M. — S. W. L. 2.00M.

Date of Commencement 22.11.91 — Date of Completion 25.11.91

DESCRIPTION OF STRATA	DEPTH FROM G. L. (M)	Lithology	Type	SAMPLES: DEPTH (M) From	To	U. D. S. / S. P. T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value
Bluish grey medium stiff silty clay with traces of brown patch		(CH)	P	15.0	15.45	3	7	8	-	15
			P	16.0	16.45	4	8	9	-	17
			P	17.0	17.45	5	6	11	-	17
			U	18.0	18.30	-	-	-	-	-
		(CI)	P	19.0	19.45	5	6	10	-	16
			P	20.0	20.45	5	6	11	-	17
	21.0		P	21.0	21.45	9	12	20	-	32
Yellowish grey medium stiff silty clay			P	22.0	22.45	10	13	21	-	34
			U	23.0	23.40	-	-	-	-	-
		(CL)	P	24.0	24.45	10	11	22	-	33
			P	25.0	25.45	10	12	23	-	35
	25.8									
Yellowish grey stiff silty clay			P	26.0	26.45	11	11	17	-	28
			P	27.0	27.45	10	12	16	-	28
			U	28.0	28.50	-	-	-	-	-
		(CH)	P	29.0	29.45	10	11	15	-	26
			P	30.0	30.45	6	8	10	-	18
	31.0		P	31.0	31.45	5	9	12	-	21

Code: U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Water Sample

Figure T-2.1.10(a) Bore Hole 8: Borelog (2)

BORELOG DATA SHEET

Job No.. CON/9111166 — Bore Hole No. BH - 8

Location .. Park Street and Chowringhee Crossing — R. L. +99.18M.

Method of Boring. Auger and Mud Rotary Circulation — Dia of Boring 150mm.

Water Struck 2.10M. — S. W. L. 2.00M.

Date of Commencement 22.11.91 — Date of Completion 25.11.91

DESCRIPTION OF STRATA	DEPTH FROM G. L. (M)	Lithology	Type	SAMPLES: DEPTH (M) From	To	U. D. S. / S. P. T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value	RE
Bluish grey very stiff silty clay with yellow/ brown patchs		(CH)	U	32.0	32.50	-	-	-	-	-	
			P	33.0	33.45	11	12	18	-	30	
			P	34.0	34.45	6	8	11	-	19	
		(CI)	P	35.0	35.45	5	8	12	-	20	
			P	36.0	36.45	6	9	12	-	21	
			P	37.0	37.45	6	9	13	-	22	
	38.0		P	38.0	38.45	19	36	60	-	96	
Brownish/yellowish grey very dense silty sand		(SM)	P	39.0	39.45	31	37	68	-	105	
			P	40.0	40.45	12	22	36	-	58	

Code: U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Water Sample

Figure T-2.1.10(a) Bore Hole 8: Borelog (3)

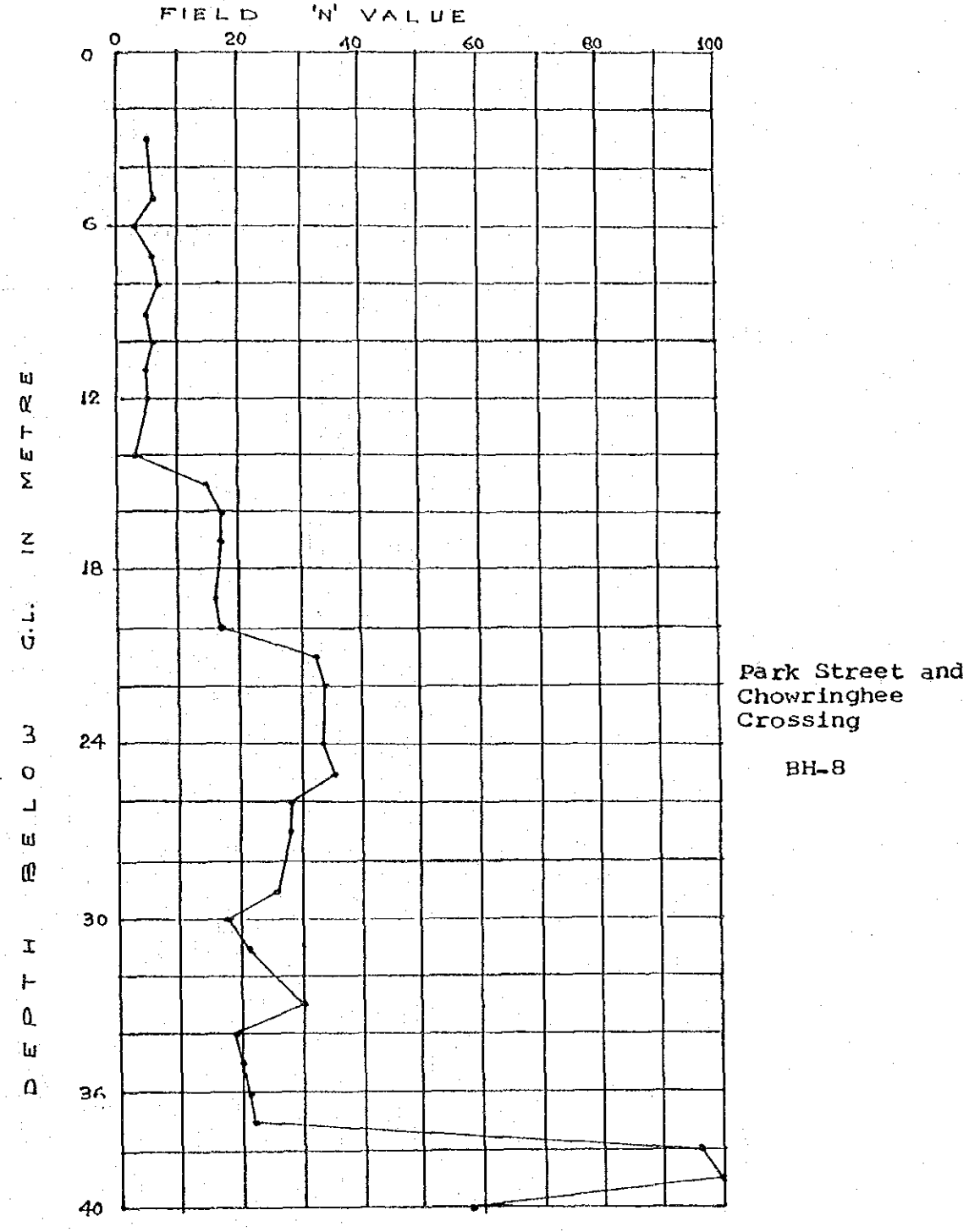
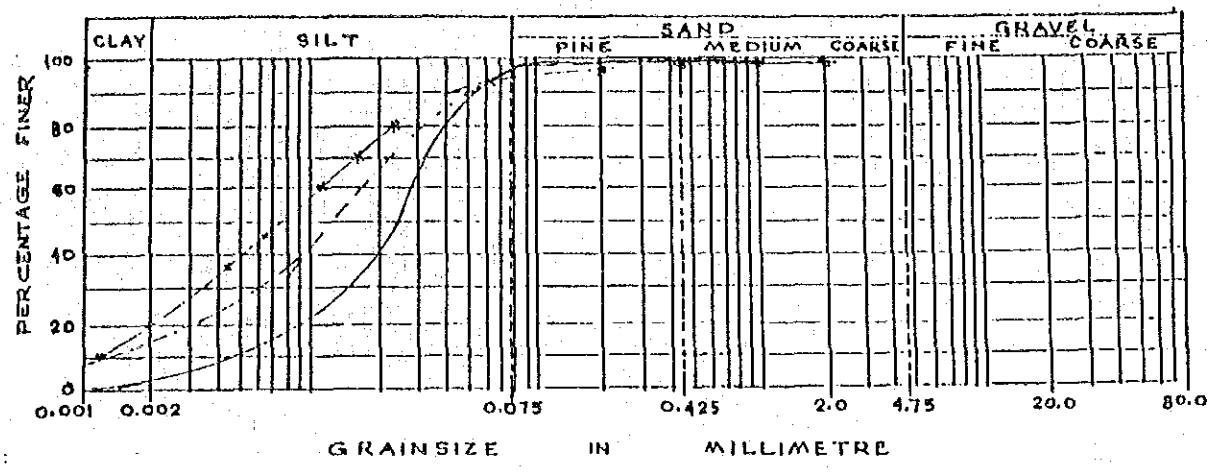


