



NORTH EASTERN RAILWAY

FINAL LOCATION SURVEY FOR NEW B.G RAILWAY LINE PROJECTS (770.00 KM.) AND FINAL LOCATION SURVEY FOR CONSTRUCTION OF DOUBLING/THIRD LINE/ 3RD & 4TH LINE (252.00 KM.) OF NORTH EASTERN RAILWAY (TOTAL 1022.00 KM)

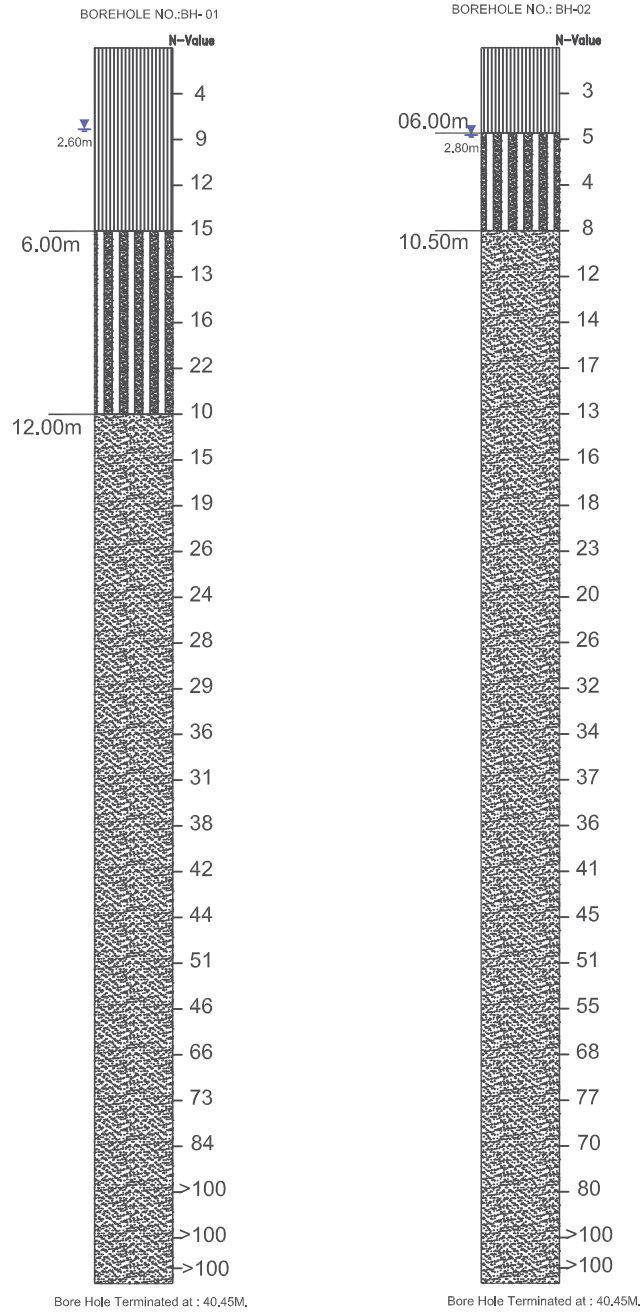
SECTION: CHITAUNI-MADHUBANI

Chainage	Br. No	Type of Crossing	Type of Bridge	Borehole No.	Easting (m)	Northing (m)	Reduced Level (m)
9251.384	11	WATERWAY	MAJOR-BRIDGE	BH-01	200412	3001033	109.62
				BH-02	200420	3001016	111.37

SUBMITTED BY:



BOREHOLE PROFILE
SECTION: CHITAUNI TO MADHUBANI
BRIDGE NO.: 11





LEGENDS

- SANDY-SILT (ML)
- SILTY SAND (SM)
- POORLY GRADED SAND (SP)
- Ground Water Table



Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

[illegible]

BRIDGE NO.:11						DATE STARTED : 25/12/2024																														
BOREHOLE NO. BH- 2				GWT: 2.80 m		DATE COMPLETED : 28/12/2024																														
FIELD TEST RESULTS										LABORATORY TEST RESULTS																										
ELEVATION IN METERS	DEPTH IN METERS BELOW REFERENCE	NATURE OF SAMPLING	SAMPLE REFERENCE NO.	LEVEL OF WATER TABLE / L.W.L	SPT TEST RESULTS					SYMBOLIC REPRESENTATION	DESCRIPTION OF SOIL WITH U.S. CLASSIFICATION	TYPE OF TEST CONDUCTED IN THE LABORATORY	GRAIN SIZE ANALYSIS				LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	BULK DENSITY (gm /cc)	DRY DENSITY (gm/cc)	MOISTURE CONTENT (%)	FREESWELL INDEX (%)	SPECIFIC GRAVITY	SUBMERGED DENSITY (gm /cc)	SHEAR STRENGTH CHARACTERISTICS		CONSOLIDATION CHARACTERISTICS	Chemical Analysis Result							
					DEPTH IN METERS	NO. OF BLOWS	PENETRATION (CM)	N VALUE (Recorded)	N VALUE (Corrected)				GRAVEL (%)	SAND (%)	SILT (%)	CLAY (%)										Cohesion Cc (kg/cm ²)	Angle of friction (Degrees)		Compression Index(I _{cc})	pH	Chloride, %	Sulphate, %	pH	Chloride, mg/l	Sulphate, mg/l	
-1.00	1.0	DS	1	 2.80 m	0.00	1.00	DS	-	-	-	LOOSE LITE BROWN SANDY SILT (ML)	--	0.00	40.00	55.00	5.00	NON-PLASTIC				-	-	-	2.52	-	-	-	-	-	-	-	-	-	-	-	-
	2.0	SPT	1		1.50	1.95	3	30	3	4		--	0.00	35.00	62.00	3.00	NON-PLASTIC			1.59	-	-	-	2.52	-	-	-	-	-	-	-	-	-	-		
	3.0	DS	2		2.50	2.80	UDS SLIPPED					--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
	4.0	SPT	2		3.00	3.45	5	30	5	7		--	0.00	36.00	60.00	4.00	NON-PLASTIC			1.94	-	-	-	2.53	-	-	-	-	-	-	-	-	-	-		
-5.00	5.0	SPT	3		4.50	4.95	4	30	4	5		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	6.0	DS	3		5.50	5.80	UDS SLIPPED					--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
	7.0	SPT	4		6.00	6.45	8	30	8	10		--	0.00	75.00	24.00	1.00	NON-PLASTIC			1.96	-	-	-	2.54	-	-	-	-	-	-	-	-	-	-		
	8.0	SPT	5		7.50	7.95	12	30	12	14		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	9.0	DS	4		8.50	8.80	UDS SLIPPED					--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
-10.00	10.0	SPT	6		9.00	9.45	14	30	14	15		--	0.00	74.00	24.00	2.00	NON-PLASTIC			2.01	-	-	-	2.53	-	-	-	-	-	-	-	-	-	-	-	
	11.0	SPT	7		10.50	10.95	17	30	17	16		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	12.0	DS	5		11.50	11.80	UDS SLIPPED					--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	13.0	SPT	8		12.00	12.45	13	30	13	13		--	0.00	98.00	2.00	0.00	NON-PLASTIC			2.02	-	-	-	2.55	-	-	-	-	-	-	-	-	-	-	-	
	14.0	SPT	9		13.50	13.95	16	30	16	15		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
-15.00	15.0	DS	6		14.50	14.80	UDS SLIPPED					--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	16.0	SPT	10		15.00	15.45	18	30	18	15		--	0.00	99.00	1.00	0.00	NON-PLASTIC			2.05	-	-	-	2.55	-	-	-	-	-	-	-	-	-	-	-	
	17.0	SPT	11		16.50	16.95	23	30	23	17		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	18.0	DS	7		17.50	17.80	UDS SLIPPED					--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	19.0	SPT	12		18.00	18.45	20	30	20	16		--	0.00	98.00	2.00	0.00	NON-PLASTIC			2.04	-	-	-	2.56	-	-	-	-	-	-	-	-	-	-	-	
-20.00	20.0	SPT	13		19.50	19.95	26	30	26	18		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	21.0	DS	8		20.50	20.80	UDS SLIPPED					--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	22.0	SPT	14		21.00	21.45	32	30	32	20		--	0.00	99.00	1.00	0.00	NON-PLASTIC			2.05	-	-	-	2.57	-	-	-	-	-	-	-	-	-	-	-	
	23.0	SPT	15		22.50	22.95	34	30	34	20		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	24.0	DS	9		23.50	23.80	UDS SLIPPED					--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
-25.00	25.0	SPT	16	24.00	24.45	37	30	37	21	--	0.00	98.00	2.00	0.00	NON-PLASTIC			2.03	-	-	-	2.56	-	-	-	-	-	-	-	-	-	-	-			
	26.0	SPT	17	25.50	25.95	36	30	36	20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
	27.0	DS	10	26.50	26.80	UDS SLIPPED				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
	28.0	SPT	18	27.00	27.45	41	30	41	21	--	0.00	97.00	3.00	0.00	NON-PLASTIC			2.05	-	-	-	2.55	-	-	-	-	-	-	-	-	-	-	-			
	29.0	SPT	19	28.50	28.95	45	30	45	22	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
-30.00	30.0	DS	11	29.50	29.80	UDS SLIPPED				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
	31.0	SPT	20	30.00	30.45	51	30	51	24	--	0.00	98.00	2.00	0.00	NON-PLASTIC			2.06	-	-	-	2.56	-	-	-	-	-	-	-	-	-	-	-			
	32.0	SPT	21	31.50	31.95	55	30	55	24	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
	33.0	DS	12	32.50	32.80	UDS SLIPPED				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
	34.0	SPT	22	33.00	33.45	68	30	68	28	--	0.00	97.00	3.00	0.00	NON-PLASTIC			2.07	-	-	-	2.57	-	-	-	-	-	-	-	-	-	-	-			
-35.00	35.0	SPT	23	34.50	34.95	77	30	77	30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
	36.0	DS	13	35.50	35.80	UDS SLIPPED				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
	37.0	SPT	24	36.00	36.45	70	30	70	27	--	0.00	98.00	2.00	0.00	NON-PLASTIC			2.08	-	-	-	2.56	-	-	-	-	-	-	-	-	-	-	-			
	38.0	SPT	25	37.50	37.95	80	30	80	29	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
	39.0	DS	14	38.50	38.80	UDS SLIPPED				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
	40.0	SPT	26	39.00	39.45	50	1	>100	>100	--	0.00	97.00	3.00	0.00	NON-PLASTIC			2.09	-	-	-	2.55	-	-	-	-	-	-	-	-	-	-	-			
-40.000	41.0	SPT	27	40.00	40.45	50	1	>100	>100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
CLASSIFICATION OF SOIL AS PER IS : 1498										Project:Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)																										
ABBREVIATION USED :																																				
DS = DISTURBED SAMPLE, SPT = STANDARD PENETRATION TEST, UDS = UNDISTURBED SAMPLE, DST = DIRECT SHEAR TEST, UC : UNCONFINED COMPRESSION TEST																																				
* UCS BASED ON POINT LOAD TEST										SECTION: CHITAUUNI-MADHUBANI																										

CALCULATIONS FOR CORRECTED SPT (N) VALUES

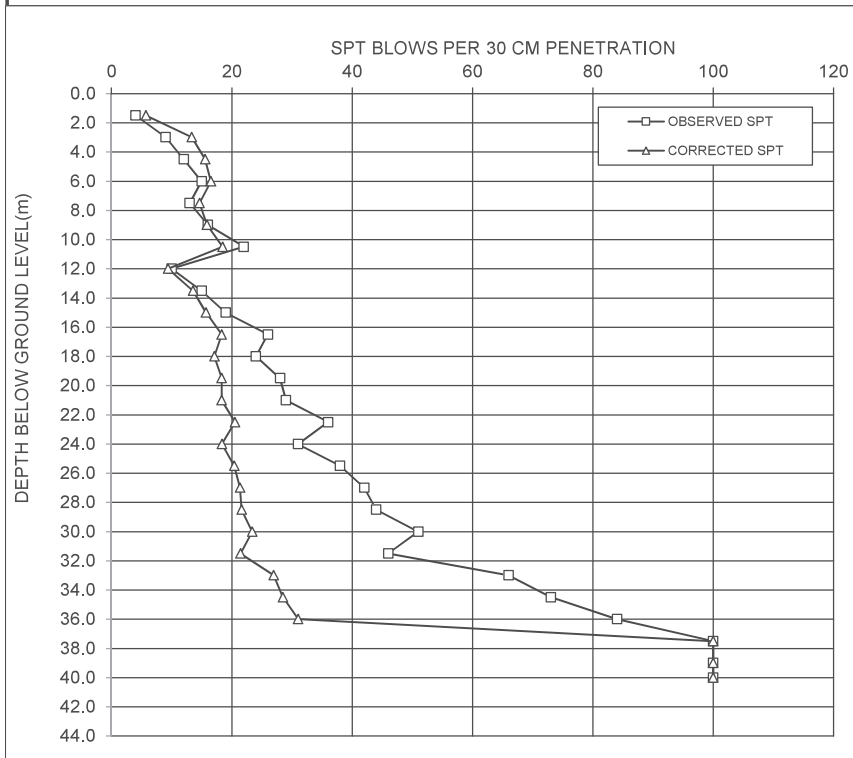
Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BOREHOLE NO. BH- 1

WATER TABLE - 2.60 m

DEPTH OF SAMPLE	TYPE OF SOIL	OBSERVED SPT 'N' VALUE	CORRECTED SPT (N') VALUE (FOR OVERBURDEN)	FINAL CORRECTED VALUE AFTER DILATANCY CORRECTION (N'')
1.50	Non Plastic	4	6	6
3.00	Non Plastic	9	13	13
4.50	Non Plastic	12	16	16
6.00	Non Plastic	15	18	17
7.50	Non Plastic	13	15	15
9.00	Non Plastic	16	17	16
10.50	Non Plastic	22	22	18
12.00	Non Plastic	10	9	9
13.50	Non Plastic	15	14	14
15.00	Non Plastic	19	16	16
16.50	Non Plastic	26	22	18
18.00	Non Plastic	24	19	17
19.50	Non Plastic	28	22	18
21.00	Non Plastic	29	22	18
22.50	Non Plastic	36	26	21
24.00	Non Plastic	31	22	18
25.50	Non Plastic	38	26	20
27.00	Non Plastic	42	28	21
28.50	Non Plastic	44	28	22
30.00	Non Plastic	51	32	23
31.50	Non Plastic	46	28	21
33.00	Non Plastic	66	39	27
34.50	Non Plastic	73	42	28
36.00	Non Plastic	84	47	31
37.50	Non Plastic	100	100	100
39.00	Non Plastic	100	100	100
40.00	Non Plastic	100	100	100

* SPT value restricted to 300.