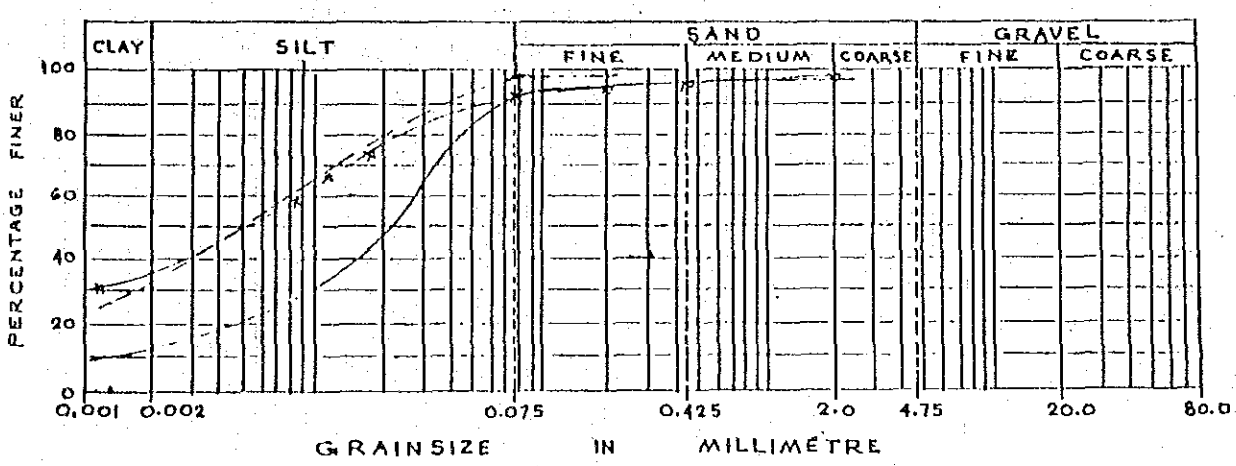
Figure T-2.1.10(b) Bore Hole 8: Distribution of 'N' Value with Depth

Bore Hole No.	Depth below G. L. in 'M'	Description	Standard Penetration resistance 'N' Value	Grain Size Analysis			Density & Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s
				Gravel (%)	Sand (%)	Silt & Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/cc)	Dry Density (gms/cc)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kg/cm²)	ϕ (Degree)	
BH - 8	4.00 to 4.50	Bluish grey clayey silt		-	2.4	97.6	28.9	1.843	1.430	31.6	27.0	4.6	UC	0.24	-	2.61
	6.50	Black peat		-	1.6	98.4	153.2	-	-	202.0 65.4	83.6 56.6	118.4 8.8	-	-	-	-
	13.0 to 13.5	Bluish grey soft silty clay with occasional traces of decomposed wood		-	2.4	97.6	32.4	1.959	1.404	40.0	21.7	18.3	UC	0.25	-	2.68
	18.0 to 18.3	Bluish grey medium stiff silty clay with traces of brown patch		-	6.1	93.9	26.5	1.905	1.506	43.3	20.2	23.1	UC	0.55	-	2.69
	23.0 to 23.4	Yellowish grey medium stiff silty clay		-	8.0	92.0	27.4	1.932	1.516	34.4	23.0	11.4	UC	0.57	-	2.62
	28.0 to 28.5	Yellowish grey stiff silty clay		-	0.8	99.2	27.1	1.979	1.557	58.2	21.4	36.8	UC	1.01	-	2.70
	32.0 to 32.5	Bluish grey very stiff silty clay with yellow/ brown patchs		-	7.2	92.8	25.6	2.005	1.596	62.8	23.0	39.8	UC	1.18	-	2.71
	39.0 to 39.45	Brownish/yellowish grey very dense silty sand		-	56.0	44.0	26.2	-	-	NON - PLASTIC			-	-	-	-

Figure T-2.1.10(c) Bore Hole 8: Soil Properties Classification by Layers



BORE HOLE	DEPTH	SYMBOL
BH-8	4.0 to 4.50m	———
BH-8	13.0 to13.50m.	— — — — — —
BH-8	18.0 to18.30m.	——·×·——×——



BORE HOLE	DEPTH	SYMBOL
BH-8	23.0 to 23.4m.	———
BH-8	28.0 to 28.5m.	— — — — —
BH-8	32.0 to 32.5m.	——×——×——

Figure T-2.1.10(d) Bore Hole 8: Grain Size Distribution Curve

BORELOG DATA SHEET

Job No. CON/9111166
Location Lock Gate Road Flyover on Rly. Line
Method of Boring Auger and Mud Rotary Circulation
Water Struck 3.25M.
Date of Commencement 11.11.91

Bore Hole No. BH-9
R. L. +99.47M
Dia of Boring 150mm.
S. W. L. 2.80M.
Date of Completion 16.11.91

DESCRIPTION OF STRATA	DEPTH FROM G. L. (M)	Lithology	Type	SAMPLES: DEPTH (M) From	To	U. D. S. / S. P. T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value
Filled up soil with brick bats, coal ash etc.										
	1.00									
Bluish grey sandy/ clayey silt		MH	U	2.00	2.50	-	-	-	-	-
			P	3.00	3.45	2	3	3	-	6
			P	4.00	4.45	1	1	2	-	3
			P	5.00	5.45	1	2	3	-	5
			P	6.00	6.45	1	2	2	-	4
	6.70									
Bluish grey very soft silty clay with traces of decomposed wood			P	7.00	7.45	1	2	3	-	5
			U	8.00	8.50	-	-	-	-	-
			P	9.00	9.45	1	2	2	-	4
		CI	P	10.0	10.45	2	2	2	-	4
			P	11.0	11.45	2	2	3	-	5
			P	12.0	12.45	2	3	3	-	6
			P	13.0	13.45	2	3	3	-	6
	13.5									

Code: U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Water Sample

Figure T-2.1.11(a) Bore Hole 9: Borelog (1)

BORELOG DATA SHEET

Job No. CON/9111166
Location Lock Gate Road Flyover on Rly. Line
Method of Boring Auger and Mud Rotary Circulation
Water Struck 3.25M.
Date of Commencement 11.11.91

Bore Hole No. BH-9
R. L. +99.47M
Dia of Boring 150mm.
S. W. L. 2.80M.
Date of Completion 16.11.91

DESCRIPTION OF STRATA	DEPTH FROM G. L. (M)	Lithology	Type	SAMPLES: DEPTH (M) From	To	U. D. S. / S P. T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value
Greyish blue stiff silty clay		CH	F	14.0	14.45	5	5	6	-	11
			U	15.0	15.50	-	-	-	-	-
			P	15.5	15.95	5	6	6	-	12
			P	16.0	16.45	6	6	5	-	11
	16.5									
Yellowish grey medium stiff to stiff silty clay with kankar		CL	P	17.0	17.45	3	4	5	-	9
			U	18.0	18.50	-	-	-	-	-
			P	18.5	18.95	4	5	8	-	13
			P	19.0	19.45	5	6	9	-	15
			P	20.0	20.45	4	9	14	-	23
			P	21.0	21.45	4	8	17	-	25
			P	22.0	22.45	4	8	18	-	26
			P	23.0	23.45	5	9	16	-	25
			P	24.0	24.45	6	13	18	-	31
	24.5									
Yellowish grey stiff to very stiff silty clay with brown patch		CH	U	25.0	25.40	-	-	-	-	-
			P	26.0	26.45	3	4	5	-	9
			P	27.0	27.45	4	6	7	-	13

Code: U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Water Sample

Figure T-2.1.11(a) Bore Hole 9: Borelog (2)

BORELOG DATA SHEET

Job No.. CON/911116
Location Lock Gate Road Flyover on Rly. Line
Method of Boring Auger and Mud Rotary Circulation
Water Struck 3.25M.
Date of Commencement 11.11.91

Bore Hole No. BH -9
R. L. +99.47M.
Dia of Boring 150mm.
S. W. L. 2.80M.
Date of Completion 16.11.91

DESCRIPTION OF STRATA	DEPTH FROM G. L. (M)	Lithology	Type	SAMPLES: DEPTH (M) From	To	U.D.S./S.P.T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value
			P	28.0	28.45	5	7	10	-	17
			P	29.0	29.45	6	10	10	-	20
			P	30.0	30.45	6	11	12	-	23
		cl	P	31.0	31.45	5	10	12	-	22
			P	32.0	32.45	5	8	13	-	21
			P	33.0	33.45	6	10	15	-	25
			U	34.0	34.50	-	-	-	-	-
	34.5									
Yellowish grey sandy silty clay with occasional blue/brown patch			P	35.0	35.45	10	18	21	-	39
		CL	P	36.5	36.95	11	17	22	-	39
		cl	P	38.0	38.45	9	13	15	-	28
			P	39.5	39.95	9	13	15	-	28

Code: U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Water Sample

Figure T-2.1.11(a) Bore Hole 9: Borelog (3)

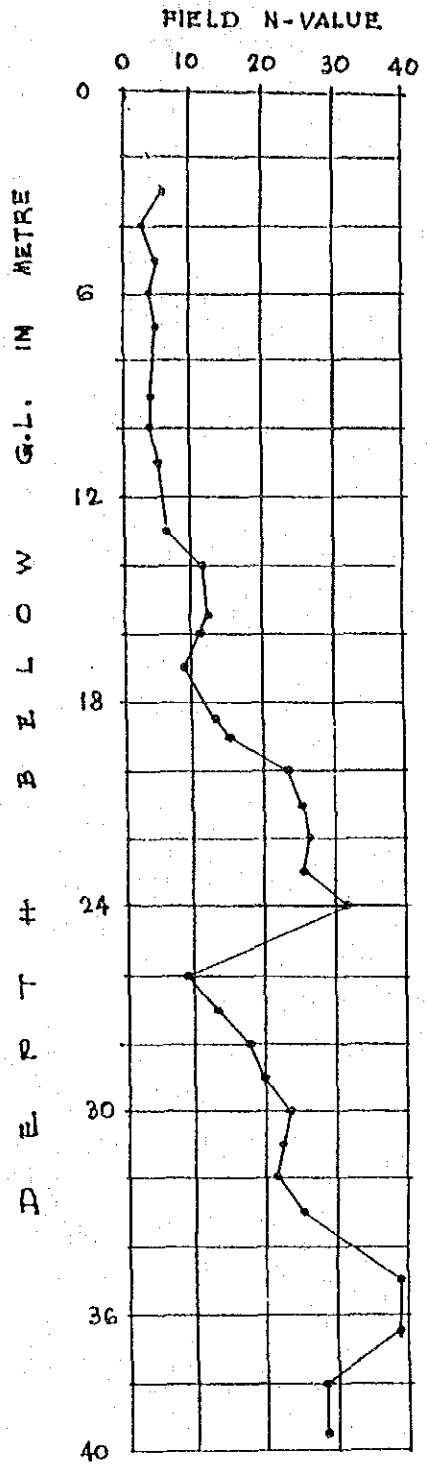
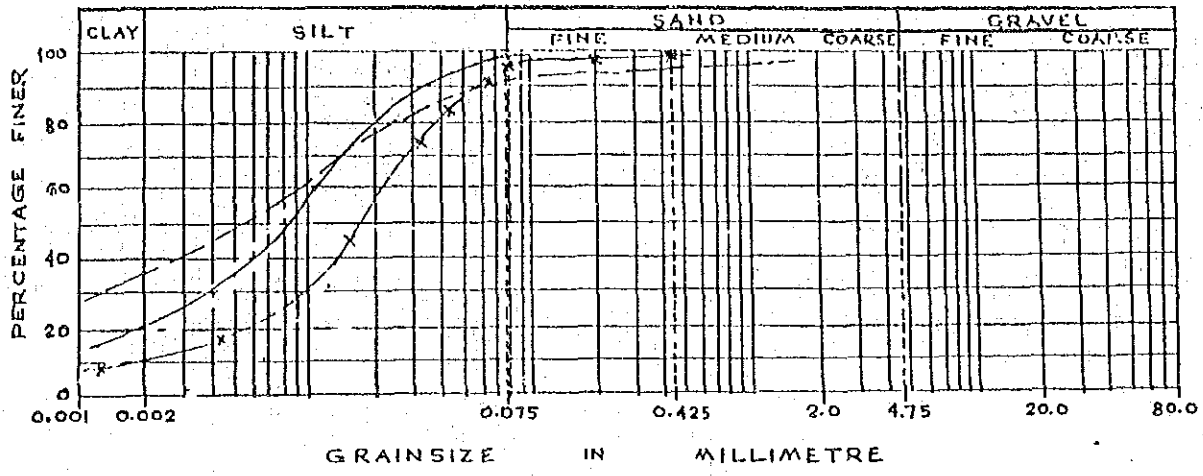


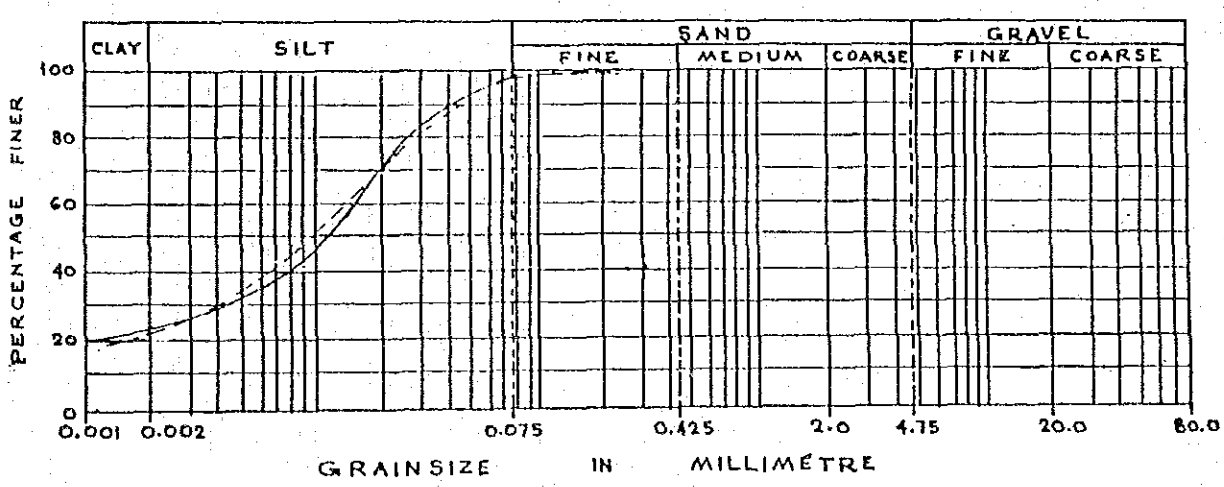
Figure T-2.1.11(b) Bore Hole 9: Distribution of 'N' Value with Depth

Bore Hole No.	Depth below G.L. in 'M'	Description	Standard Penetration resistance 'N' Value	Grain Size Analysis			Density & Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s
				Gravel (%)	Sand (%)	Silt & Clay (%)	Natural Moisture Content (%)	Bulk Density (gms./c.c)	Dry Density (gms./c.c)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kg/cm²)	ϕ (Degree)	
BH - 9	8.00 to 8.50	Bluish grey very soft silty clay with traces of decomposed wood		-	0.4	99.6	38.2	1.761	1.274	43.4	17.0	26.4	UC	0.125	-	2.68
	15.0 to 15.5	Greyish blue stiff silty clay		-	9.0	91.0	22.9	1.863	1.516	64.1	19.5	44.6	UC	0.26	-	2.69
	18.0 to 18.5	Yellowish grey medium stiff to stiff silty clay with kankar		-	3.7	96.3	22.7	1.885	1.536	35.0	22.6	12.4	UC	0.31	-	2.62
	25.0 to 25.4	Yellowish grey stiff to very stiff silty clay with brown patch		-	0.8	99.2	29.5	1.835	1.456	50.5	23.1	27.4	UC	0.55	-	2.69
	34.0 to 34.5	-do-		0	0.8	99.2	23.1	1.913	1.554	41.6	20.6	21.0	UC	0.91	-	2.64
	38.0 to 38.45	Yellowish grey sandy silty clay with occational blue/brown patch		-	29.3	70.7	19.7	-	-	36.6	19.0	17.6	-	-	-	-

Figure T-2.1.11(c) Bore Hole 9: Soil Properties Classification by Layers



BORE HOLE	DEPTH	SYMBOL
BH-9	8.0 to 8.5m	———
BH-9	15.0 to 15.5m.	- - - - - -
BH-9	18.0 to 18.5m.	——x——x——



BORE HOLE	DEPTH	SYMBOL
BH-9	25.0 to 25.4m.	———
BH-9	34.0 to 34.5m.	— — — —

Figure T-2.1.11(d) Bore Hole 9: Grain Size Distribution Curve

BORELOG DATA SHEET

Job No. CON/9111166 — Bore Hole No. BH-10

Location. A.J.C.Bose Road at Park Street Crossing — R. L. +99.585M

Method of Boring. Auger and Mud Rotary Circulation — Dia of Boring 150mm

Water Struck 1.50M. — S. W. L. 1.65M.