CALCULATIONS FOR CORRECTED SPT (N) VALUES

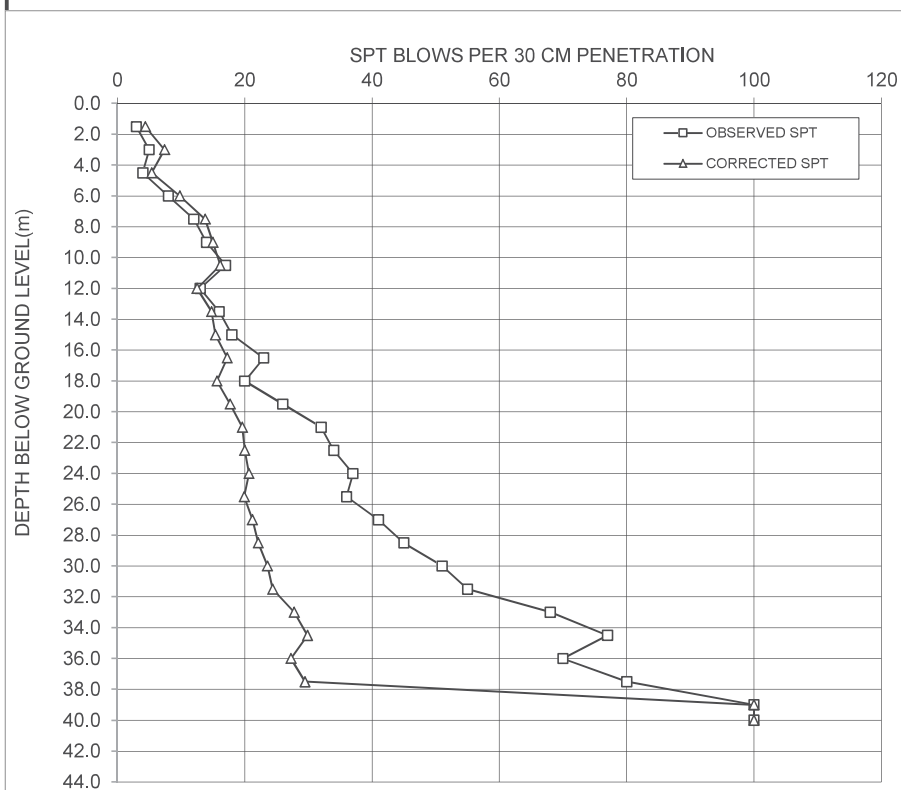
Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BOREHOLE NO. BH- 2

WATER TABLE- 2.80 m

DEPTH OF SAMPLE	TYPE OF SOIL	OBSERVED SPT 'N' VALUE	CORRECTED SPT (N') VALUE (FOR OVERBURDEN)	FINAL CORRECTED VALUE AFTER DILATANCY CORRECTION (N'')
1.50	Non Plastic	3	4	4
3.00	Non Plastic	5	7	7
4.50	Non Plastic	4	5	5
6.00	Non Plastic	8	10	10
7.50	Non Plastic	12	14	14
9.00	Non Plastic	14	15	15
10.50	Non Plastic	17	17	16
12.00	Non Plastic	13	13	13
13.50	Non Plastic	16	15	15
15.00	Non Plastic	18	16	15
16.50	Non Plastic	23	20	17
18.00	Non Plastic	20	16	16
19.50	Non Plastic	26	20	18
21.00	Non Plastic	32	24	20
22.50	Non Plastic	34	25	20
24.00	Non Plastic	37	26	21
25.50	Non Plastic	36	25	20
27.00	Non Plastic	41	27	21
28.50	Non Plastic	45	29	22
30.00	Non Plastic	51	32	24
31.50	Non Plastic	55	34	24
33.00	Non Plastic	68	41	28
34.50	Non Plastic	77	45	30
36.00	Non Plastic	70	40	27
37.50	Non Plastic	80	44	29
39.00	Non Plastic	100	100	100
40.00	Non Plastic	100	100	100

* SPT value restricted to 300.



Typical Computation of Liquefaction Potential as per IRC:SP: 114 / IS: 1893

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO: 11

BOREHOLE NO.

BH-01

SECTION: CHITAUUNI-MADHUBANI

Water table assumed for Calculation: 0.00 m

Depth below EGL, m	Type of Strata	Observed SPT Value	Saturated density (t/m^3)	Submerged Density (t/m^3)	Fine Content (%)	Earthquake Zone	Peak ground acceleration a_{max}/g	Earth quake magnitude (Mw)	Stress reduction coefficient (rd)	Total overburden pressure (σ_o), t/m^2	Effective overburden (σ_o), t/m^2	Cyclic Stress ratio (CSR)	C_N	CE or CHT	CH or CHW	CB or CBD	CR or CRL	CS or CSS	SPT corrected (N_1) ₆₀	α	β	(N_1) _{60cs}	$CRR_{M=7.5}$	Relative Density, $D_r\%$	f	K_σ	K_α	MSF	CRR	FOS	Conclusion
1.50	ML	4	1.58	0.58	56	IV	0.24	7.00	0.99	2.37	0.87	0.42	1.70	1.33	1.000	1.05	0.75	1.00	7.12	5.00	1.20	13.55	0.15	NA	NA	1.00	1.00	1.19	0.17	>1.0	Non Liquefiable
3.00	ML	9	1.58	0.58	56	IV	0.24	7.00	0.98	4.74	1.74	0.42	1.70	1.33	1.000	1.05	0.85	1.00	18.16	5.00	1.20	26.79	0.33	NA	NA	1.00	1.00	1.19	0.40	>1.0	Non Liquefiable
4.50	ML	12	1.58	0.58	56	IV	0.24	7.00	0.97	7.11	2.61	0.41	1.70	1.33	1.000	1.05	0.95	1.00	27.06	5.00	1.20	37.48	NA	NA	NA	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
6.00	SM	15	2.01	1.01	32	IV	0.24	7.00	0.95	9.48	3.48	0.41	1.70	1.33	1.000	1.05	0.95	1.00	33.73	4.83	1.17	44.33	NA	68.73	0.66	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
7.50	SM	13	2.01	1.01	32	IV	0.24	7.00	0.94	12.50	5.00	0.37	1.41	1.33	1.000	1.05	0.95	1.00	24.40	4.83	1.17	33.40	NA	52.41	0.74	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
9.00	SM	16	2.04	1.04	33	IV	0.24	7.00	0.93	15.51	6.51	0.35	1.24	1.33	1.000	1.05	1	1.00	27.69	4.88	1.18	37.55	NA	59.81	0.70	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
10.50	SM	22	2.04	1.04	33	IV	0.24	7.00	0.89	18.57	8.07	0.32	1.11	1.33	1.000	1.05	1	1.00	34.20	4.88	1.18	45.22	NA	69.20	0.65	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
12.00	SP	10	2.05	1.05	2	IV	0.24	7.00	0.85	21.63	9.63	0.30	1.02	1.33	1.000	1.05	1	1.00	14.23	0.00	1.00	14.23	0.15	29.52	0.85	1.00	1.00	1.19	0.18	0.61	Liquefiable
13.50	SP	15	2.05	1.05	2	IV	0.24	7.00	0.81	24.71	11.21	0.28	0.94	1.33	1.000	1.05	1	1.00	19.79	0.00	1.00	19.79	0.21	42.03	0.79	0.98	1.00	1.19	0.25	0.89	Liquefiable
15.00	SP	19	2.02	1.02	1	IV	0.24	7.00	0.77	27.78	12.78	0.26	0.88	1.33	1.000	1.05	1	1.00	23.47	0.00	1.00	23.47	0.26	50.31	0.75	0.94	1.00	1.19	0.30	1.13	Non Liquefiable
16.50	SP	26	2.02	1.02	1	IV	0.24	7.00	0.73	30.81	14.31	0.25	0.84	1.33	1.000	1.05	1	1.00	30.35	0.00	1.00	30.35	NA	65.35	0.67	0.89	1.00	1.19	NA	>1.0	Non Liquefiable
18.00	SP	24	2.03	1.03	2	IV	0.24	7.00	0.69	33.84	15.84	0.23	0.79	1.33	1.000	1.05	1	1.00	26.63	0.00	1.00	26.63	0.33	57.42	0.71	0.88	1.00	1.19	0.34	1.49	Non Liquefiable
19.50	SP	28	2.03	1.03	2	IV	0.24	7.00	0.65	36.89	17.39	0.22	0.76	1.33	1.000	1.05	1	1.00	29.66	0.00	1.00	29.66	0.45	64.23	0.68	0.84	1.00	1.19	0.44	2.06	Non Liquefiable
21.00	SP	29	2.01	1.01	3	IV	0.24	7.00	0.61	39.93	18.93	0.20	0.73	1.33	1.000	1.05	1	1.00	29.43	0.00	1.00	29.43	0.43	63.73	0.68	0.82	1.00	1.19	0.42	2.09	Non Liquefiable
22.50	SP	36	2.01	1.01	3	IV	0.24	7.00	0.57	42.95	20.45	0.19	0.70	1.33	1.000	1.05	1	1.00	35.16	0.00	1.00	35.16	NA	70.16	0.65	0.78	1.00	1.19	NA	>1.0	Non Liquefiable

Note: Values of all Parameters are as per IRC:SP: 114 / IS 1893: 2016

C_E or C_{HT} (Correction for hammer energy ratio) = $ER/60$, ER for Rope and pully System = 80 % , Hence $C_E = 80/60 = 1.33$

C_H or C_{HW} (Correction for hammer) = 1.00

Borehole Diameter = 150 mm , Hence C_B or C_{BD} (Correction for Borehole diameter), = 1.05

C_S or C_{SS} (Correction for Standard sampler) = 1.00

K_σ Correction for high overburden stress (for effective oberburden pressure > 10 T/m²)

K_α Correction for static shear stress is required only for sloping ground

Typical Computation of Liquefaction Potential as per IRC:SP: 114 / IS: 1893

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO: 11

BOREHOLE NO.

BH-02

SECTION: CHITAUNI-MADHUBANI

Water table assumed for Calculation: 0.00 m

Depth below EGL, m	Type of Strata	Observed SPT Value	Saturated density (t/m^3)	Submerged Density (t/m^3)	Fine Content (%)	Earthquake Zone	Peak ground acceleration a_{max}/g	Earth quake magnitude (Mw)	Stress reduction coefficient (rd)	Total overburden pressure (σ_o), t/m^2	Effective overburden (σ'_o), t/m^2	Cyclic Stress ratio (CSR)	C_N	CE or CHT	CH or CHW	CB or CBD	CR or CRL	CS or CSS	SPT corrected (N_{160})	α	β	$(N_1)_{60cs}$	$CRR_{M=7.5}$	Relative Density, $Dr\%$	f	K_G	K_α	MSF	CRR	FOS	Conclusion
1.50	ML	3	1.59	0.59	65	IV	0.24	7.00	0.99	2.39	0.89	0.42	1.70	1.33	1.000	1.05	0.75	1.00	5.34	5.00	1.20	11.41	0.13	NA	NA	1.00	1.00	1.19	0.15	>1.0	Non Liquefiable
3.00	ML	5	1.94	0.94	64	IV	0.24	7.00	0.98	4.77	1.77	0.41	1.70	1.33	1.000	1.05	0.85	1.00	10.09	5.00	1.20	17.11	0.18	NA	NA	1.00	1.00	1.19	0.22	>1.0	Non Liquefiable
4.50	ML	4	1.94	0.94	64	IV	0.24	7.00	0.97	7.68	3.18	0.36	1.70	1.33	1.000	1.05	0.95	1.00	9.02	5.00	1.20	15.83	0.17	NA	NA	1.00	1.00	1.19	0.20	>1.0	Non Liquefiable
6.00	SM	8	1.96	0.96	25	IV	0.24	7.00	0.95	10.59	4.59	0.34	1.48	1.33	1.000	1.05	0.95	1.00	15.67	4.29	1.12	21.76	0.24	32.75	0.84	1.00	1.00	1.19	0.28	0.83	Liquefiable
7.50	SM	12	1.96	0.96	25	IV	0.24	7.00	0.94	13.53	6.03	0.33	1.29	1.33	1.000	1.05	0.95	1.00	20.50	4.29	1.12	27.15	0.34	43.63	0.78	1.00	1.00	1.19	0.41	1.24	Non Liquefiable
9.00	SM	14	2.01	1.01	26	IV	0.24	7.00	0.93	16.47	7.47	0.32	1.16	1.33	1.000	1.05	1	1.00	22.62	4.39	1.12	29.78	0.45	48.40	0.76	1.00	1.00	1.19	0.54	1.69	Non Liquefiable
10.50	SM	17	2.01	1.01	26	IV	0.24	7.00	0.89	19.49	8.99	0.30	1.05	1.33	1.000	1.05	1	1.00	25.05	4.39	1.12	32.50	NA	53.85	0.73	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
12.00	SP	13	2.02	1.02	2	IV	0.24	7.00	0.85	22.50	10.50	0.29	0.98	1.33	1.000	1.05	1	1.00	17.72	0.00	1.00	17.72	0.19	37.36	0.81	0.99	1.00	1.19	0.22	0.78	Liquefiable
13.50	SP	16	2.02	1.02	2	IV	0.24	7.00	0.81	25.53	12.03	0.27	0.91	1.33	1.000	1.05	1	1.00	20.37	0.00	1.00	20.37	0.22	43.34	0.78	0.96	1.00	1.19	0.25	0.94	Liquefiable
15.00	SP	18	2.05	1.05	1	IV	0.24	7.00	0.77	28.56	13.56	0.25	0.86	1.33	1.000	1.05	1	1.00	21.59	0.00	1.00	21.59	0.24	46.07	0.77	0.93	1.00	1.19	0.26	1.03	Non Liquefiable
16.50	SP	23	2.05	1.05	1	IV	0.24	7.00	0.73	31.64	15.14	0.24	0.81	1.33	1.000	1.05	1	1.00	26.11	0.00	1.00	26.11	0.32	56.24	0.72	0.89	1.00	1.19	0.34	1.40	Non Liquefiable
18.00	SP	20	2.04	1.04	2	IV	0.24	7.00	0.69	34.71	16.71	0.22	0.77	1.33	1.000	1.05	1	1.00	21.61	0.00	1.00	21.61	0.24	46.11	0.77	0.89	1.00	1.19	0.25	1.12	Non Liquefiable
19.50	SP	26	2.04	1.04	2	IV	0.24	7.00	0.65	37.77	18.27	0.21	0.74	1.33	1.000	1.05	1	1.00	26.86	0.00	1.00	26.86	0.33	57.94	0.71	0.84	1.00	1.19	0.34	1.59	Non Liquefiable
21.00	SP	32	2.05	1.05	1	IV	0.24	7.00	0.61	40.83	19.83	0.20	0.71	1.33	1.000	1.05	1	1.00	31.73	0.00	1.00	31.73	NA	66.73	0.67	0.80	1.00	1.19	NA	>1.0	Non Liquefiable
22.50	SP	34	2.05	1.05	1	IV	0.24	7.00	0.57	43.91	21.41	0.18	0.68	1.33	1.000	1.05	1	1.00	32.45	0.00	1.00	32.45	NA	67.45	0.66	0.77	1.00	1.19	NA	>1.0	Non Liquefiable

Note: Values of all Parameters are as per IRC:SP: 114 / IS 1893: 2016

C_E or C_{HT} (Correction for hammer energy ratio) = $ER/60$, ER for Rope and pully System = 80 % , Hence $C_E = 80/60 = 1.33$

C_H or C_{HW} (Correction for hammer) = 1.00

Borehole Diameter = 150 mm , Hence C_B or C_{BD} (Correction for Borehole diameter), = 1.05

C_S or C_{SS} (Correction for Standard sampler) = 1.00

K_α Correction for high overburden stress (for effective oberburden pressure>10 T/m2)

K_α Correction for static shear stress is required only for sloping ground



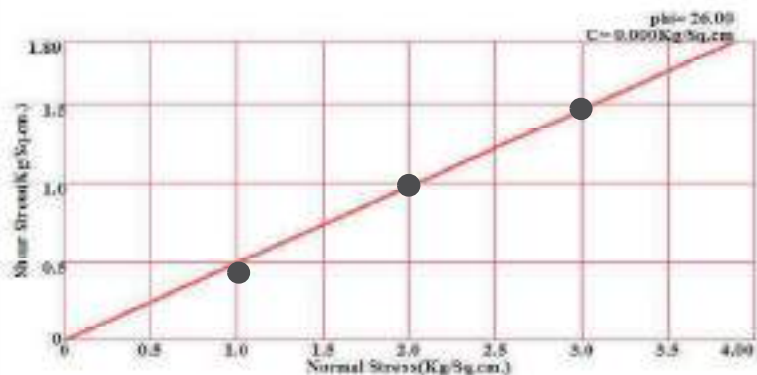
Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. -11

BOREHOLE NO. -01

SECTION: CHITAUNI-MADHUBANI

TRIAXIAL SHEAR GRAPH



Bore Hole No. = 01
Sample No. = A-01/D82
Depth = 1.50000034
Type of Test = C.D.