Date of Commencement 14.11.91 — Date of Completion 17.11.91

DESCRIPTION OF STRATA	DEPTH FROM G. L. (M)	Lithology	Type	SAMPLES: DEPTH (M) From	To	U. D. S. / S. P. T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value
Filled up with brick bats etc	1.40									
Light blackish grey clayey silt	3.90	(CL)	P	2.00	2.45	2	2	3	–	5
			P	3.00	3.45	2	3	3	–	6
Peat like layer	4.50	(Pt)	U	4.00	4.50	–	–	–	–	–
Blackish grey soft silty clay with organic matter in the form of decomposed wood			P	5.00	5.45	1	2	2	–	4
		(CH)	P	6.00	6.45	2	3	3	–	6
		(MI)	U	7.00	7.50	–	–	–	–	–
			P	8.00	8.45	2	3	3	–	6
			P	9.00	9.45	3	3	6	–	9
			P	10.0	10.45	2	3	3	–	6
		(CH)	P	11.0	11.45	2	3	4	–	7
			P	12.0	12.45	1	2	3	–	5
			U	13.0	13.50	–	–	–	–	–
			P	14.0	14.45	1	2	2	–	4
	15.8		P	15.0	15.45	1	1	3	–	4
Light bluish grey medium stiff silty clay with traces of sand and kankar			P	16.0	16.45	7	9	12	–	21
		(CH)	P	17.0	17.45	5	10	12	–	22
			U	18.0	18.50	–	–	–	–	–

Code : U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Water Sample

Figure T-2.1.12(a) Bore Hole 10: Borelog (1)

BORELOG DATA SHEET

Job No. CON/9111166 — Bore Hole No. BH-10

Location. A.J.C. Bose Road at Park Street Crossing — R. L. +99.585M.

Method of Boring. Auger and Mud Rotary Circulation — Dia of Boring 150mm

Water Struck 1.50M. — S. W. L. 1.65M.

Date of Commencement 14.11.91 — Date of Completion 17.11

DESCRIPTION OF STRATA	DEPTH FROM G. L. (M)	Lithology	Type	SAMPLES: DEPTH (M) From	To	U. D. S. / S. P. T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value
		(CH)	P	18.5	18.95	5	6	6	-	12
	20.1		P	19.5	19.95	4	5	6	-	11
Light yellowish grey sandy silty clay			P	20.5	20.95	6	10	15	-	25
		(CL)	P	21.5	21.95	5	12	16	-	28
			P	22.5	22.95	4	10	16	-	26
	23.5		P	23.5	23.95	11	20	23	-	43
Yellowish grey dense silty sand		(SM)	P	24.5	24.95	10	18	22	-	40
	25.3		P	25.5	25.95	7	14	16	-	30
Yellowish/bluish grey stiff silty clay with traces of sand			P	26.5	26.95	6	15	17	-	32
			U	27.5	27.85	-	-	-	-	-
			P	28.5	28.95	6	7	11	-	18
			P	29.5	29.95	5	8	12	-	20
		(CH)	P	30.5	30.95	7	8	12	-	20
			P	31.5	31.95	6	9	13	-	22
			U	32.5	32.85	-	-	-	-	-
			P	33.5	33.95	7	12	15	-	27
			P	34.5	34.95	8	14	17	-	31

Code : U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—W Sam

Figure T-2.1.12(a) Bore Hole 10: Borelog (2)

BORELOG DATA SHEET

Job No. CON/9111166
Location. A.J.C.Bose Road at Park Street Crossing
Method of Boring. Auger and Mud Rotary Circulation
Water Struck. 1.50M.
Date of Commencement. 14.11.91

Bore Hole No. BH-10
R. L. +99.585M.
Dia of Boring. 150mm
S. W. L. 1.65M.
Date of Completion. 17.11.91

DESCRIPTION OF STRATA	DEPTH FROM G. L. (M)	Lithology	Type	SAMPLES: DEPTH (M) From	To	U. D. S. / S. P. T. 0-150 mm	150-300 mm	300-450 mm	450-600 mm	'N' Value
Yellowish/bluish grey stiff silty clay with traces of sand		(CH)	P	35.5	35.95	7	11	16	-	27
			P	36.5	36.95	8	12	20	-	32
			P	37.5	37.95	9	11	22	-	33
			P	38.5	38.95	11	14	25	-	39
			P	40.0	40.45	9	13	25	-	38

Code : U—Undisturbed Sample D—Disturbed Sample P—Penetrometer Sample W—Water Sample

Figure T-2.1.12(a) Bore Hole 10: Borelog (3)

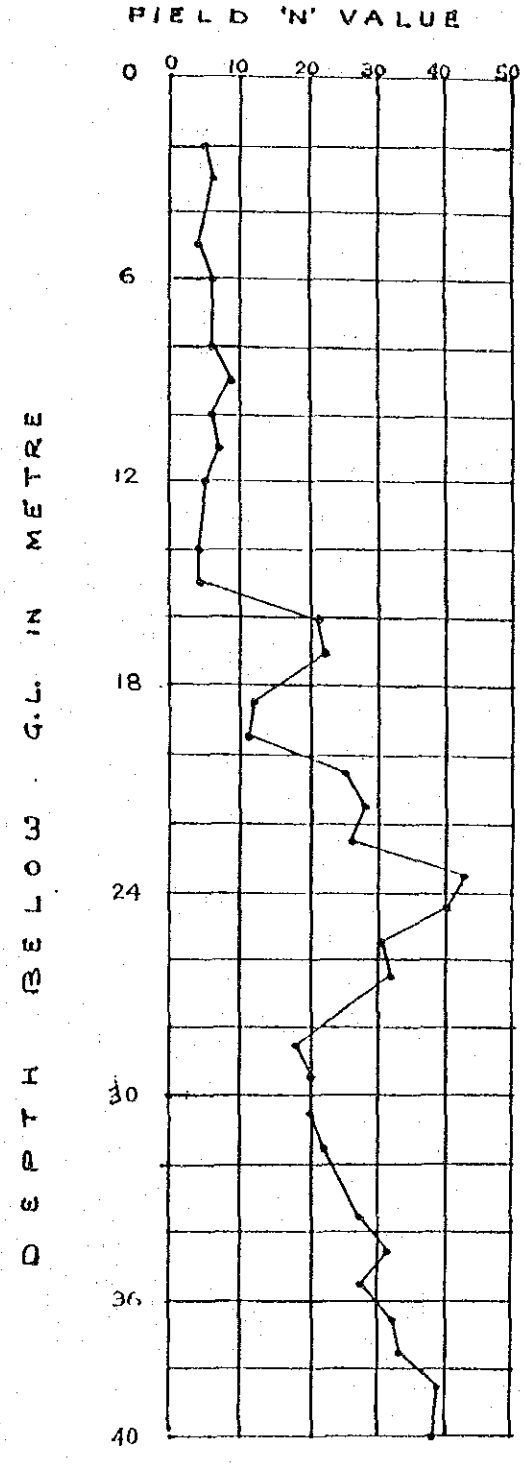
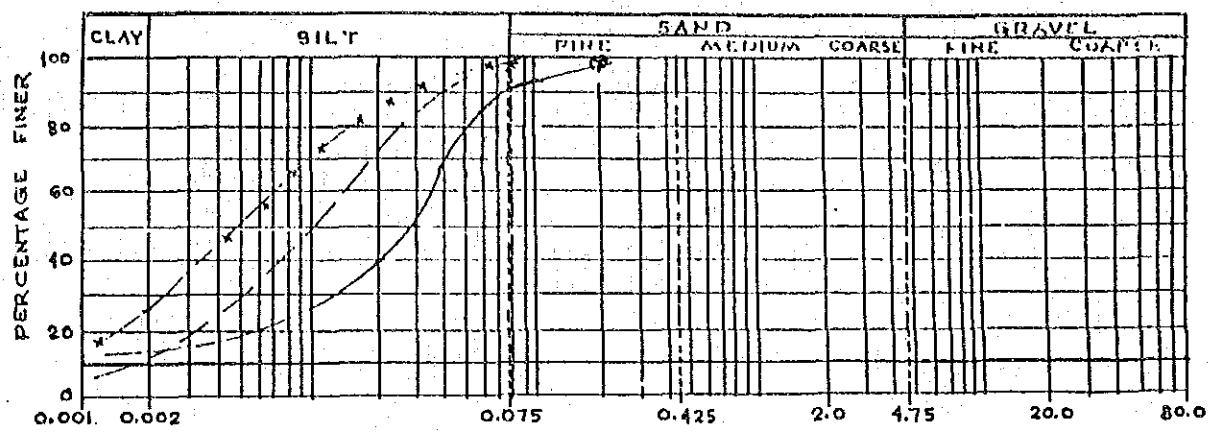


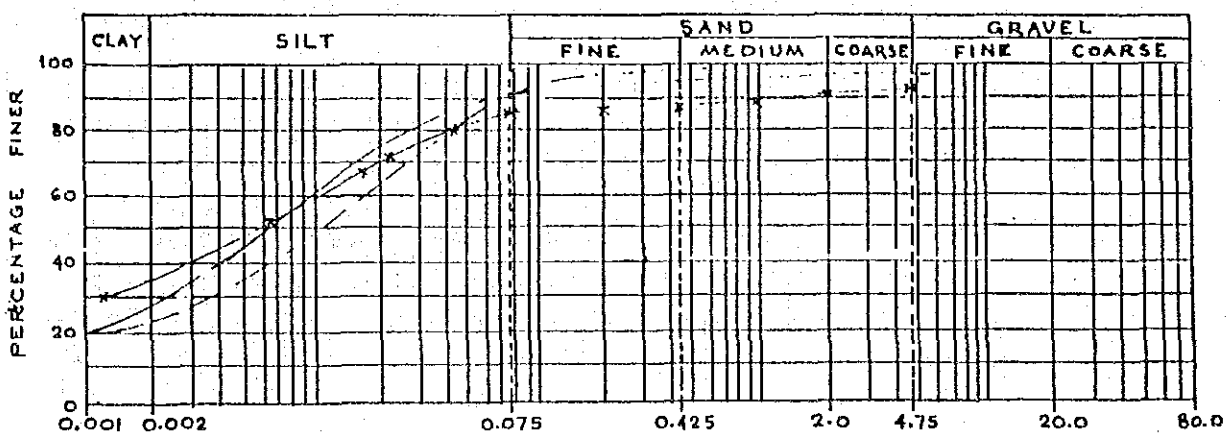
Figure T-2.1.12(b) Bore Hole 10: Distribution of 'N' Value with Depth

Bore Hole No.	Depth below G.L. in M.	Description	Standard Penetration resistance 'N' Value	Grain Size Analysis			Density & Moisture Test			Atterberg Limits			Shear Strength Parameters			Specific Gravity G_s
				Gravel (%)	Sand (%)	Silt & Clay (%)	Natural Moisture Content (%)	Bulk Density (gms/c.c)	Dry Density (gms/c.c)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Type of Test	C (kg/cm^2)	ϕ (Degree)	
BH - 10	4.00 to 4.50	Peat like layer	-	-	8.8	91.2	170.9	1.531	0.565	183.9	119.5	64.4	UC	0.145	-	2.56
	7.00 to 7.50	Blackish grey soft silty clay with organic matter in the form of decomposed wood	-	-	0.3	99.7	39.1	1.799	1.293	42.6	28.3	14.5	UC	0.28	-	2.69
	13.0 to 13.5	-do-	-	-	0.8	99.2	49.4	1.724	1.154	61.0	23.3	37.7	UC	0.212	-	2.71
	18.0 to 18.5	Light bluish grey medium stiff silty clay with traces of sand and kankar	-	2.8	5.3	91.9	28.0	1.938	1.514	52.8	19.9	33.9	UU	0.54	-	2.72
	21.5 to 21.95	Light yellowish grey sandy silty clay	-	-	11.2	88.8	23.2	-	-	32.0	17.4	14.6	-	-	-	-
	24.5 to 24.95	Yellowish grey dense silty sand	-	-	68.2	31.8	25.4	-	-	NON - PLASTIC			-	-	-	-
	27.5 to 27.95	Yellowish/bluish grey stiff silty clay with traces of sand	-	-	8.7	91.3	26.3	1.936	1.533	58.3	19.6	38.7	UC	0.64	-	2.71
	32.5 to 32.95	-do-	-	6.8	7.7	85.5	25.7	2.003	1.593	56.0	19.2	36.8	UC	0.875	-	2.71

Figure T-2.1.12(c) Bore Hole 10: Soil Properties Classification by Layers



BORE HOLE	DEPTH	SYMBOL
BH-10	4.00 to 4.50m.	———
BH-10	7.00 to 7.50m.	- - - - - -
BH-10	13.00 to 13.5m.	—x—x—x—



BORE HOLE	DEPTH	SYMBOL
BH-10	18.0 to 18.5m.	———
BH-10	27.5 to 27.85m.	- - - - - -
BH-10	32.5 to 32.85m.	—x—x—x—

Figure T-2.1.12(d) Bore Hole 10: Grain Size Distribution Curve

c. Findings of the 1970 Study

The 1970 study described the subsoil stratification of the normal Calcutta deposit as follows;

Layer I: Light brown or brownish gray silty clay, clayey silt and sandy silt, found at depths from ground level to -1.5m.

Layer II: Gray or dark gray silty clay with semi decomposed timber pieces, at depths of +0.25m to -1.5m.

Layer III: Bluish gray silty clay and mottled brown or gray, silty clay with kankar, at depths of -8.0m to -17.5m.

Layer IV: Brown or yellowish brown sandy silt, silty fine sand with occasional lenses or pockets of brown and gray silty clay, at depths of -13.0m to -22.0m.

Layer V: Mottled brown or gray clay, gray and brown silty clay often with laminar character all with rusty brown pockets of brown silt, at depths of -15.0m to -27.0m.

Layer VI: Brown or light brown silty fine to medium sand, at depths of -30.0m to -45.0m.

At hole 19A river channel deposit sand was observed from about 2 meters below the ground level and extended throughout the total depth of the hole (25 meters). Table T-2.1.2 shows the properties of the Calcutta subsoil as derived from the 1970 study.

Table T-2.1.2 Calcutta Mass Transit Study Soil Investigation Results

Stratum	LL (%)	PL (%)	Natural Moisture Content	Cohesion C (Kg/cm2)	Angle of Friction ϕ °	N value (SPT)
I	60	21	30	0.23	0°	3-16
II	80	25	55	0.28	0°	2-8 (up to -5m) 4-10 (-5 to -10m)
III	60	18	30	0.56	0°	10
IV	38-44	15-25	26-32	0.42	15-33°	20-40
V	65-75	19-20	22-25	1.05	20-30°	
VI	35-50	20-25	29-30		40°	50

(2) Metropolitan Transport Project (1973)

a. Study extent

Prior to the commencement of actual construction of the metro project a number of bore holes of depths ranging between 20 and 30 meters were executed along the metro corridor. Drawings of the following bore holes related to the study intersections were obtained from the Metro authority;

- Hole numbers 50, 51, and 52 at Rabindra Sadan intersection #5
- Hole numbers 67 and 69 at Park Street intersection #8
- Hole numbers 78 and 79 at Esplanade intersections #2
- Hole numbers 128 and 129 at Shyambazar intersection #4

b. Bore holes related to this Study

Fig. T-2.1.14 shows the soil classifications of the nine bore holes of the 1973 study, connected with this Study's intersections. The layers observed in the data of the 1973 study are very similar to those of the 1970 study, and the investigation undergone in 1991 in connection with this Study.