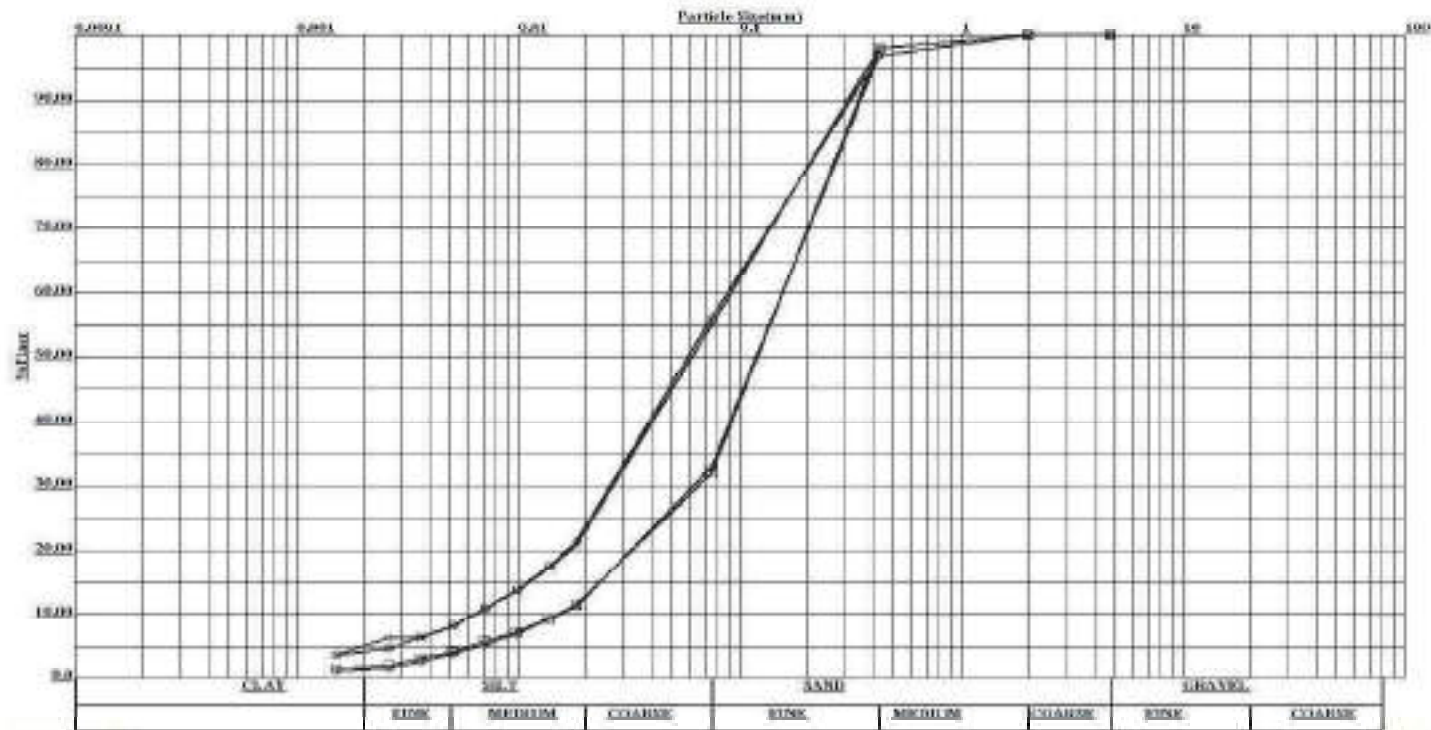
aarvee associates
architects engineers & consultants pvt. ltd.

PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 11
SECTION:CHITAUNI-MADHUBANI

BOREHOLE NO.-BH- 01

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C_u	C_c
			(%)	(%)	(%)	(%)		
×	0.0	LOOSE TO MEDIUM DENSE LITE BROWN SANDY SILT (ML)	0.00	45.00	50.00	5.00	14.23	1.22
○	2.5		0.00	44.00	52.00	4.00	14.08	1.24
□	6.0	MEDIUM DENSE LITE GREY SILTY SAND (SM)	0.00	68.00	30.00	2.00	10.46	1.83
◇	8.5		0.00	67.00	32.00	1.00	10.04	1.58

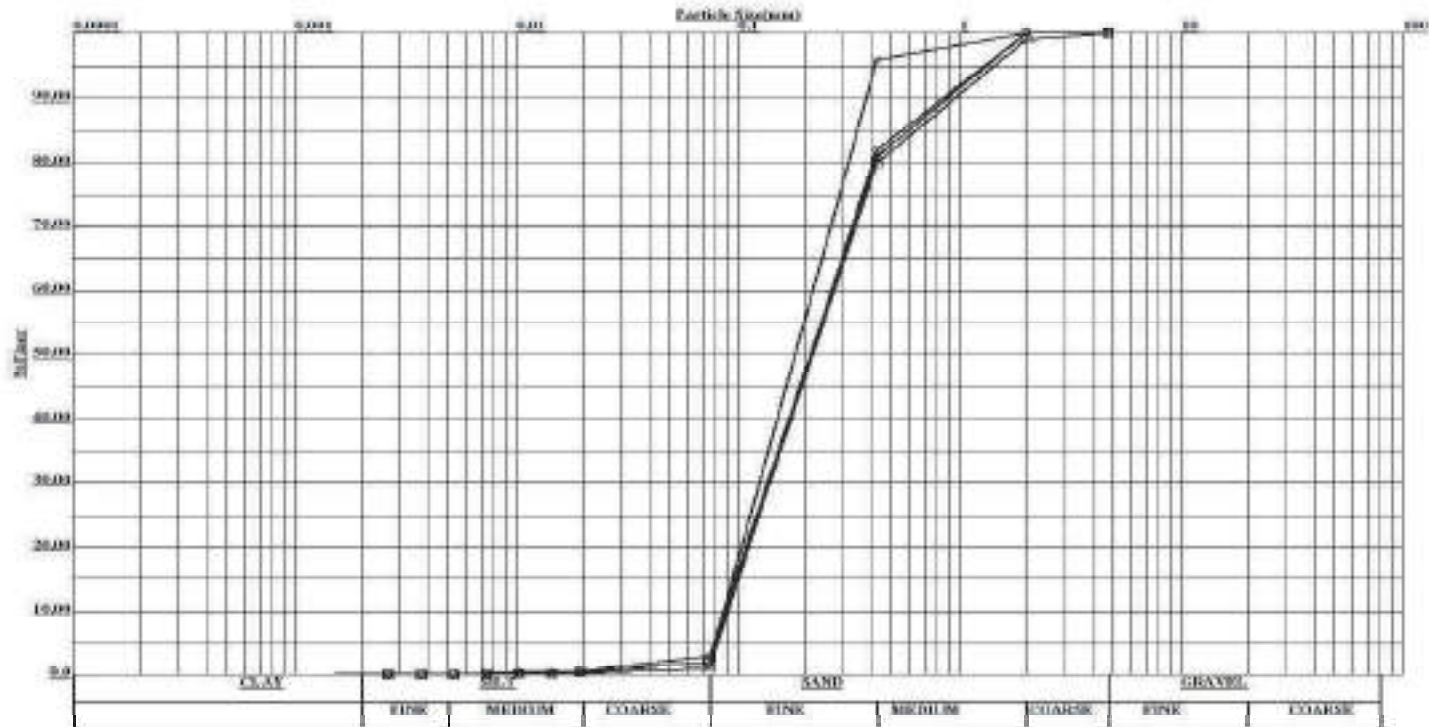


PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 11
SECTION:CHITAUNI-MADHUBANI

BOREHOLE NO.-BH- 01

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C_u	C_c
			(%)	(%)	(%)	(%)		
x	12.0	MEDIUM DENSE TO VERY DENSE DARK GREY POORLY GRADED SAND (SP)	0.00	98.00	2.00	0.00	2.52	0.83
○	15.0		0.00	99.00	1.00	0.00	2.92	0.81
□	18.0		0.00	98.00	2.00	0.00	3.04	0.80
◇	21.0		0.00	97.00	3.00	0.00	3.04	0.80

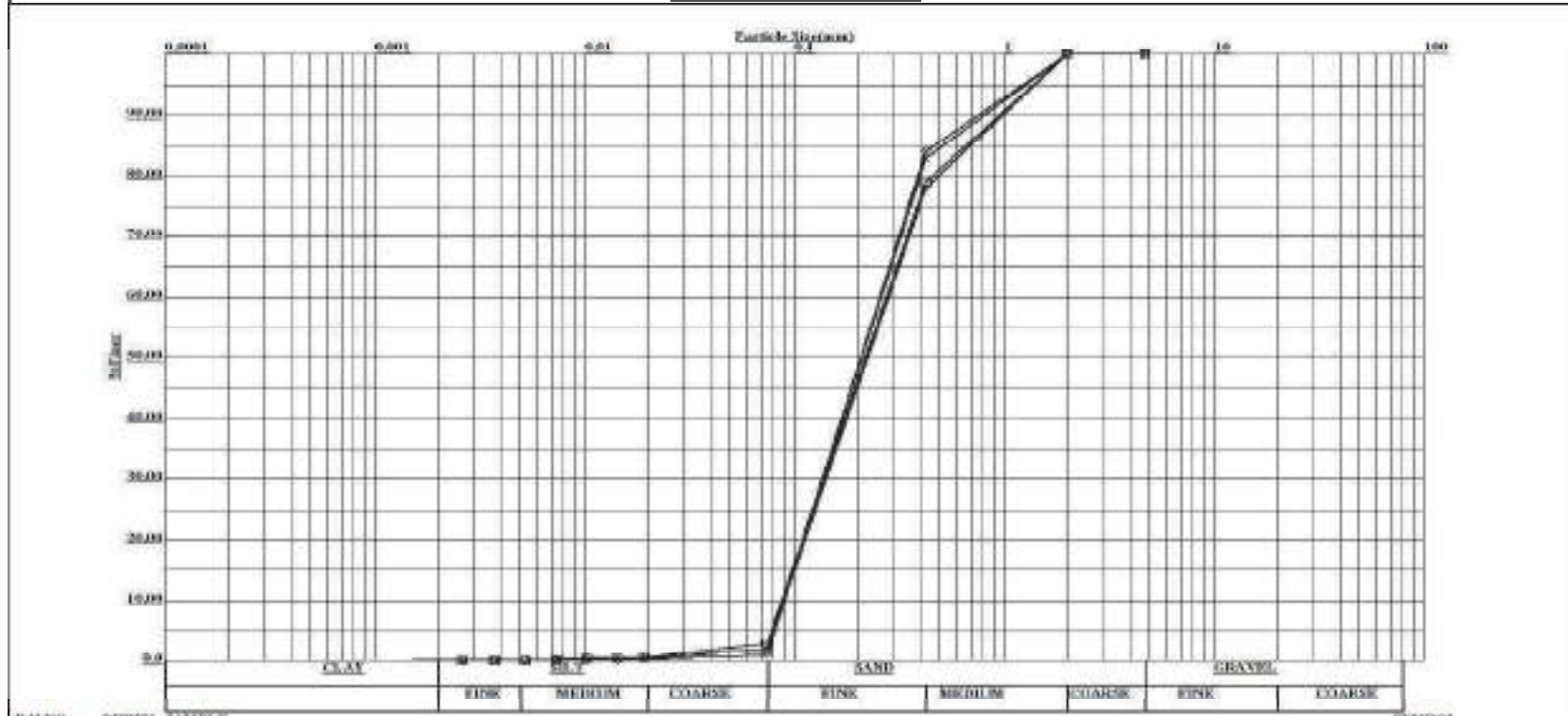


PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 11
SECTION:CHITAUNI-MADHUBANI

BOREHOLE NO.-BH- 01

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C_u	C_c
			(%)	(%)	(%)	(%)		
x	24.0	MEDIUM DENSE TO VERY DENSE DARK GREY POORLY GRADED SAND (SP)	0.00	98.00	2.00	0.00	2.92	0.81
○	27.0		0.00	99.00	1.00	0.00	2.84	0.81
□	30.0		0.00	97.00	3.00	0.00	3.13	0.80
◇	33.0		0.00	98.00	2.00	0.00	3.13	0.80



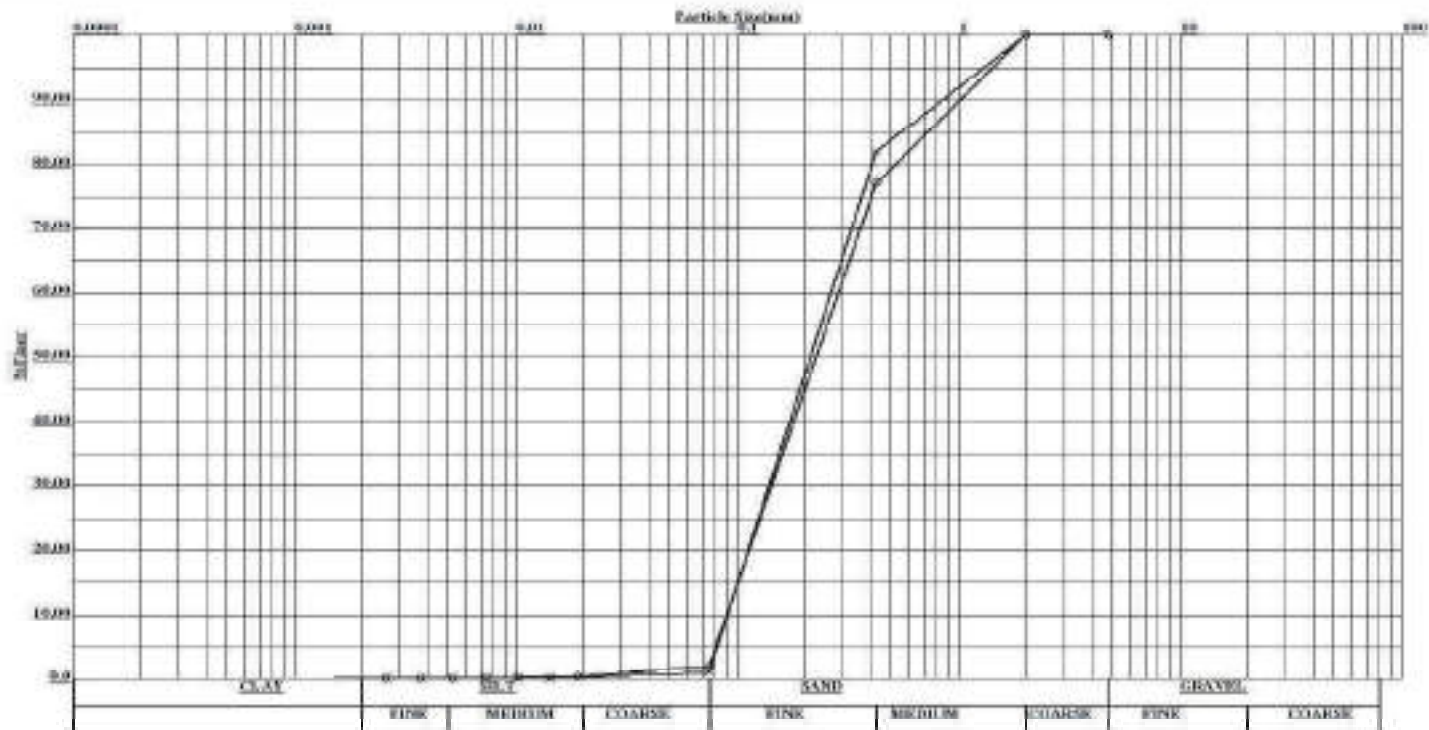
aarvee associates
architects engineers & consultants pvt. ltd.

PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 11
SECTION:CHITAUNI-MADHUBANI

BOREHOLE NO.-BH- 01

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C_u	C_c
			(%)	(%)	(%)	(%)		
x	36.0	MEDIUM DENSE TO VERY DENSE DARK GREY POORLY GRADED SAND (SP)	0.00	99.00	1.00	0.00	2.92	0.81
O	39.0		0.00	98.00	2.00	0.00	3.18	0.79



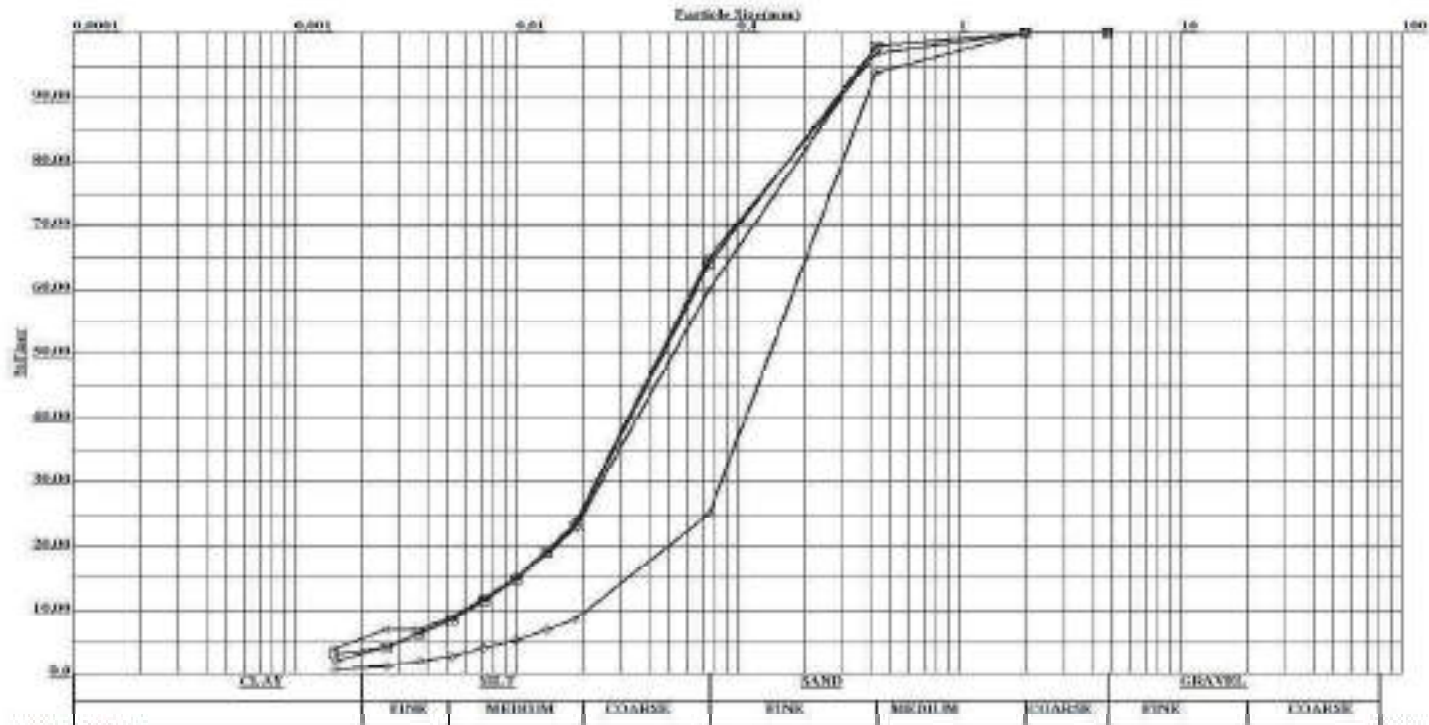
aarvee associates
architects engineers & consultants pvt. ltd.

PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 11
SECTION:CHITAUNI-MADHUBANI

BOREHOLE NO.-BH - 02

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C_u	C_c
			(%)	(%)	(%)	(%)		
x	0.0	VERY LOOSE LITE BROWN SANDY SILT (ML)	0.00	40.00	55.00	5.00	12.87	1.35
○	1.5		0.00	35.00	62.00	3.00	10.56	1.41
□	3.0		0.00	36.00	60.00	4.00	10.73	1.38
◇	6.0	LOOSE MEDIUM DENSE LITE GREY SILTY SAND (SM)	0.00	75.00	24.00	1.00	8.62	1.91



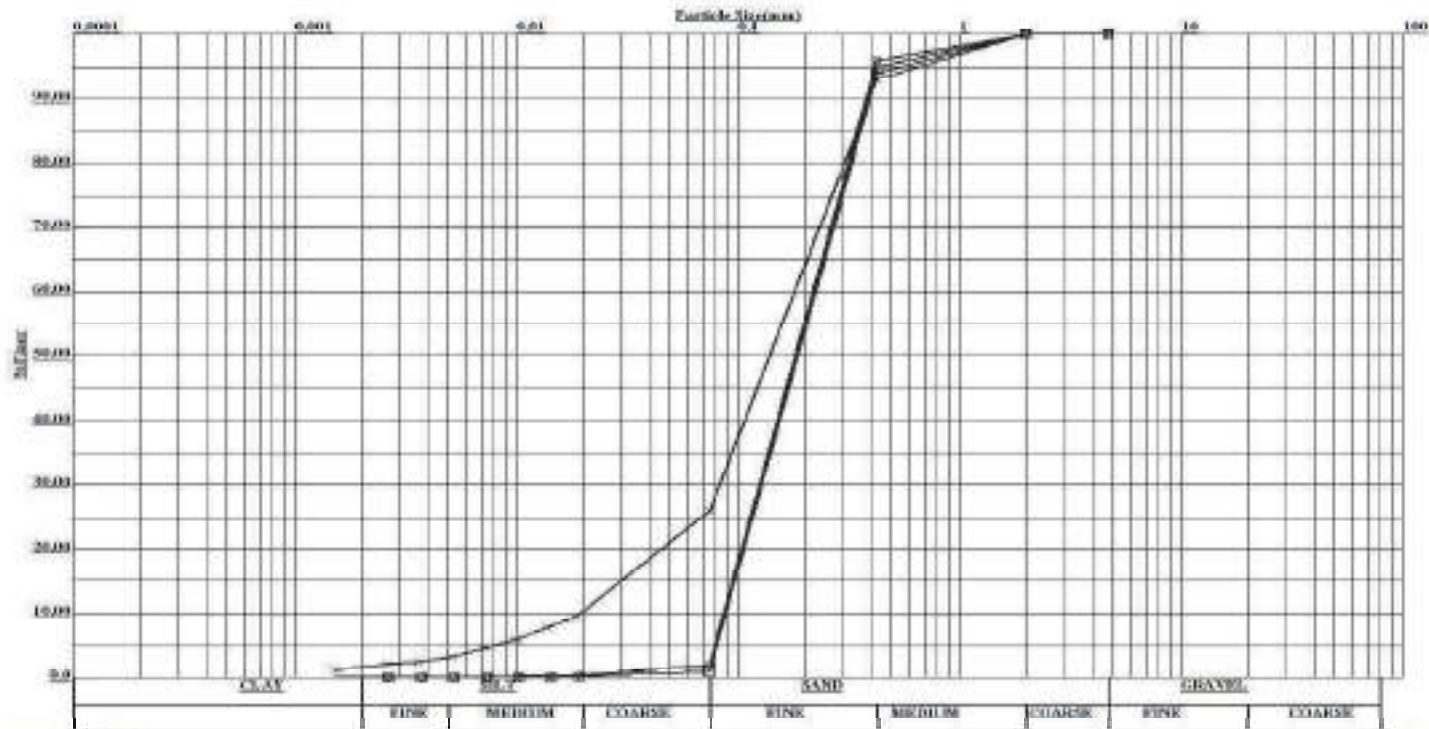
aarvee associates
architects engineers & consultants pvt. ltd.

PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 11
SECTION:CHITAUNI-MADHUBANI

BOREHOLE NO.-BH - 02

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C_u	C_c
			(%)	(%)	(%)	(%)		
x	9.0	LOOSE MEDIUM DENSE LITE GREY SILTY SAND (SM)	0.00	74.00	24.00	2.00	9.26	1.96
○	12.0	MEDIUM DENSE TO VERY DENSE DARK GREY POORLY GRADED SAND (SP)	0.00	98.00	2.00	0.00	2.52	0.83
□	15.0		0.00	99.00	1.00	0.00	2.54	0.83
◇	18.0		0.00	98.00	2.00	0.00	2.54	0.83

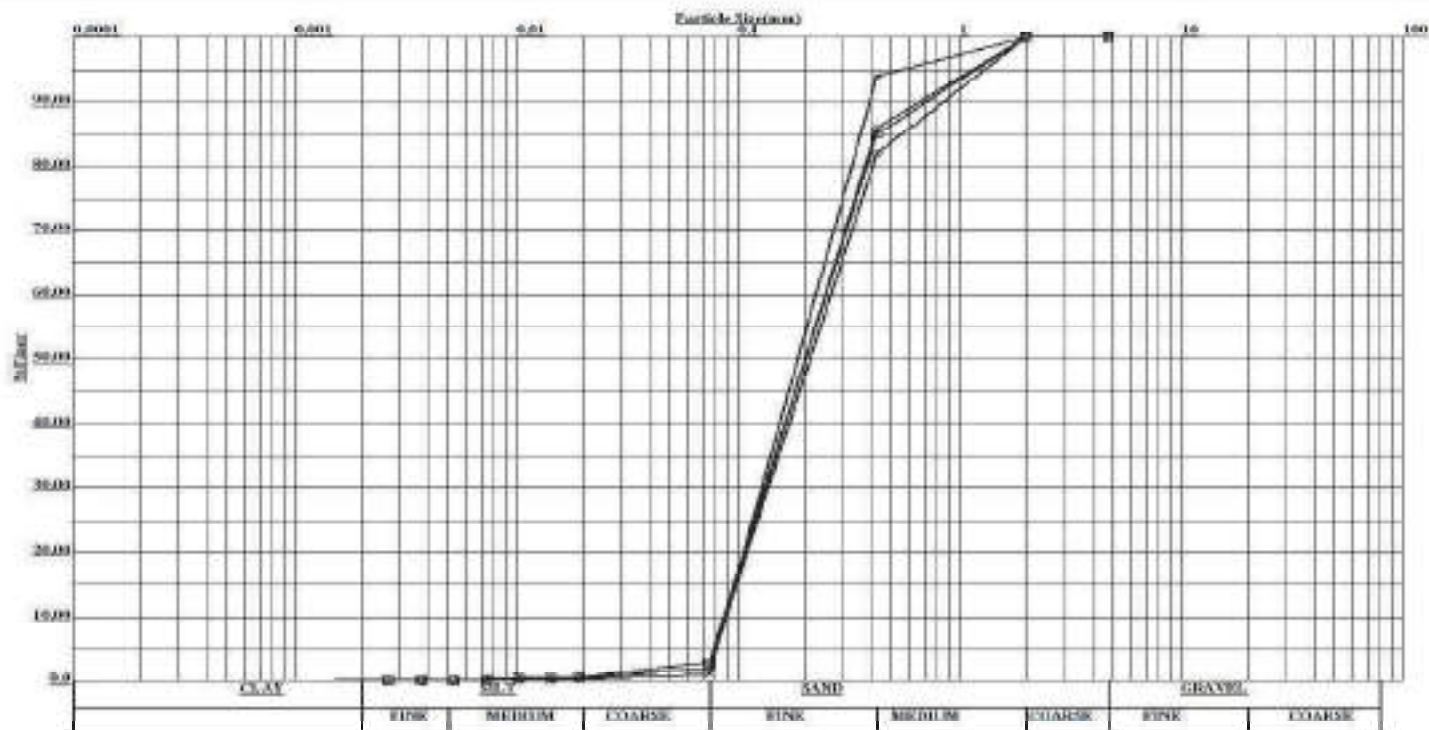


PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 11
SECTION:CHITAUNI-MADHUBANI

BOREHOLE NO.-BH - 02

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C_u	C_c
			(%)	(%)	(%)	(%)		
x	21.0	MEDIUM DENSE TO VERY DENSE DARK GREY POORLY GRADED SAND (SP)	0.00	99.00	1.00	0.00	2.54	0.83
○	24.0		0.00	98.00	2.00	0.00	2.96	0.81
□	27.0		0.00	97.00	3.00	0.00	2.88	0.81
◇	30.0		0.00	98.00	2.00	0.00	2.81	0.81



NORTH EASTERN RAILWAY

FINAL LOCATION SURVEY FOR NEW B.G RAILWAY LINE PROJECTS (770.00 KM.) AND FINAL LOCATION SURVEY FOR CONSTRUCTION OF DOUBLING/THIRD LINE/ 3RD & 4TH LINE (252.00 KM.) OF NORTH EASTERN RAILWAY (TOTAL 1022.00 KM)

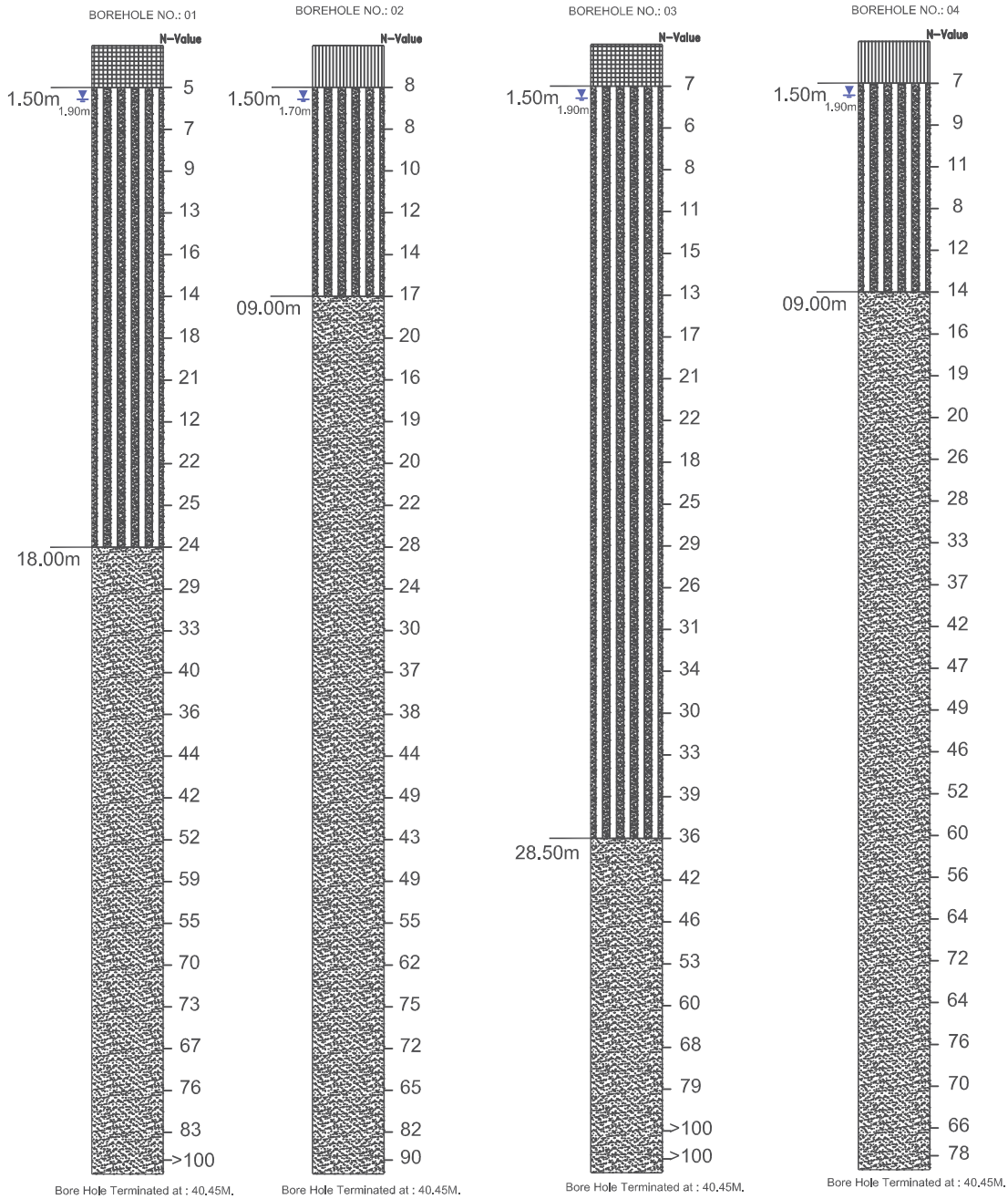
SECTION: CHITAUNI-MADHUBANI

Chainage	Br. No	Type of Crossing	Type of Bridge	Borehole No.	Easting (m)	Northing (m)	Reduced Level (m)
10421.613	14	WATERWAY	MAJOR-BRIDGE	BH-01	200949	3000003	108.94
				BH-02	200954	2999992	109.04
				BH-03	200960	2999982	108.82
				BH-04	200965	2999971	110.04

SUBMITTED BY:



BOREHOLE PROFILE
SECTION: CHITAUNI TO MADHUBANI
BRIDGE NO.: 14




Borehole Location Plan




Br: 14, SECTION :CHITAUNI-MADHUBANI




Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO.:14				DATE STARTED : 29/12/2024		<div> aarvee associates architects engineers & consultants pvt. ltd.</div>																												
BOREHOLE NO. BH- 1				DATE COMPLETED : 30/12/2024																														
GWT: 1.90 m				CONSOLIDATED LOGS INCLUDING LABORATORY TEST RESULTS OF SOIL																														
FIELD TEST RESULTS										LABORATORY TEST RESULTS																								
ELEVATION IN METERS	DEPTH IN METERS BELOW REFERENCE	NATURE OF SAMPLING	SAMPLE REFERENCE NO.	LEVEL OF WATER TABLE / L.W.L	SPT TEST RESULTS						SYMBOLIC REPRESENTATION	DESCRIPTION OF SOIL WITH I.S. CLASSIFICATION	TYPE OF TEST CONDUCTED IN THE LABORATORY	GRAIN SIZE ANALYSIS				LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	BULK DENSITY (gm /cc)	DRY DENSITY (gm/cc)	MOISTURE CONTENT (%)	FREESWELL INDEX (%)	SPECIFIC GRAVITY	SUBMERGED DENSITY (gm /cc)	SHEAR STRENGTH CHARACTERISTICS		CONSOLIDATION CHARACTERISTICS	Chemical Analysis Result				
					DEPTH IN METERS	NO. OF BLOWS	PENETRATION (CM)	N VALUE (Recorded)	N VALUE (Corrected)	GRAVEL (%)				SAND (%)	SILT (%)	CLAY (%)	Cohesion C. (Kg/cm ²)										Angle of friction (Degrees)	Compression Index(I _{cc})		pH	Chloride, %	Sulphate, %	pH	Chloride, mg/l
-1.00	1.0	DS	1	1.1	0.00	1.00	DS	-	-	-	LITE BROWN LOW PLASTICITY CLAY (CL)	--	0.00	5.00	77.00	18.00	34	23	11		-	-	-	2.83	-	-	-	-	7.56	0.03	NIL	-	-	-
	2.0	SPT	1		1.50	1.95	5	30	5	7		--	0.00	68.00	30.00	2.00	NON-PLASTIC				-	-	-	2.80	-	-	-	-	7.63	0.02	NIL	-	-	-
	3.0	DS	2	1.1	2.50	2.80	UDS SLIPPED				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7.68	0.02	NIL	--	--	--	
	4.0	SPT	2		3.00	3.45	7	30	7	10	--	0.00	65.00	34.00	1.00	NON-PLASTIC				-	-	-	2.58	-	-	-	-	--	--	--	--	--	--	
-5.00	5.0	SPT	3	1.1	4.50	4.95	9	30	9	12	LOOSE TO MEDIUM DENSE LITE GREY SILTY SAND (SM)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
	6.0	DS	3		5.50	5.80	UDS SLIPPED					--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	7.0	SPT	4	1.1	6.00	6.45	13	30	13	15	--	0.00	66.00	32.00	2.00	NON-PLASTIC				-	-	-	2.58	-	-	-	-	--	--	--	--	--	--	
	8.0	SPT	5		7.50	7.95	16	30	16	17	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	9.0	DS	4	1.1	8.50	8.80	UDS SLIPPED				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
-10.00	10.0	SPT	6		9.00	9.45	14	30	14	15	--	0.00	67.00	32.00	1.00	NON-PLASTIC				-	-	-	2.58	-	-	-	-	--	--	--	--	--	--	
	11.0	SPT	7	1.1	10.50	10.95	18	30	18	17	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	12.0	DS	5		11.50	11.80	UDS SLIPPED				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	13.0	SPT	8	1.1	12.00	12.45	21	30	21	18	--	0.00	65.00	33.00	2.00	NON-PLASTIC				-	-	-	2.57	-	-	-	-	--	--	--	--	--	--	
	14.0	SPT	9		13.50	13.95	12	30	12	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
-15.00	15.0	DS	6	1.1	14.50	14.80	UDS SLIPPED				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	16.0	SPT	10		15.00	15.45	22	30	22	17	--	0.00	66.00	33.00	1.00	NON-PLASTIC				-	-	-	2.57	-	-	-	-	--	--	--	--	--	--	
	17.0	SPT	11	1.1	16.50	16.95	25	30	25	18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	18.0	DS	7		17.50	17.80	UDS SLIPPED				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	19.0	SPT	12	1.90m	18.00	18.45	24	30	24	17	MEDIUM DENSE TO VERY DENSE DARK GREY POORLY GRADED SAND (SP)	--	0.00	98.00	2.00	0.00	NON-PLASTIC				-	-	-	2.56	-	-	-	-	--	--	--	--	--	--
-20.00	20.0	SPT	13		19.50	19.95	29	30	29	19		--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	21.0	DS	8	1.1	20.50	20.80	UDS SLIPPED				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	22.0	SPT	14		21.00	21.45	33	30	33	20	--	0.00	97.00	3.00	0.00	NON-PLASTIC				-	-	-	2.56	-	-	-	-	--	--	--	--	--	--	
	23.0	SPT	15	1.1	22.50	22.95	40	30	40	22	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	24.0	DS	9		23.50	23.80	UDS SLIPPED				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
-25.00	25.0	SPT	16	1.1	24.00	24.45	36	30	36	20	--	0.00	98.00	2.00	0.00	NON-PLASTIC				-	-	-	-	-	-	-	-	--	--	--	--	--	--	
	26.0	SPT	17		25.50	25.95	44	30	44	23	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	27.0	DS	10	1.1	26.50	26.80	UDS SLIPPED				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	28.0	SPT	18		27.00	27.45	42	30	42	22	--	0.00	96.00	4.00	0.00	NON-PLASTIC				-	-	-	2.55	-	-	-	-	--	--	--	--	--	--	
	29.0	SPT	19	1.1	28.50	28.95	52	30	52	24	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
-30.00	30.0	DS	11		29.50	29.80	UDS SLIPPED				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	31.0	SPT	20	1.1	30.00	30.45	59	30	59	26	--	0.00	97.00	3.00	0.00	NON-PLASTIC				-	-	-	2.55	-	-	-	-	--	--	--	--	--	--	
	32.0	SPT	21		31.50	31.95	55	30	55	24	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	33.0	DS	12	1.1	32.50	32.80	UDS SLIPPED				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	34.0	SPT	22		33.00	33.45	70	30	70	28	--	0.00	96.00	4.00	0.00	NON-PLASTIC				-	-	-	2.55	-	-	-	-	--	--	--	--	--	--	
-35.00	35.0	SPT	23	1.1	34.50	34.95	73	30	73	29	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	36.0	DS	13		35.50	35.80	UDS SLIPPED				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	37.0	SPT	24	1.1	36.00	36.45	67	30	67	26	--	0.00	97.00	3.00	0.00	NON-PLASTIC				-	-	-	2.54	-	-	-	-	--	--	--	--	--	--	
	38.0	SPT	25		37.50	37.95	76	30	76	28	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	39.0	DS	14	1.1	38.50	38.80	UDS SLIPPED				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
	40.0	SPT	26		39.00	39.45	83	30	83	30	--	0.00	99.00	1.00	0.00	NON-PLASTIC				-	-	-	-	-	-	-	-	--	--	--	--	--	--	
-40.00	41.0	SPT	27	1.1	40.00	40.45	50	1	>100	>100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
CLASSIFICATION OF SOIL AS PER IS : 1498												Project:Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)																						
ABBREVIATION USED :												SECTION: CHITAU NI-MADHUBANI																						
DS = DISTURBED SAMPLE , SPT = STANDARD PENETRATION TEST. UDS = UNDISTURBED SAMPLE, DST = DIRECT SHEAR TEST,																																		
UC : UNCONFINED COMPRESSION TEST UU : UNCONSOLIDATED UNDRAINED TRIAXIAL TEST																																		
* UCS BASED ON POINT LOAD TEST																																		

[illegible]

BRIDGE NO:14					DATE STARTED : 30/12/2024					<div>aarvee associates architects engineers & consultants pvt. ltd.</div>																							
BOREHOLE NO. BH- 3					GWT: 1.90 m																				DATE COMPLETED : 01-01-2025								
FIELD TEST RESULTS										CONSOLIDATED LOGS INCLUDING LABORATORY TEST RESULTS OF SOIL																							
										LABORATORY TEST RESULTS																							
ELEVATION IN METERS	DEPTH IN METERS BELOW REFERENCE	NATURE OF SAMPLING	SAMPLE REFERENCE NO.	LEVEL OF WATER TABLE / LWL	SPT TEST RESULTS					SYMBOLIC REPRESENTATION	DESCRIPTION OF SOIL WITH I.S. CLASSIFICATION	TYPE OF TEST CONDUCTED IN THE LABORATORY	GRAIN SIZE ANALYSIS											SHEAR STRENGTH CHARACTERISTICS		CONSOLIDATION CHARACTERISTICS	Chemical Analysis Result						
					DEPTH IN METERS	NO. OF BLOWS	PENETRATION (CM)	N VALUE (Recorded)	N VALUE (Corrected)				GRAVEL (%)	SAND (%)	SILT (%)	CLAY (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	BULK DENSITY (gm/cc)	DRY DENSITY (gm/cc)	MOISTURE CONTENT (%)	FREESWELL INDEX (%)	SPECIFIC GRAVITY	SUBMERGED DENSITY (gm/cc)	Cohesion Cc (kg/cm²)	Angle of friction (Degrees)	Compression Index(Cc)	pH	Chloride, %	Sulphate, %	pH	Chloride, mg/l
-1.00	1.0	DS	1		0.00	1.00	DS	-	-	-	LOOSE LITE BROWN LOW PLASTICITY CLAY (CL)	-	0.00	5.00	77.00	18.00	33.00	22.00	11		-	-	-		-	-	-	7.44	0.03	NIL	-	-	-
	2.0	SPT	1		1.50	1.95	7	30	7	10		-	0.00	75.00	23.00	2.00	NON-PLASTIC					-	-	-	2.54	-	-	-	7.46	0.04	NIL	-	-
	3.0	DS	2		2.50	2.80	UDS SLIPPED					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.51	0.03	NIL	-	-	-
	4.0	SPT	2		3.00	3.45	6	30	6	9		-	0.00	72.00	27.00	1.00	NON-PLASTIC					-	-	-	2.55	-	-	-	-	-	-	-	-
-5.00	5.0	SPT	3		4.50	4.95	8	30	8	11		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	6.0	DS	3		5.50	5.80	UDS SLIPPED					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	7.0	SPT	4		6.00	6.45	11	30	11	13		-	0.00	73.00	25.00	2.00	NON-PLASTIC					-	-	-	2.54	-	-	-	-	-	-	-	-
	8.0	SPT	5		7.50	7.95	15	30	15	16		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	9.0	DS	4		8.50	8.80	UDS SLIPPED					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-10.00	10.0	SPT	6		9.00	9.45	13	30	13	14		-	0.00	74.00	25.00	1.00	NON-PLASTIC					-	-	-	2.59	-	-	-	-	-	-	-	-
	11.0	SPT	7		10.50	10.95	17	30	17	16		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	12.0	DS	5		11.50	11.80	UDS SLIPPED					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	13.0	SPT	8		12.00	12.45	21	30	21	18		-	0.00	69.00	29.00	2.00	NON-PLASTIC					-	-	-	-	-	-	-	-	-	-	-	-
	14.0	SPT	9		13.50	13.95	22	30	22	18		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-15.00	15.0	DS	6		14.50	14.80	UDS SLIPPED					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	16.0	SPT	10		15.00	15.45	18	30	18	15		-	0.00	66.00	33.00	1.00	NON-PLASTIC					-	-	-	2.60	-	-	-	-	-	-	-	-
	17.0	SPT	11		16.50	16.95	25	30	25	18		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	18.0	DS	7		17.50	17.80	UDS SLIPPED					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	19.0	SPT	12		18.00	18.45	29	30	29	19		-	0.00	65.00	33.00	2.00	NON-PLASTIC					-	-	-	2.57	-	-	-	-	-	-	-	-
-20.00	20.0	SPT	13		19.50	19.95	26	30	26	18		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	21.0	DS	8		20.50	20.80	UDS SLIPPED					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	22.0	SPT	14		21.00	21.45	31	30	31	19		-	0.00	67.00	32.00	1.00	NON-PLASTIC					-	-	-	2.58	-	-	-	-	-	-	-	-
	23.0	SPT	15		22.50	22.95	34	30	34	20		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	24.0	DS	9		23.50	23.80	UDS SLIPPED					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-25.00	25.0	SPT	16		24.00	24.45	30	30	30	18		-	0.00	66.00	32.00	2.00	NON-PLASTIC					-	-	-	-	-	-	-	-	-	-	-	-
	26.0	SPT	17		25.50	25.95	33	30	33	19		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	27.0	DS	10		26.50	26.80	UDS SLIPPED					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	28.0	SPT	18		27.00	27.45	39	30	39	21		-	0.00	65.00	33.00	2.00	NON-PLASTIC					-	-	-	-	-	-	-	-	-	-	-	-
	29.0	SPT	19		28.50	28.95	36	30	36	19		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-30.00	30.0	DS	11		29.50	29.80	UDS SLIPPED					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	31.0	SPT	20		30.00	30.45	42	30	42	21		-	0.00	97.00	3.00	0.00	NON-PLASTIC					-	-	-	-	-	-	-	-	-	-	-	-
	32.0	SPT	21		31.50	31.95	46	30	46	22		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	33.0	DS	12		32.50	32.80	UDS SLIPPED					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	34.0	SPT	22		33.00	33.45	53	30	53	23		-	0.00	96.00	4.00	0.00	NON-PLASTIC					-	-	-	2.55	-	-	-	-	-	-	-	-
-35.00	35.0	SPT	23		34.50	34.95	60	30	60	25		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	36.0	DS	13		35.50	35.80	UDS SLIPPED					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	37.0	SPT	24		36.00	36.45	68	30	68	27		-	0.00	97.00	3.00	0.00	NON-PLASTIC					-	-	-	2.55	-	-	-	-	-	-	-	-
	38.0	SPT	25		37.50	37.95	79	30	79	29		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	39.0	DS	14		38.50	38.80	UDS SLIPPED					-	0.00	96.00	4.00	0.00	NON-PLASTIC					-	-	-	2.54	-	-	-	-	-	-	-	-
	40.0	SPT	26		39.00	39.45	50	1	>100	>100		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-40.00	41.0	SPT	27		40.00	40.45	50	1	>100	>100		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
CLASSIFICATION OF SOIL AS PER IS : 1498 ABBREVIATION USED : DS = DISTURBED SAMPLE, SPT = STANDARD PENETRATION TEST, UDS = UNDISTURBED SAMPLE, DST = DIRECT SHEAR TEST, UC : UNCONFINED COMPRESSION TEST UU : UNCONSOLIDATED UNDRAINED TRIAXIAL TEST * UCS BASED ON POINT LOAD TEST												Project:Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)																					
SECTION: CHITAUNI - MADHUBANI																																	