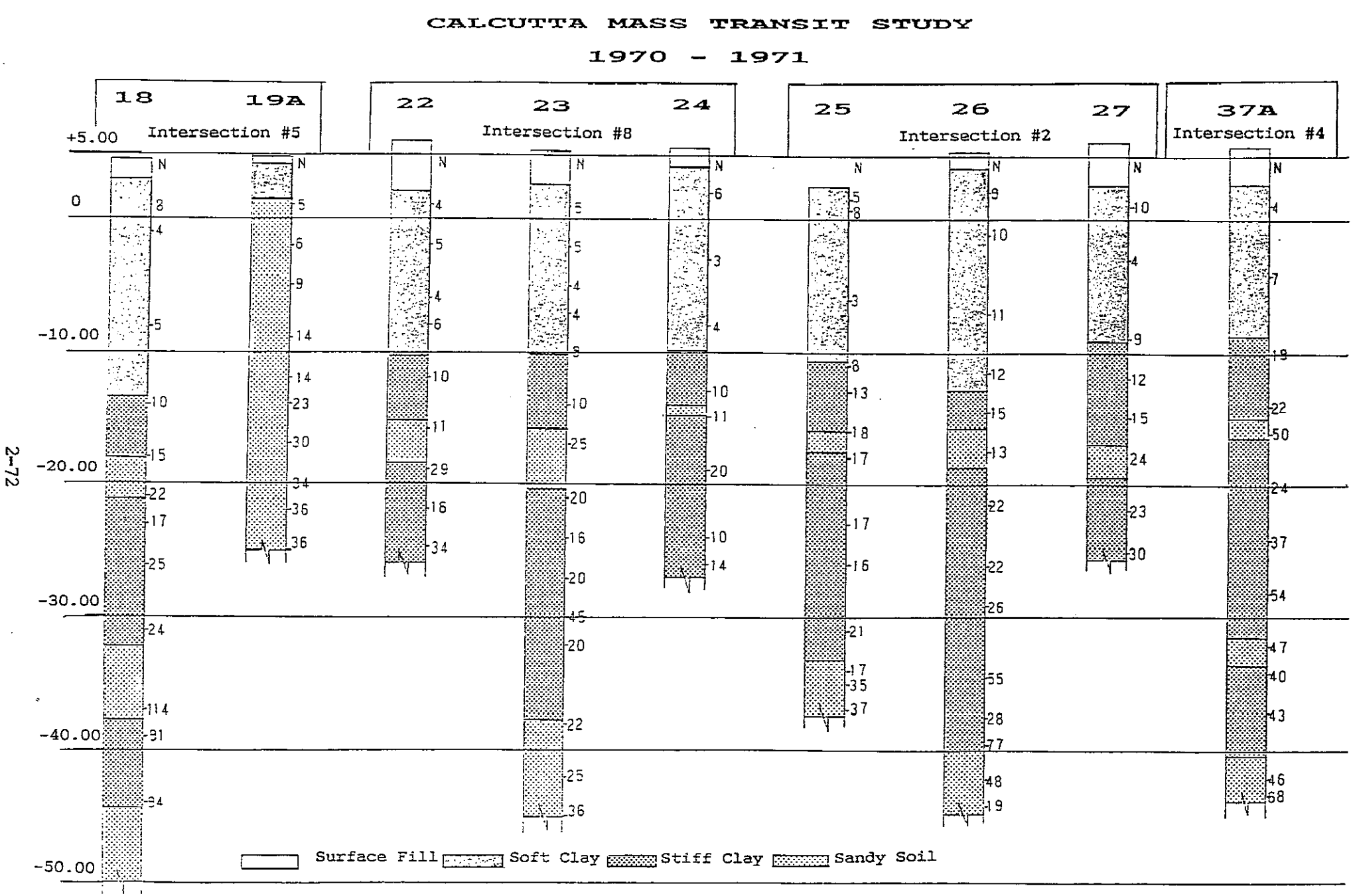


Figure T-2.1.13 Culcutta Mass Transit Study Bore Holes Profiles

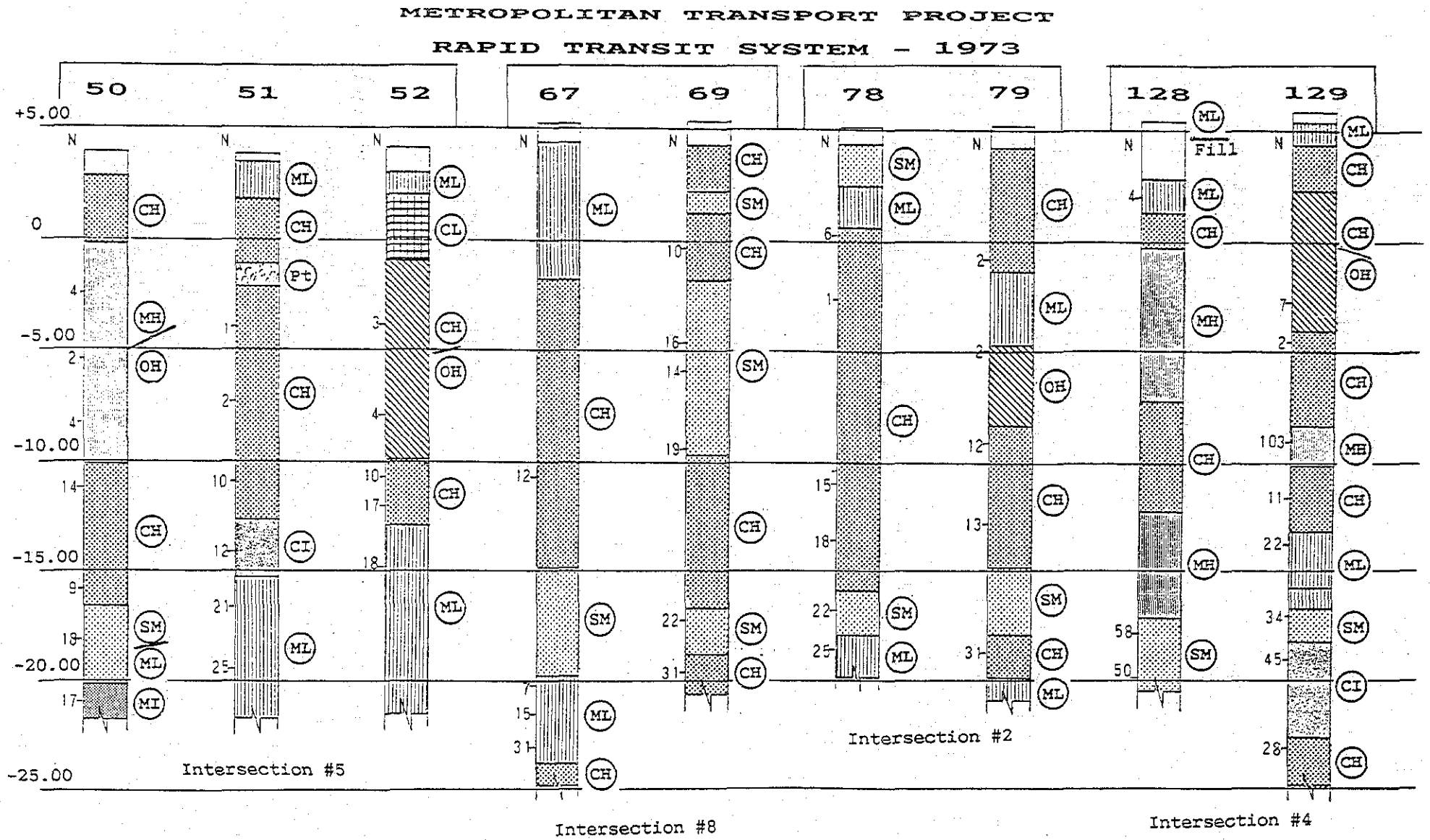


Figure T-2.1.14 Metropolitan Transport Project Bore Holes Profiles

(3) Geological Survey of India Report (1964)

a. Report background

This report was prepared under the title of Geology and Groundwater Resources of the Greater Calcutta Industrial Area, West Bengal. The aim of the report was to identify the groundwater conditions and prepare a suitable management plan for the utilization of that important resource.

b. Report data

In addition to a comprehensive study of the groundwater conditions in the region the report contains interesting information on the region's geological features. Information on the type of soil layers and their thicknesses for a number of bore holes executed in the region are enclosed. Over 20 of these bore holes are located in the Calcutta core area. Examples of some of these bore holes are shown in Table T-2.1.3.

As can be seen from the examples, the upper layers are mostly clay and silt, with sand generally appearing after depths of over 35 meters. It is also worthy to note that even after going down as deep as 160m, no gravel was struck.

2.2 Topographic Survey

2.2.1 Topographic Survey Extent and Methodology

(1) Survey Locations

The topographic field survey conducted under this Study covered the ten intersections where there are proposals to construct flyovers or execute at-grade intersection improvement projects.

Table T-2.1.3 Data from Geological Survey of India Report, 1964

BH 42 : Gun & Shell Factory Cossipore (#9)

Lithology	Thickness (m)
Top soil, silt, dark grey	1.5
Sand, fine	6.1
Sand fine, silt and clay	13.7
Clay, greyish brown with silt	10.7
Clay, brown, sticky	28.0
Sand, fine	3.4
Sand, brown, fine to medium	18.9
Sand, fine, micaceous	13.7
Sand, fine to medium with clay	23.5
Sand, fine	5.5
Sand, medium well rounded	6.1
Sand, medium to coarse	13.7
Sand, coarse to medium	10.7
Sand, medium to fine	7.6
TOTAL DEPTH	163.1

BH 43 : South Sinthi Road, south side (#4)

Lithology	Thickness (m)
Soil, peat (decayed wood)	2.7
Silt	9.1
Clay, light yellow	11.0
Clay, brown	13.4
Sand, brown, fine	12.5
Sand, silty with kankar	4.0
Sand, light grey very fine mica	12.5
Sand, light grey, fine, mica	32.3
Sand, coarse to medium, mica	21.9
Sand, grey, very fine, mica	4.0
TOTAL DEPTH	123.4

BH 47 : North Sealdah Road, within Railway Colony (#1)&(#7)

Lithology	Thickness (m)
Clay, stiff, light blue	12.2
Clay, yellow, mix with pebbles	9.1
Clay, yellow, stiff	6.1
Clay, yellow, mix with pebbles	18.3
Sand, light brown, fine, mica	15.2
Sand, medium	12.2
Sand, light brown, fine, mica	16.8
Sand, grey, fine, mica	4.6
Sand, light grey, medium, mica	33.5
TOTAL DEPTH	128.0

BH 48 : Ganesh Chandra Avenue (#6)

Lithology	Thickness (m)
Top soil, clay	6.1
Clay, grey	10.7
Clay, with wood	13.7
Clay, light brown, hard	13.7
Sand, brown, fine	4.6
Sand, very fine, micaceous	11.0
sand, grey, fine	12.2
Sand, grey, fine and medium	12.2
sand, grey fine	12.2
Sand, grey medium	19.8
TOTAL DEPTH	116.1

BH 50 : Dalhousie Square (#2)

Lithology	Thickness (m)
Silt, clay, grey	18.9
Sand, very fine, grey	12.5
Silt light grey	6.4
Sand, fine yellowish	12.8
Sand, medium, yellowish, mica	12.5
Sand, medium to fine, yellowish	12.8
Silt, yellowish, with kankar	18.6
Silt, fine to medium, yellowish	18.9
Sand, medium	26.5
TOTAL DEPTH	139.9

BH 75 : Bank Colony, Jodhpur Park (#3)

Lithology	Thickness (m)
Clay	13.1
Silt, light brown	18.9
Clay, light brown, hard	7.6
Silt, light brown	9.1
Sand, fine to med, light brown	12.2
Sand, fine, light brown	15.2
Sand, light brown, fine to med	3.0
Sand, grey, fine, micaceous	6.1
Sand, grey, fine to medium	6.1
Sand, medium	9.1
Sand, grey, medium to fine	3.0
Sand, grey, medium to coarse	6.1
Sand, grey, coarse	15.8
TOTAL DEPTH	125.5

(2) Survey Methodology

The sequence under which this survey was implemented is described hereafter;

a. Collection of available maps

Through the assistance of the Counterpart Team, maps were collected for some of the Study intersections, of varying levels of detail. From these maps, for each intersection a base map was prepared to be used on site and verified.

b. Execution of the field survey

The Study Team entrusted this survey to the local Calcutta-based firm of Development Consulting Services (DCL). The Study intersections were visited by the Study Team and DCL and the extent of the topographic survey at each was identified.

The actual field survey works commenced on the 9th of November and were completed by the 17th of the same month. The heavily congested traffic conditions at nine of the ten intersections undermined any possibility that field surveys could be executed during the daytime, and consequently the surveys were done during the hours of 11 PM to 5 AM of the following morning.

Satisfactory precautions were taken by DCL to ensure that there was adequate illumination to conduct the survey, measures to protect the surveyors from speeding trucks, etc. and the police were also very helpful in providing roving patrol cars to watch over security. Survey of intersection #9 was conducted during the daytime due to the heavy parking of trucks at night and therefore difficulty in carrying out the survey at that time.

Work progressed at four intersections at the same time, with each intersection taking about 3-4 days to complete. Depending on the amount of work at each intersection roughly 7 to 11 surveyors were used at each intersection with similar numbers of assistants, under the supervision

of two or three engineers. The survey was executed by the theodolite traversing, offsetting and plane table method.

c. Preparation of preliminary maps and field check

Upon the preparation of the preliminary drawings for the intersections, these drawings were taken to site and over four nights were checked as to accuracy of measurements and confirmation that all necessary information was recorded on the maps.

d. Finalization of maps and submission

Using CAD system and plotters at its offices, DCL prepared the final maps which were completed by December 6th, four weeks after the commencement of the survey.

2.2.2 Topographical Mapping

Under this survey the following types of maps were prepared and produced;

(1) Topographic Survey Maps

Topographic surveys were prepared for the Study intersections in such detail and extent as to allow for the planning and design of various intersection improvement schemes.

Alongside the road dimensions, the maps identify the existing road furniture and other utilities occupying the road space. Such features as light posts, electricity posts, tram related utilities, manholes, electricity and telephone boxes, drainage gutters, statues, etc. are clearly identified on the maps. Hawkers and stalls erected on the pavement and medians at some of the intersections are duly shown on the maps, as well as tram tracks where applicable.

Building elevations and their types, and religious places are also clearly shown on the maps. Maps were mainly

prepared in scale of 1/500, with the exception of the two intersections #1 and #10 which were prepared in a scale of 1/1000. Then through reduction and enlargement in Tokyo, two maps were prepared for each intersection at scales of 1/1000 and 1/500.

(2) Longitudinal Sections

Pavement and sidewalk elevations were recorded at every twenty meter intervals. Maps were prepared for each intersection showing the longitudinal profiles of the roads leading into the intersection.

(3) Cross Sectional Charts

Charts identifying type of road cross-section, and dimensions of the cross section and levels at every 20 meter interval were prepared for each cross section.

(4) General Layout Maps

The available maps were checked and a site reconnaissance of the roads surrounding the Study intersections was conducted to verify that all relevant roads were indicated on the maps. These maps were prepared at the scale of 1/500.

2.3 Underground Utilities Survey

2.3.1 Objective

The objective of the survey was to identify the types and locations of subsurface utilities at the ten intersections which are the subject of this Study. Mapping of such utilities is necessary for formulation of the most suitable construction plan and determination of extent of diversion works.

2.3.2 Methodology

The following surveys were undertaken by the Study Team to formulate a preliminary understanding of the existing underground utilities at the Study intersections.

(1) Interview Survey and Mapping
(2) Subsurface Radar Survey
(3) Verification excavation of utilities locations detected by Radar

The execution methods of these surveys and their results shall be reviewed in this chapter.

2.3.3 Interview Survey and Mapping

(1) Methodology

The Study Team entrusted this survey to the local consulting firm of Consulting Engineering Services (CES), and the survey was executed during the last three weeks of November and the first week of December, 1991.