BRIDGE NO.:14					DATE STARTED : 01-01-2025																													
BOREHOLE NO. BH- 4					DATE COMPLETED : 01-03-2025																													
GWT: 1.90 m					CONSOLIDATED LOGS INCLUDING LABORATORY TEST RESULTS OF SOIL																													
FIELD TEST RESULTS										LABORATORY TEST RESULTS																								
ELEVATION IN METERS	DEPTH IN METERS BELOW REFERENCE	NATURE OF SAMPLING	SAMPLE REFERENCE NO.	LEVEL OF WATER TABLE / LWL	SPT TEST RESULTS					SYMBOLIC REPRESENTATION	DESCRIPTION OF SOIL WITH I.S. CLASSIFICATION	TYPE OF TEST CONDUCTED IN THE LABORATORY	GRAIN SIZE ANALYSIS				LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX (%)	BULK DENSITY (gm/cc)	DRY DENSITY (gm/cc)	MOISTURE CONTENT (%)	FREESWELL INDEX (%)	SPECIFIC GRAVITY	SUBMERGED DENSITY (gm/cc)	SHEAR STRENGTH CHARACTERISTICS		CONSOLIDATION CHARACTERISTICS	Chemical Analysis Result					
					DEPTH IN METERS	NO. OF BLOWS	PENETRATION (CM)	N VALUE (Recorded)	N VALUE (Corrected)				GRAVEL (%)	SAND (%)	SILT (%)	CLAY (%)										Cohesion, Cc (kg/cm²)	Angle of friction (Degrees)		Compression Index(Cc)	pH	Chloride, %	Sulphate, %	pH	Chloride, mg/l
-1.00	1.0	DS	1	1.1	0.00	1.00	DS	-	-	-	LITE BROWN SANDY SILT (ML)	--	0.00	48.00	48.00	4.00	NON-PLASTIC				-	-	-	-	-	-	-	-	7.41	0.03	NIL	-	-	-
	2.0	SPT	1		1.50	1.95	7	30	7	10		--	0.00	65.00	33.00	2.00	NON-PLASTIC				-	-	-	-	-	-	-	-	7.46	0.03	NIL	-	-	-
	3.0	DS	2	1.1	2.50	2.80	UDS SLIPPED				LOOSE TO MEDIUM DENSE LITE GREY SILTY SAND (SM)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
	4.0	SPT	2		3.00	3.45	9	30	9	13		--	0.00	68.00	31.00	1.00	NON-PLASTIC				-	-	-	-	-	-	-	-	7.55	0.02	NIL	-	-	-
-5.00	5.0	SPT	3	1.1	4.50	4.95	11	30	11	15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
	6.0	DS	3		5.50	5.80	UDS SLIPPED				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
	7.0	SPT	4	1.1	6.00	6.45	8	30	8	10	--	0.00	66.00	32.00	2.00	NON-PLASTIC				-	-	-	-	-	-	-	-	2.58	-	-	-	-		
	8.0	SPT	5		7.50	7.95	12	30	12	14	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
	9.0	DS	4	1.1	8.50	8.80	UDS SLIPPED				MEDIUM DENSE TO VERY DENSE DARK GREY POORLY GRADED SAND (SP)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--			
-10.00	10.0	SPT	6		9.00	9.45	14	30	14	15		--	0.00	99.00	1.00	0.00	NON-PLASTIC				-	-	-	-	-	-	-	-	2.56	-	-	-	-	
	11.0	SPT	7	1.1	10.50	10.95	16	30	16	16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
	12.0	DS	5		11.50	11.80	UDS SLIPPED				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
	13.0	SPT	8	1.1	12.00	12.45	19	30	19	17	--	0.00	98.00	2.00	0.00	NON-PLASTIC				-	-	-	-	-	-	-	-	--	--	--	--	--		
	14.0	SPT	9		13.50	13.95	20	30	20	17	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	
-15.00	15.0	DS	6	1.1	14.50	14.80	UDS SLIPPED				MEDIUM DENSE TO VERY DENSE DARK GREY POORLY GRADED SAND (SP)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--			
	16.0	SPT	10		15.00	15.45	26	30	26	19		--	0.00	97.00	3.00	0.00	NON-PLASTIC				-	-	-	-	-	-	-	-	2.56	-	-	-	-	
	17.0	SPT	11	1.1	16.50	16.95	28	30	28	19	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
	18.0	DS	7		17.50	17.80	UDS SLIPPED				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
	19.0	SPT	12	1.1	18.00	18.45	33	30	33	21	--	0.00	98.00	2.00	0.00	NON-PLASTIC				-	-	-	-	-	-	-	-	--	--	--	--	--		
-20.00	20.0	SPT	13		19.50	19.95	37	30	37	22	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
	21.0	DS	8	1.1	20.50	20.80	UDS SLIPPED				MEDIUM DENSE TO VERY DENSE DARK GREY POORLY GRADED SAND (SP)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--			
	22.0	SPT	14		21.00	21.45	42	30	42	23		--	0.00	97.00	3.00	0.00	NON-PLASTIC				-	-	-	-	-	-	-	-	2.55	-	-	-	-	
	23.0	SPT	15	1.1	22.50	22.95	47	30	47	25	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
	24.0	DS	9		23.50	23.80	UDS SLIPPED				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
-25.00	25.0	SPT	16	1.1	24.00	24.45	49	30	49	25	--	0.00	98.00	2.00	0.00	NON-PLASTIC				-	-	-	-	-	-	-	-	--	--	--	--	--		
	26.0	SPT	17		25.50	25.95	46	30	46	23	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
	27.0	DS	10	1.1	26.50	26.80	UDS SLIPPED				MEDIUM DENSE TO VERY DENSE DARK GREY POORLY GRADED SAND (SP)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--			
	28.0	SPT	18		27.00	27.45	52	30	52	25		--	0.00	99.00	1.00	0.00	NON-PLASTIC				-	-	-	-	-	-	-	-	2.55	-	-	-	-	
	29.0	SPT	19	1.1	28.50	28.95	60	30	60	27	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
-30.00	30.0	DS	11		29.50	29.80	UDS SLIPPED				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
	31.0	SPT	20	1.1	30.00	30.45	56	30	56	25	--	0.00	98.00	2.00	0.00	NON-PLASTIC				-	-	-	-	-	-	-	-	--	--	--	--	--		
	32.0	SPT	21		31.50	31.95	64	30	64	27	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
	33.0	DS	12	1.1	32.50	32.80	UDS SLIPPED				MEDIUM DENSE TO VERY DENSE DARK GREY POORLY GRADED SAND (SP)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--			
	34.0	SPT	22		33.00	33.45	72	30	72	29		--	0.00	97.00	3.00	0.00	NON-PLASTIC				-	-	-	-	-	-	-	-	2.54	-	-	-	-	
-35.00	35.0	SPT	23	1.1	34.50	34.95	64	30	64	26	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
	36.0	DS	13		35.50	35.80	UDS SLIPPED				--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
	37.0	SPT	24	1.1	36.00	36.45	76	30	76	29	--	0.00	98.00	2.00	0.00	NON-PLASTIC				-	-	-	-	-	-	-	-	2.54	-	-	-	-		
	38.0	SPT	25		37.50	37.95	70	30	70	27	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		
	39.0	DS	14	1.1	38.50	38.80	UDS SLIPPED				MEDIUM DENSE TO VERY DENSE DARK GREY POORLY GRADED SAND (SP)	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--			
	40.0	SPT	26		39.00	39.45	66	30	66	25		--	0.00	97.00	3.00	0.00	NON-PLASTIC				-	-	-	-	-	-	-	-	--	--	--	--	--	
-40.00	41.0	SPT	27	1.1	40.00	40.45	78	30	78	28	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--		

CLASSIFICATION OF SOIL AS PER IS : 1498

ABBREVIATION USED :

DS = DISTURBED SAMPLE, SPT = STANDARD PENETRATION TEST, UDS = UNDISTURBED SAMPLE, DST = DIRECT SHEAR TEST, UC : UNCONFINED COMPRESSION TEST, UU : UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

* UCS BASED ON POINT LOAD TEST

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

SECTION: CHITAUNI - MADHUBANI

CALCULATIONS FOR CORRECTED SPT (N) VALUES

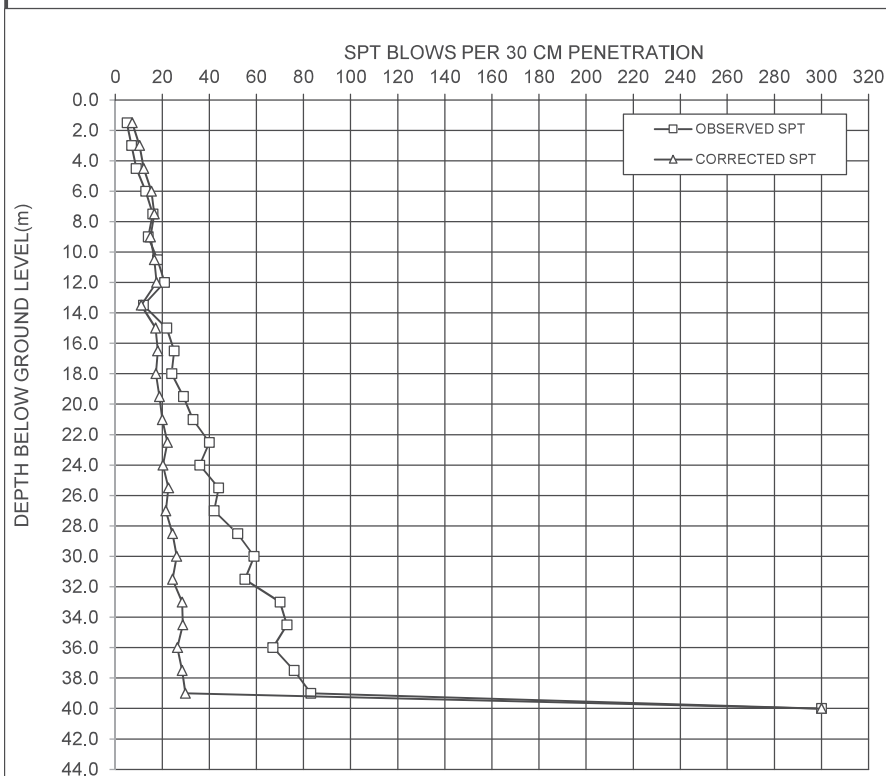
Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BOREHOLE NO. BH- 1

WATER TABLE -1.90 m

DEPTH OF SAMPLE	TYPE OF SOIL	OBSERVED SPT 'N' VALUE	CORRECTED SPT (N') VALUE (FOR OVERBURDEN)	FINAL CORRECTED VALUE AFTER DILATANCY CORRECTION (N'')
1.50	Non Plastic	5	7	7
3.00	Non Plastic	7	10	10
4.50	Non Plastic	9	12	12
6.00	Non Plastic	13	16	15
7.50	Non Plastic	16	18	17
9.00	Non Plastic	14	15	15
10.50	Non Plastic	18	18	17
12.00	Non Plastic	21	20	18
13.50	Non Plastic	12	11	11
15.00	Non Plastic	22	19	17
16.50	Non Plastic	25	21	18
18.00	Non Plastic	24	19	17
19.50	Non Plastic	29	23	19
21.00	Non Plastic	33	25	20
22.50	Non Plastic	40	29	22
24.00	Non Plastic	36	26	20
25.50	Non Plastic	44	30	23
27.00	Non Plastic	42	28	22
28.50	Non Plastic	52	34	24
30.00	Non Plastic	59	37	26
31.50	Non Plastic	55	34	24
33.00	Non Plastic	70	42	28
34.50	Non Plastic	73	42	29
36.00	Non Plastic	67	38	26
37.50	Non Plastic	76	42	28
39.00	Non Plastic	83	45	30
40.00	Non Plastic	300	300	300

* SPT value restricted to 300.



CALCULATIONS FOR CORRECTED SPT (N) VALUES

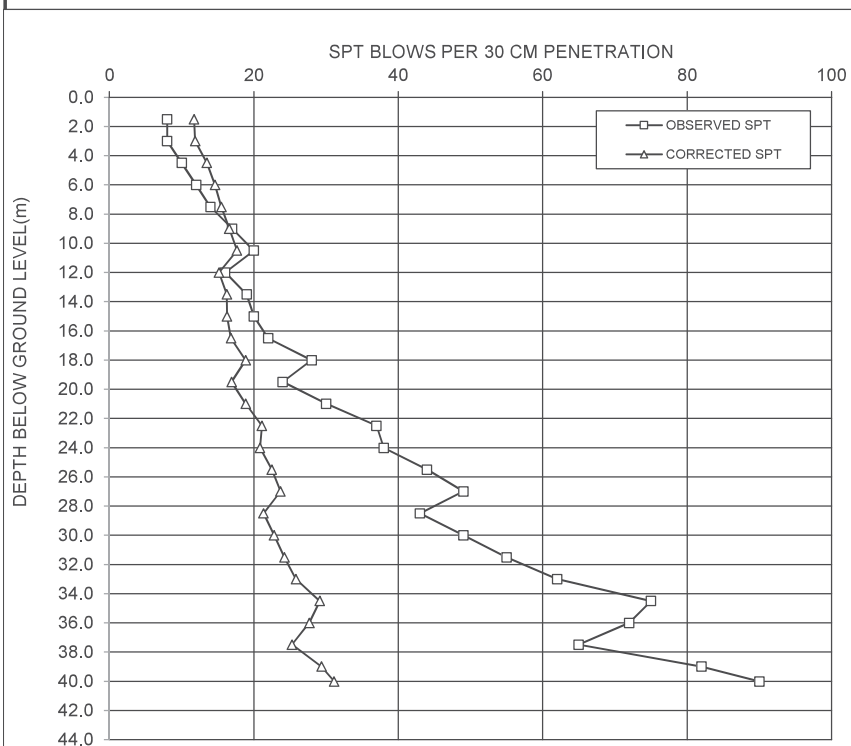
Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BOREHOLE NO. BH- 2

WATER TABLE-1.70 m

DEPTH OF SAMPLE	TYPE OF SOIL	OBSERVED SPT 'N' VALUE	CORRECTED SPT (N') VALUE (FOR OVERBURDEN)	FINAL CORRECTED VALUE AFTER DILATANCY CORRECTION (N'')
1.50	Non Plastic	8	12	12
3.00	Non Plastic	8	12	12
4.50	Non Plastic	10	13	13
6.00	Non Plastic	12	15	15
7.50	Non Plastic	14	16	16
9.00	Non Plastic	17	18	17
10.50	Non Plastic	20	20	18
12.00	Non Plastic	16	15	15
13.50	Non Plastic	19	18	16
15.00	Non Plastic	20	18	16
16.50	Non Plastic	22	19	17
18.00	Non Plastic	28	23	19
19.50	Non Plastic	24	19	17
21.00	Non Plastic	30	23	19
22.50	Non Plastic	37	27	21
24.00	Non Plastic	38	27	21
25.50	Non Plastic	44	30	22
27.00	Non Plastic	49	32	24
28.50	Non Plastic	43	28	21
30.00	Non Plastic	49	31	23
31.50	Non Plastic	55	33	24
33.00	Non Plastic	62	37	26
34.50	Non Plastic	75	43	29
36.00	Non Plastic	72	40	28
37.50	Non Plastic	65	36	25
39.00	Non Plastic	82	44	29
40.00	Non Plastic	90	47	31

* SPT value restricted to 300.



CALCULATIONS FOR CORRECTED SPT (N) VALUES

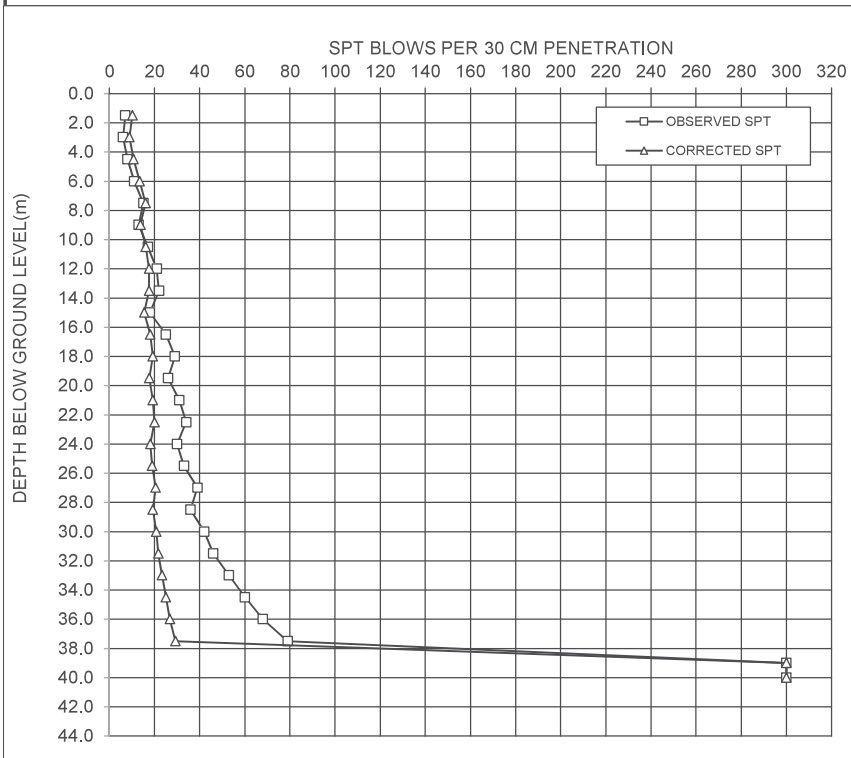
Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BOREHOLE NO. BH- 3

WATER TABLE-1.90 m

DEPTH OF SAMPLE	TYPE OF SOIL	OBSERVED SPT 'N' VALUE	CORRECTED SPT (N') VALUE (FOR OVERBURDEN)	FINAL CORRECTED VALUE AFTER DILATANCY CORRECTION (N'')
1.50	Non Plastic	7	10	10
3.00	Non Plastic	6	9	9
4.50	Non Plastic	8	11	11
6.00	Non Plastic	11	13	13
7.50	Non Plastic	15	17	16
9.00	Non Plastic	13	14	14
10.50	Non Plastic	17	17	16
12.00	Non Plastic	21	20	18
13.50	Non Plastic	22	20	18
15.00	Non Plastic	18	16	15
16.50	Non Plastic	25	21	18
18.00	Non Plastic	29	24	19
19.50	Non Plastic	26	20	18
21.00	Non Plastic	31	23	19
22.50	Non Plastic	34	25	20
24.00	Non Plastic	30	21	18
25.50	Non Plastic	33	23	19
27.00	Non Plastic	39	26	21
28.50	Non Plastic	36	23	19
30.00	Non Plastic	42	27	21
31.50	Non Plastic	46	28	22
33.00	Non Plastic	53	32	23
34.50	Non Plastic	60	35	25
36.00	Non Plastic	68	38	27
37.50	Non Plastic	79	44	29
39.00	Non Plastic	300	300	300
40.00	Non Plastic	300	300	300

* SPT value restricted to 300.



CALCULATIONS FOR CORRECTED SPT (N) VALUES

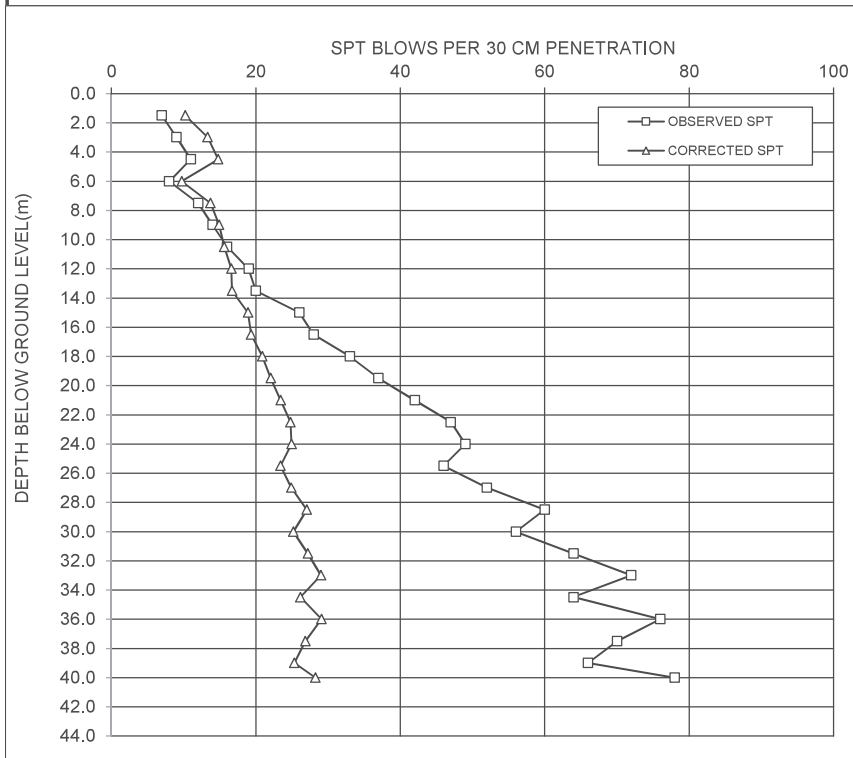
Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BOREHOLE NO. BH- 4

WATER TABLE-1.90 m

DEPTH OF SAMPLE	TYPE OF SOIL	OBSERVED SPT 'N' VALUE	CORRECTED SPT (N') VALUE (FOR OVERBURDEN)	FINAL CORRECTED VALUE AFTER DILATANCY CORRECTION (N'')
1.50	Non Plastic	7	10	10
3.00	Non Plastic	9	13	13
4.50	Non Plastic	11	15	15
6.00	Non Plastic	8	10	10
7.50	Non Plastic	12	14	14
9.00	Non Plastic	14	15	15
10.50	Non Plastic	16	16	16
12.00	Non Plastic	19	18	17
13.50	Non Plastic	20	18	17
15.00	Non Plastic	26	23	19
16.50	Non Plastic	28	24	19
18.00	Non Plastic	33	27	21
19.50	Non Plastic	37	29	22
21.00	Non Plastic	42	32	23
22.50	Non Plastic	47	35	25
24.00	Non Plastic	49	35	25
25.50	Non Plastic	46	32	23
27.00	Non Plastic	52	35	25
28.50	Non Plastic	60	39	27
30.00	Non Plastic	56	35	25
31.50	Non Plastic	64	39	27
33.00	Non Plastic	72	43	29
34.50	Non Plastic	64	37	26
36.00	Non Plastic	76	43	29
37.50	Non Plastic	70	39	27
39.00	Non Plastic	66	36	25
40.00	Non Plastic	78	42	28

* SPT value restricted to 300.



Typical Computation of Liquefaction Potential as per IRC:SP: 114 / IS: 1893

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO: 14

BOREHOLE NO.

BH-01

SECTION: CHITAUUNI-MADHUBANI

Water table assumed for Calculation: 0.00 m

Depth below EGL, m	Type of Strata	Observed SPT Value	Saturated density (t/m^3)	Submerged Density (t/m^3)	Fine Content (%)	Earthquake Zone	Peak ground acceleration a_{max}/g	Earth quake magnitude (Mw)	Stress reduction coefficient (rd)	Total overburden pressure (σ_o), t/m^2	Effective overburden (σ_o), t/m^2	Cyclic Stress ratio (CSR)	C_N	CE or CHT	CH or CHW	CB or CBD	CR or CRL	CS or CSS	SPT corrected (N_1) ₆₀	α	β	(N_1) _{60cs}	$CRR_{M=7.5}$	Relative Density, Dr%	f	K_σ	K_α	MSF	CRR	FOS	Conclusion
1.50	SM	5	1.64	0.64	32	IV	0.24	6.50	0.99	2.46	0.96	0.40	1.70	1.33	1.000	1.05	0.75	1.00	8.90	4.83	1.17	15.25	0.16	18.17	0.91	1.00	1.00	1.44	0.23	0.59	Liquefiable
3.00	SM	7	1.92	0.92	35	IV	0.24	6.50	0.98	4.92	1.92	0.39	1.70	1.33	1.000	1.05	0.85	1.00	14.13	5.00	1.20	21.95	0.24	29.28	0.85	1.00	1.00	1.44	0.35	0.89	Liquefiable
4.50	SM	9	1.92	0.92	35	IV	0.24	6.50	0.97	7.80	3.30	0.36	1.70	1.33	1.000	1.05	0.95	1.00	20.30	5.00	1.20	29.36	0.43	43.17	0.78	1.00	1.00	1.44	0.62	1.73	Non Liquefiable
6.00	SM	13	2.01	1.01	34	IV	0.24	6.50	0.95	10.68	4.68	0.34	1.46	1.33	1.000	1.05	0.95	1.00	25.21	4.93	1.19	34.89	NA	54.22	0.73	1.00	1.00	1.44	NA	>1.0	Non Liquefiable
7.50	SM	16	2.01	1.01	34	IV	0.24	6.50	0.94	13.70	6.20	0.33	1.27	1.33	1.000	1.05	0.95	1.00	26.97	4.93	1.19	36.98	NA	58.18	0.71	1.00	1.00	1.44	NA	>1.0	Non Liquefiable
9.00	SM	14	2.02	1.02	33	IV	0.24	6.50	0.93	16.71	7.71	0.31	1.14	1.33	1.000	1.05	1	1.00	22.27	4.88	1.18	31.15	NA	47.60	0.76	1.00	1.00	1.44	NA	>1.0	Non Liquefiable
10.50	SM	18	2.02	1.02	33	IV	0.24	6.50	0.89	19.74	9.24	0.30	1.04	1.33	1.000	1.05	1	1.00	26.15	4.88	1.18	35.73	NA	56.34	0.72	1.00	1.00	1.44	NA	>1.0	Non Liquefiable
12.00	SM	21	2.03	1.03	35	IV	0.24	6.50	0.85	22.77	10.77	0.28	0.96	1.33	1.000	1.05	1	1.00	28.26	5.00	1.20	38.91	NA	61.08	0.69	0.98	1.00	1.44	NA	>1.0	Non Liquefiable
13.50	SM	12	2.03	1.03	35	IV	0.24	6.50	0.81	25.82	12.32	0.27	0.90	1.33	1.000	1.05	1	1.00	15.10	5.00	1.20	23.12	0.26	31.48	0.84	0.97	1.00	1.44	0.36	1.36	Non Liquefiable
15.00	SM	22	2.04	1.04	34	IV	0.24	6.50	0.77	28.86	13.86	0.25	0.85	1.33	1.000	1.05	1	1.00	26.10	4.93	1.19	35.94	NA	56.22	0.72	0.91	1.00	1.44	NA	>1.0	Non Liquefiable
16.50	SM	25	2.04	1.04	34	IV	0.24	6.50	0.73	31.92	15.42	0.24	0.81	1.33	1.000	1.05	1	1.00	28.12	4.93	1.19	38.34	NA	60.76	0.70	0.88	1.00	1.44	NA	>1.0	Non Liquefiable
18.00	SP	24	2.02	1.02	2	IV	0.24	6.50	0.69	34.98	16.98	0.22	0.77	1.33	1.000	1.05	1	1.00	25.72	0.00	1.00	25.72	0.31	55.37	0.72	0.86	1.00	1.44	0.38	1.71	Non Liquefiable
19.50	SP	29	2.02	1.02	2	IV	0.24	6.50	0.65	38.01	18.51	0.21	0.74	1.33	1.000	1.05	1	1.00	29.77	0.00	1.00	29.77	0.45	64.48	0.68	0.82	1.00	1.44	0.53	2.55	Non Liquefiable
21.00	SP	33	2.01	1.01	3	IV	0.24	6.50	0.61	41.04	20.04	0.20	0.71	1.33	1.000	1.05	1	1.00	32.55	0.00	1.00	32.55	NA	67.55	0.66	0.79	1.00	1.44	NA	>1.0	Non Liquefiable
22.50	SP	40	2.01	1.01	3	IV	0.24	6.50	0.57	44.06	21.56	0.18	0.68	1.33	1.000	1.05	1	1.00	38.05	0.00	1.00	38.05	NA	73.05	0.63	0.76	1.00	1.44	NA	>1.0	Non Liquefiable

Note: Values of all Parameters are as per IRC:SP: 114 / IS 1893: 2016

C_E or C_{HT} (Correction for hammer energy ratio) = $ER/60$, ER for Rope and pully System = 80 % , Hence $C_E = 80/60 = 1.33$

C_H or C_{HW} (Correction for hammer) = 1.00

Borehole Diameter = 150 mm , Hence C_B or C_{BD} (Correction for Borehole diameter), = 1.05

C_S or C_{SS} (Correction for Standard sampler) = 1.00

K_σ Correction for high overburden stress (for effective oberburden pressure>10 T/m2)

K_α Correction for static shear stress is required only for sloping ground

Typical Computation of Liquefaction Potential as per IRC:SP: 114 / IS: 1893

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO: 14

BOREHOLE NO.

BH-02

SECTION: CHITAUNI-MADHUBANI

Water table assumed for Calculation: 0.00 m

Depth below EGL, m	Type of Strata	Observed SPT Value	Saturated density (t/m^3)	Submerged Density (t/m^3)	Fine Content (%)	Earthquake Zone	Peak ground acceleration a_{max}/g	Earth quake magnitude (Mw)	Stress reduction coefficient (rd)	Total overburden pressure (σ_o), t/m^2	Effective overburden (σ_o), t/m^2	Cyclic Stress ratio (CSR)	C_N	CE or CHT	CH or CHW	CB or CBD	CR or CRL	CS or CSS	SPT corrected (N_1) ₆₀	α	β	(N_1) _{60cs}	$CRR_{M=7.5}$	Relative Density, Dr%	f	K_σ	K_α	MSF	CRR	FOS	Conclusion
1.50	SM	8	1.62	0.62	35	IV	0.24	6.50	0.99	2.43	0.93	0.40	1.70	1.33	1.000	1.05	0.75	1.00	14.24	5.00	1.20	22.09	0.24	29.55	0.85	1.00	1.00	1.44	0.35	0.87	Liquefiable
3.00	SM	8	1.91	0.91	33	IV	0.24	6.50	0.98	4.86	1.86	0.40	1.70	1.33	1.000	1.05	0.85	1.00	16.14	4.88	1.18	23.92	0.27	33.82	0.83	1.00	1.00	1.44	0.39	0.99	Liquefiable
4.50	SM	10	1.91	0.91	33	IV	0.24	6.50	0.97	7.73	3.23	0.36	1.70	1.33	1.000	1.05	0.95	1.00	22.55	4.88	1.18	31.49	NA	48.25	0.76	1.00	1.00	1.44	NA	>1.0	Non Liquefiable
6.00	SM	12	2.00	1.00	34	IV	0.24	6.50	0.95	10.59	4.59	0.34	1.48	1.33	1.000	1.05	0.95	1.00	23.50	4.93	1.19	32.85	NA	50.37	0.75	1.00	1.00	1.44	NA	>1.0	Non Liquefiable
7.50	SM	14	2.00	1.00	34	IV	0.24	6.50	0.94	13.59	6.09	0.33	1.28	1.33	1.000	1.05	0.95	1.00	23.80	4.93	1.19	33.21	NA	51.05	0.74	1.00	1.00	1.44	NA	>1.0	Non Liquefiable
9.00	SP	17	2.01	1.01	3	IV	0.24	6.50	0.93	16.59	7.59	0.32	1.15	1.33	1.000	1.05	1	1.00	27.25	0.00	1.00	27.25	0.35	58.81	0.71	1.00	1.00	1.44	0.50	1.57	Non Liquefiable
10.50	SP	20	2.01	1.01	3	IV	0.24	6.50	0.89	19.61	9.11	0.30	1.05	1.33	1.000	1.05	1	1.00	29.27	0.00	1.00	29.27	0.42	63.36	0.68	1.00	1.00	1.44	0.61	2.04	Non Liquefiable
12.00	SP	16	2.03	1.03	4	IV	0.24	6.50	0.85	22.62	10.62	0.28	0.97	1.33	1.000	1.05	1	1.00	21.68	0.00	1.00	21.68	0.24	46.28	0.77	0.99	1.00	1.44	0.34	1.19	Non Liquefiable
13.50	SP	19	2.03	1.03	4	IV	0.24	6.50	0.81	25.67	12.17	0.27	0.91	1.33	1.000	1.05	1	1.00	24.06	0.00	1.00	24.06	0.27	51.63	0.74	0.95	1.00	1.44	0.38	1.40	Non Liquefiable
15.00	SP	20	2.04	1.04	3	IV	0.24	6.50	0.77	28.71	13.71	0.25	0.85	1.33	1.000	1.05	1	1.00	23.85	0.00	1.00	23.85	0.27	51.17	0.74	0.92	1.00	1.44	0.36	1.43	Non Liquefiable
16.50	SP	22	2.04	1.04	3	IV	0.24	6.50	0.73	31.77	15.27	0.24	0.81	1.33	1.000	1.05	1	1.00	24.86	0.00	1.00	24.86	0.29	53.44	0.73	0.89	1.00	1.44	0.37	1.56	Non Liquefiable
18.00	SP	28	2.02	1.02	4	IV	0.24	6.50	0.69	34.83	16.83	0.22	0.77	1.33	1.000	1.05	1	1.00	30.14	0.00	1.00	30.14	NA	65.14	0.67	0.84	1.00	1.44	NA	>1.0	Non Liquefiable
19.50	SP	24	2.02	1.02	4	IV	0.24	6.50	0.65	37.86	18.36	0.21	0.74	1.33	1.000	1.05	1	1.00	24.74	0.00	1.00	24.74	0.29	53.15	0.73	0.85	1.00	1.44	0.35	1.67	Non Liquefiable
21.00	SP	30	2.01	1.01	1	IV	0.24	6.50	0.61	40.89	19.89	0.20	0.71	1.33	1.000	1.05	1	1.00	29.71	0.00	1.00	29.71	0.45	64.34	0.68	0.80	1.00	1.44	0.52	2.63	Non Liquefiable
22.50	SP	37	2.01	1.01	1	IV	0.24	6.50	0.57	43.91	21.41	0.18	0.68	1.33	1.000	1.05	1	1.00	35.32	0.00	1.00	35.32	NA	70.32	0.65	0.77	1.00	1.44	NA	>1.0	Non Liquefiable

Note: Values of all Parameters are as per IRC:SP: 114 / IS 1893: 2016

C_E or C_{HT} (Correction for hammer energy ratio) = $ER/60$, ER for Rope and pully System = 80 % , Hence $C_E = 80/60 = 1.33$

C_H or C_{HW} (Correction for hammer) = 1.00

Borehole Diameter = 150 mm , Hence C_B or C_{BD} (Correction for Borehole diameter), = 1.05

C_S or C_{SS} (Correction for Standard sampler) = 1.00

K_σ Correction for high overburden stress (for effective oberburden pressure > 10 T/m²)

K_α Correction for static shear stress is required only for sloping ground

Typical Computation of Liquefaction Potential as per IRC:SP: 114 / IS: 1893

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO: 14

BOREHOLE NO.