Through the cooperation of the Counterpart Team, the Study Team and CES staff visited the following authorities and companies to collect data and available maps related to the Study intersections;

a. Calcutta Municipal Corporation
   Water supply and drainage
b. Metro Railway
   Information on extent of utilities diversionary works executed during the metro construction
c. Calcutta Electric Supply Corporation (CESC)
   Electric power supply network
d. Calcutta Telephones
   Telephone network
e. Greater Calcutta Gas Supply Corporation
   Gas supply network
f. Calcutta Metropolitan Development Authority (CMDA)
   Water supply and drainage network
g. Calcutta Investment Trust (CIT)

Various available utilities mapping at some of the Study intersections

(2) Results of the Survey

The authorities described above were very helpful in providing the needed information. However it was often stressed by the officials contacted that Calcutta being a city three hundred years old, some pipes other than the information available at these authorities may be found at the time of excavation.

The data and information obtained from the above mentioned authorities were compiled onto the topographic maps prepared by the topographic survey at scale of 1/500. A summation of this interview survey is shown in Tab.T-2.3.1.

2.3.4 Subsurface Radar Survey

(1) Description

Various methods are used to detect buried objects such as pipes and geological structures buried within a few meters below the ground surface. These include magnetic induction method, seismic method and electrical resistivity method. These conventional methods do not always provide satisfactory results and are time consuming.

The principles of the Subsurface Radar method, utilized in this Study are the same as that of the radar used for aircraft detection through air. The most important difference between the subsurface radar and the aircraft detection radar is the electrical conductivity nature of the medium through which electromagnetic waves pass. While the earth is electrically conductive and lossy, air acts as an electrical insulator.

The Subsurface Radar emits electromagnetic wave into the earth through the transmitting antenna. Transmitted electromagnetic wave reflects at boundaries of electrically foreign materials, such as pipes, cavities, and returns to the surface of the ground. Reflected electromagnetic wave

Table T-2.3.1(1) Underground Utilities Interview Survey Results

	Intersection/Road Name	Water Line (F) Filter (U) Unfilter	Sewer Line	Gas Line	Electricity (H) H.T.Cable (L) L.T.Cable	Telephone
#1	MOULALI	φ 229mm (U) φ 457mm (U) φ 152mm (F) φ 610mm (F) φ 1524mm (F)	2845x2210 mm φ 305mm	φ 457mm φ 305mm φ 305mm φ 152mm	3 nos. (L) 2 nos. (H) 4 nos. (L)	1 no.
	A.P.C. Roy Road					
	D.R.L. Bhattacharjee Road	φ 152mm (F) φ 152mm (U) φ 762mm (F) φ 305mm (F) φ 381mm (U) φ 152mm (U) φ 152mm (F)	φ 203mm φ 1676mm φ 305mm	φ 152mm	7 nos. (H) 2 nos. (L) 4 nos. (L)	1 no.
#2	ESPLANADE	φ 229mm (F) φ 305mm (F) φ 305mm (U) φ 229mm (U) φ 152mm (F)	1650x1100 mm φ 202mm	φ 457mm φ 102mm φ 150mm (C) φ 152mm (C)	2 nos. (H) 1 no. (L)	
	Chowringhee Road					
	Esplanade Row East from Lenin Sarani	φ 152mm (F) φ 452mm (F) φ 152mm (U) φ 452mm (F) φ 152mm (F)	2464x1905 mm	φ 150mm φ 229mm φ 150mm φ 152mm	2 nos. (L) 2 nos. (H)	
#3	GARIAHAT	φ 152mm (F) φ 152mm (U) φ 305mm (U) φ 152mm (U) φ 152mm (F)	φ 229mm φ 2896mm φ 229mm φ 152mm	φ 150mm φ 229mm φ 305mm φ 102mm	2 nos. (L)	2 nos.
	Rash Behari Avenue					
	Gariahat Road	φ 152mm (F) φ 152mm (U) φ 305mm (F) φ 305mm (U) φ 152mm (F) φ 152mm (U)	φ 229mm φ 991mm φ 1067mm φ 229mm φ 914mm φ 1219mm φ 152mm φ 152mm	φ 305mm φ 205mm φ 152mm φ 102mm φ 305mm φ 229mm φ 305mm φ 305mm φ 152mm	2 nos. (L) 2 nos. (H)	2 nos.
#4	SHYAMBAZAR	φ 152mm (F) φ 152mm (U) φ 762mm (F) φ 305mm (U) φ 762mm (F) φ 1829mm (F) φ 1524mm (F) φ 152mm (F) φ 102mm (F)	1219x 813 mm	φ 76mm φ 305mm φ 200mm φ 152mm φ 102mm	7 nos. (L) 7 nos. (H)	1 no. (C)
	A.P.C. Roy Road					
	R.G. Kar Road	φ 152mm (U) φ 102mm (F) φ 152mm (U) φ 102mm (F) φ 152mm (F) φ 457mm (U) φ 684mm (F) φ 152mm (U) φ 152mm (U) φ 152mm (F)	φ 305->225mm φ 375mm φ 225mm	φ 102mm	2 nos. (L) 2 nos. (H)	

Table T-2.3.1(2) Underground Utilities Interview Survey Results

	Intersection/Road Name	Water Line (F) Filter (U) Unfilter	Sewer Line	Gas Line	Electricity (H) H.T.Cable (L) L.T.Cable	Telephone
#5	RABINDRA SADAN	φ 152mm (F) φ 150mm (U) φ 305mm (U) φ 102mm (F)	φ 525mm φ 200mm φ 300mm φ 150mm φ 1500mm	φ 152mm φ 229mm φ 305mm φ 102mm	3 nos. (L) 8 nos. (H)	
	Chowringhee Road					
	A.J.C. Bose Road	φ 305mm (U) φ 152mm (F) φ 610mm (U) φ 102mm (F) φ 152mm (U) φ 533mm (U)	1219x 813 mm φ 762mm φ 610mm	φ 381mm φ 102mm	2 nos. (L) 7 nos. (H)	1 no. (C)
#6	BECK BAGAN	φ 152mm (U) φ 533mm (F) φ 1524mm (F) φ 533mm (U) φ 102mm (F) φ 152mm (U)	2464x1905 mm φ 229mm	φ 381mm φ 32mm	2 nos. (H)	
	A.J.C. Bose Road at Ballygunge Circular Road x-ing A.J.C. Bose Road at Sarat Bose Road x-ing					
#7	MANIKTALA	φ 152mm (U) φ 305mm (U) φ 610mm (F) φ 610mm (F) φ 1524mm (F) φ 102mm (F)	2464x1905 mm φ 203mm	φ 229mm	5 nos. (L) 7 nos. (H)	2 nos.
	A.P.C. Roy Road					
	Vivekanada Road	φ 152mm (F) φ 152mm (U) φ 762mm (F) φ 152mm (U) φ 102mm (F) φ 1219mm (U)	2972x2134 mm φ 305mm φ 1143mm φ 203mm	φ 152mm φ 100mm	4 nos. (L) 11 nos. (H)	2 nos.
#8	PARK STREET	φ 533mm (U) φ 457mm (F) φ 150mm (F) φ 300mm (F) φ 914mm (F) φ 300mm (F) φ 150mm (U)	1524x1016 mm 1200x 800 mm φ 457mm	φ 457mm φ 305mm	4 nos. (L) 2 nos. (H)	1 no. (Park st. cross)
	Chowringhee Road					
	Park Street	φ 300mm (F) φ 914mm (F) φ 300mm (F) φ 150mm (U)	1200x 800 mm φ 600mm	φ 229mm φ 76mm φ 150mm	4 nos. (L) 2 nos. (H)	
#9	LOCK GATE	φ 102mm (F) φ 533mm (F)	2134x1524 mm φ 457mm	φ 76mm φ 51mm	1 no. (L)	
	Lock Gate Road					
#10	MULLIKBAZAR	φ 152mm (U) φ 305mm (U) φ 533mm (F) φ 152mm (F) φ 152mm (F)	1845x2210 mm φ 457mm	φ 457mm φ 305mm φ 32mm φ 229mm φ 305mm	2 nos. (L) 1 no. (H)	
	A.J.C. Bose Road					
	Park Street	φ 102mm (F) φ 152mm (U) φ 305mm (F) φ 152mm (U) φ 102mm (F)	φ 1321mm 1981x1321 mm φ 1372mm	φ 305mm φ 152mm φ 305mm φ 229mm φ 76mm φ 150mm	3 nos. (L) 1 no. (H)	1 no.