BH-03

SECTION: CHITAUNI-MADHUBANI

Water table assumed for Calculation: 0.00 m

Depth below EGL, m	Type of Strata	Observed SPT Value	Saturated density (t/m^3)	Submerged Density (t/m^3)	Fine Content (%)	Earthquake Zone	Peak ground acceleration a_{max}/g	Earth quake magnitude (Mw)	Stress reduction coefficient (rd)	Total overburden pressure (σ_o), t/m^2	Effective overburden (σ_o), t/m^2	Cyclic Stress ratio (CSR)	C_N	CE or CHT	CH or CHW	CB or CBD	CR or CRL	CS or CSS	SPT corrected (N_1) ₆₀	α	β	$(N_1)_{60cs}$	$CRR_{M=7.5}$	Relative Density, $D_r\%$	f	K_σ	K_α	MSF	CRR	FOS	Conclusion
1.50	SM	7	1.64	0.64	25	IV	0.24	6.50	0.99	2.46	0.96	0.40	1.70	1.33	1.000	1.05	0.75	1.00	12.46	4.29	1.12	18.19	0.19	25.54	0.87	1.00	1.00	1.44	0.28	0.71	Liquefiable
3.00	SM	6	1.95	0.95	28	IV	0.24	6.50	0.98	4.92	1.92	0.39	1.70	1.33	1.000	1.05	0.85	1.00	12.11	4.56	1.14	18.34	0.20	24.74	0.88	1.00	1.00	1.44	0.28	0.72	Liquefiable
4.50	SM	8	1.95	0.95	28	IV	0.24	6.50	0.97	7.85	3.35	0.35	1.70	1.33	1.000	1.05	0.95	1.00	18.04	4.56	1.14	25.10	0.29	38.10	0.81	1.00	1.00	1.44	0.42	1.20	Non Liquefiable
6.00	SM	11	2.01	1.01	27	IV	0.24	6.50	0.95	10.77	4.77	0.34	1.45	1.33	1.000	1.05	0.95	1.00	21.13	4.48	1.13	28.36	0.38	45.04	0.77	1.00	1.00	1.44	0.55	1.64	Non Liquefiable
7.50	SM	15	2.01	1.01	27	IV	0.24	6.50	0.94	13.79	6.29	0.32	1.26	1.33	1.000	1.05	0.95	1.00	25.10	4.48	1.13	32.85	NA	53.98	0.73	1.00	1.00	1.44	NA	>1.0	Non Liquefiable
9.00	SM	13	2.02	1.02	26	IV	0.24	6.50	0.93	16.80	7.80	0.31	1.13	1.33	1.000	1.05	1	1.00	20.56	4.39	1.12	27.46	0.35	43.75	0.78	1.00	1.00	1.44	0.51	1.62	Non Liquefiable
10.50	SM	17	2.02	1.02	26	IV	0.24	6.50	0.89	19.83	9.33	0.30	1.04	1.33	1.000	1.05	1	1.00	24.58	4.39	1.12	31.98	NA	52.80	0.74	1.00	1.00	1.44	NA	>1.0	Non Liquefiable
12.00	SM	21	2.01	1.01	31	IV	0.24	6.50	0.85	22.86	10.86	0.28	0.96	1.33	1.000	1.05	1	1.00	28.14	4.77	1.16	37.49	NA	60.82	0.70	0.98	1.00	1.44	NA	>1.0	Non Liquefiable
13.50	SM	22	2.01	1.01	31	IV	0.24	6.50	0.81	25.88	12.38	0.27	0.90	1.33	1.000	1.05	1	1.00	27.62	4.77	1.16	36.88	NA	59.64	0.70	0.94	1.00	1.44	NA	>1.0	Non Liquefiable
15.00	SM	18	2.03	1.03	34	IV	0.24	6.50	0.77	28.89	13.89	0.25	0.85	1.33	1.000	1.05	1	1.00	21.33	4.93	1.19	30.28	NA	45.49	0.77	0.93	1.00	1.44	NA	>1.0	Non Liquefiable
16.50	SM	25	2.03	1.03	34	IV	0.24	6.50	0.73	31.94	15.44	0.24	0.80	1.33	1.000	1.05	1	1.00	28.10	4.93	1.19	38.32	NA	60.73	0.70	0.88	1.00	1.44	NA	>1.0	Non Liquefiable
18.00	SM	29	2.02	1.02	35	IV	0.24	6.50	0.69	34.98	16.98	0.22	0.77	1.33	1.000	1.05	1	1.00	31.08	5.00	1.20	42.30	NA	66.08	0.67	0.84	1.00	1.44	NA	>1.0	Non Liquefiable
19.50	SM	26	2.02	1.02	35	IV	0.24	6.50	0.65	38.01	18.51	0.21	0.74	1.33	1.000	1.05	1	1.00	26.69	5.00	1.20	37.03	NA	57.55	0.71	0.84	1.00	1.44	NA	>1.0	Non Liquefiable
21.00	SM	31	2.01	1.01	33	IV	0.24	6.50	0.61	41.04	20.04	0.20	0.71	1.33	1.000	1.05	1	1.00	30.58	4.88	1.18	40.95	NA	65.58	0.67	0.80	1.00	1.44	NA	>1.0	Non Liquefiable
22.50	SM	34	2.01	1.01	33	IV	0.24	6.50	0.57	44.06	21.56	0.18	0.68	1.33	1.000	1.05	1	1.00	32.34	4.88	1.18	43.03	NA	67.34	0.66	0.77	1.00	1.44	NA	>1.0	Non Liquefiable

Note: Values of all Parameters are as per IRC:SP: 114 / IS 1893: 2016

C_E or C_{HT} (Correction for hammer energy ratio) = $ER/60$, ER for Rope and pully System = 80 % , Hence $C_E = 80/60 = 1.33$

C_H or C_{HW} (Correction for hammer) = 1.00

Borehole Diameter = 150 mm , Hence C_B or C_{BD} (Correction for Borehole diameter), = 1.05

C_S or C_{ss} (Correction for Standard sampler) = 1.00

K_σ Correction for high overburden stress (for effective oberburden pressure > 10 T/m²)

K_α Correction for static shear stress is required only for sloping ground

Typical Computation of Liquefaction Potential as per IRC:SP: 114 / IS: 1893

Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO: 14

BOREHOLE NO.

BH-04

SECTION: CHITAUNI-MADHUBANI

Water table assumed for Calculation: 0.00 m

Depth below EGL, m	Type of Strata	Observed SPT Value	Saturated density (t/m^3)	Submerged Density (t/m^3)	Fine Content (%)	Earthquake Zone	Peak ground acceleration a_{max}/g	Earth quake magnitude (Mw)	Stress reduction coefficient (rd)	Total overburden pressure (σ_o), t/m^2	Effective overburden (σ_o), t/m^2	Cyclic Stress ratio (CSR)	C_N	CE or CHT	CH or CHW	CB or CBD	CR or CRL	CS or CSS	SPT corrected (N_1) ₆₀	α	β	$(N_1)_{60cs}$	$CRR_{M=7.5}$	Relative Density, $D_r\%$	f	K_σ	K_α	MSF	CRR	FOS	Conclusion
1.50	SM	7	1.63	0.63	35	IV	0.24	6.50	0.99	2.45	0.95	0.40	1.70	1.33	1.000	1.05	0.75	1.00	12.46	5.00	1.20	19.96	0.21	25.54	0.87	1.00	1.00	1.44	0.31	0.78	Liquefiable
3.00	SM	9	1.92	0.92	32	IV	0.24	6.50	0.98	4.89	1.89	0.39	1.70	1.33	1.000	1.05	0.85	1.00	18.16	4.83	1.17	26.10	0.32	38.36	0.81	1.00	1.00	1.44	0.45	1.15	Non Liquefiable
4.50	SM	11	1.92	0.92	32	IV	0.24	6.50	0.97	7.77	3.27	0.36	1.70	1.33	1.000	1.05	0.95	1.00	24.81	4.83	1.17	33.88	NA	53.32	0.73	1.00	1.00	1.44	NA	>1.0	Non Liquefiable
6.00	SM	8	2.01	1.01	34	IV	0.24	6.50	0.95	10.65	4.65	0.34	1.47	1.33	1.000	1.05	0.95	1.00	15.56	4.93	1.19	23.43	0.26	32.52	0.84	1.00	1.00	1.44	0.38	1.12	Non Liquefiable
7.50	SM	12	2.01	1.01	34	IV	0.24	6.50	0.94	13.67	6.17	0.33	1.27	1.33	1.000	1.05	0.95	1.00	20.28	4.93	1.19	29.02	0.41	43.12	0.78	1.00	1.00	1.44	0.59	1.82	Non Liquefiable
9.00	SP	14	2.02	1.02	1	IV	0.24	6.50	0.93	16.68	7.68	0.32	1.14	1.33	1.000	1.05	1	1.00	22.31	0.00	1.00	22.31	0.25	47.70	0.76	1.00	1.00	1.44	0.36	1.13	Non Liquefiable
10.50	SP	16	2.02	1.02	1	IV	0.24	6.50	0.89	19.71	9.21	0.30	1.04	1.33	1.000	1.05	1	1.00	23.28	0.00	1.00	23.28	0.26	49.89	0.75	1.00	1.00	1.44	0.38	1.26	Non Liquefiable
12.00	SP	19	2.01	1.01	2	IV	0.24	6.50	0.85	22.74	10.74	0.28	0.96	1.33	1.000	1.05	1	1.00	25.60	0.00	1.00	25.60	0.30	55.11	0.72	0.98	1.00	1.44	0.43	1.53	Non Liquefiable
13.50	SP	20	2.01	1.01	2	IV	0.24	6.50	0.81	25.76	12.26	0.27	0.90	1.33	1.000	1.05	1	1.00	25.23	0.00	1.00	25.23	0.30	54.27	0.73	0.95	1.00	1.44	0.40	1.52	Non Liquefiable
15.00	SP	26	2.03	1.03	3	IV	0.24	6.50	0.77	28.77	13.77	0.25	0.85	1.33	1.000	1.05	1	1.00	30.94	0.00	1.00	30.94	NA	65.94	0.67	0.90	1.00	1.44	NA	>1.0	Non Liquefiable
16.50	SP	28	2.03	1.03	3	IV	0.24	6.50	0.73	31.82	15.32	0.24	0.81	1.33	1.000	1.05	1	1.00	31.60	0.00	1.00	31.60	NA	66.60	0.67	0.87	1.00	1.44	NA	>1.0	Non Liquefiable
18.00	SP	33	2.02	1.02	2	IV	0.24	6.50	0.69	34.86	16.86	0.22	0.77	1.33	1.000	1.05	1	1.00	35.49	0.00	1.00	35.49	NA	70.49	0.65	0.83	1.00	1.44	NA	>1.0	Non Liquefiable
19.50	SP	37	2.02	1.02	2	IV	0.24	6.50	0.65	37.89	18.39	0.21	0.74	1.33	1.000	1.05	1	1.00	38.10	0.00	1.00	38.10	NA	73.10	0.63	0.80	1.00	1.44	NA	>1.0	Non Liquefiable
21.00	SP	42	2.01	1.01	3	IV	0.24	6.50	0.61	40.92	19.92	0.20	0.71	1.33	1.000	1.05	1	1.00	41.56	0.00	1.00	41.56	NA	76.56	0.62	0.77	1.00	1.44	NA	>1.0	Non Liquefiable
22.50	SP	47	2.01	1.01	3	IV	0.24	6.50	0.57	43.94	21.44	0.18	0.68	1.33	1.000	1.05	1	1.00	44.83	0.00	1.00	44.83	NA	79.83	0.60	0.74	1.00	1.44	NA	>1.0	Non Liquefiable

Note: Values of all Parameters are as per IRC:SP: 114 / IS 1893: 2016

C_E or C_{HT} (Correction for hammer energy ratio) = $ER/60$, ER for Rope and pully System = 80 % , Hence $C_E = 80/60 = 1.33$

C_H or C_{HW} (Correction for hammer) = 1.00

Borehole Diameter = 150 mm , Hence C_B or C_{BD} (Correction for Borehole diameter), = 1.05

C_S or C_{ss} (Correction for Standard sampler) = 1.00

K_σ Correction for high overburden stress (for effective oberburden pressure > 10 T/m²)

K_α Correction for static shear stress is required only for sloping ground



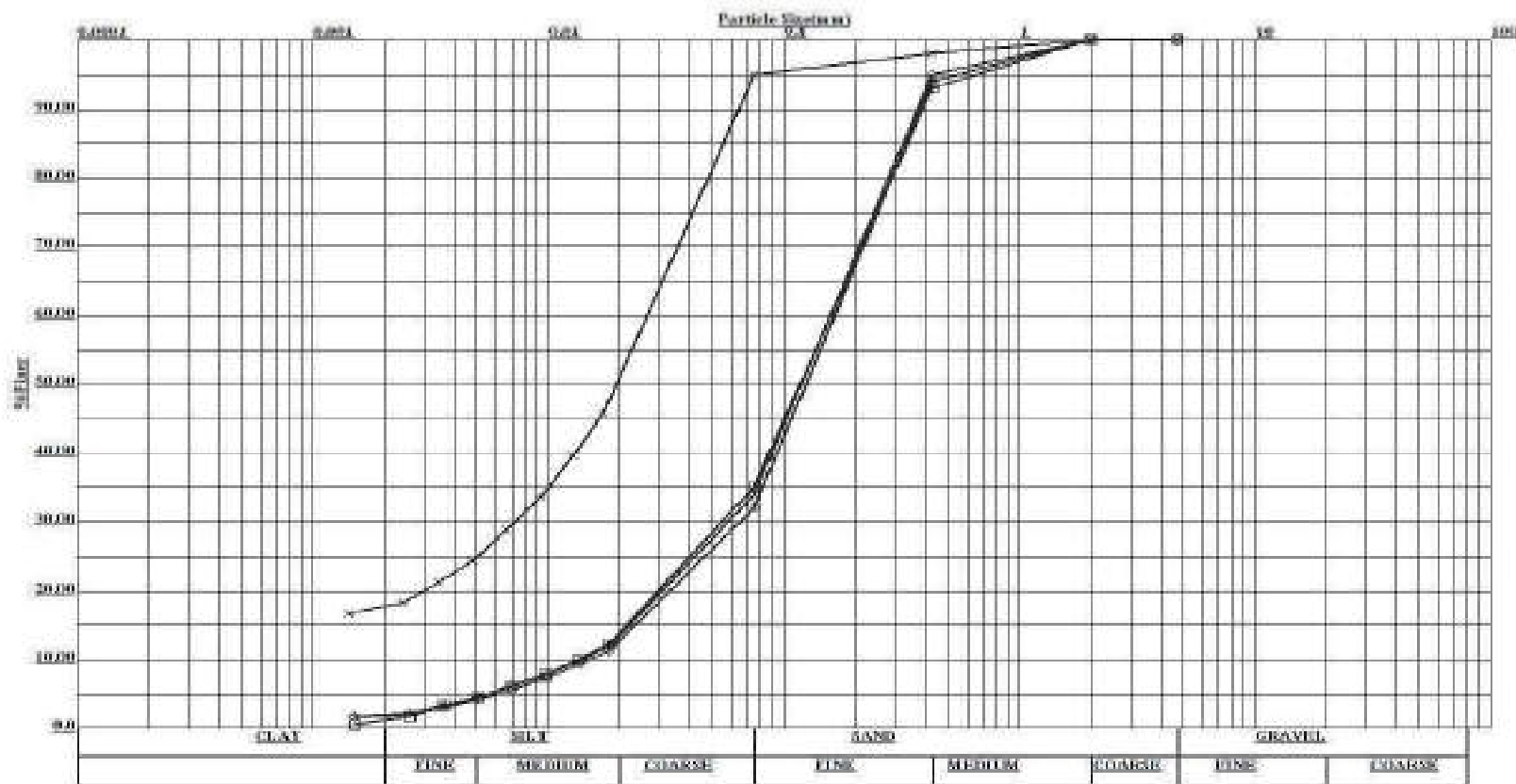
PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 14

BOREHOLE NO. - 01

SECTION:CHITAUNI TO MADHUBANI

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C_u	C_c
			(%)	(%)	(%)	(%)		
×	0.0	LITE BROWN LOW PLASTICITY CLAY (CL)	0.00	5.00	77.00	18.00	-	-
○	1.5	LOOSE TO MEDIUM DENSE LITE GREY SILTY SAND (SM)	0.00	68.00	30.00	2.00	10.96	1.74
□	3.0		0.00	65.00	34.00	1.00	11.96	1.43
◇	6.0		0.00	66.00	32.00	2.00	11.39	1.55

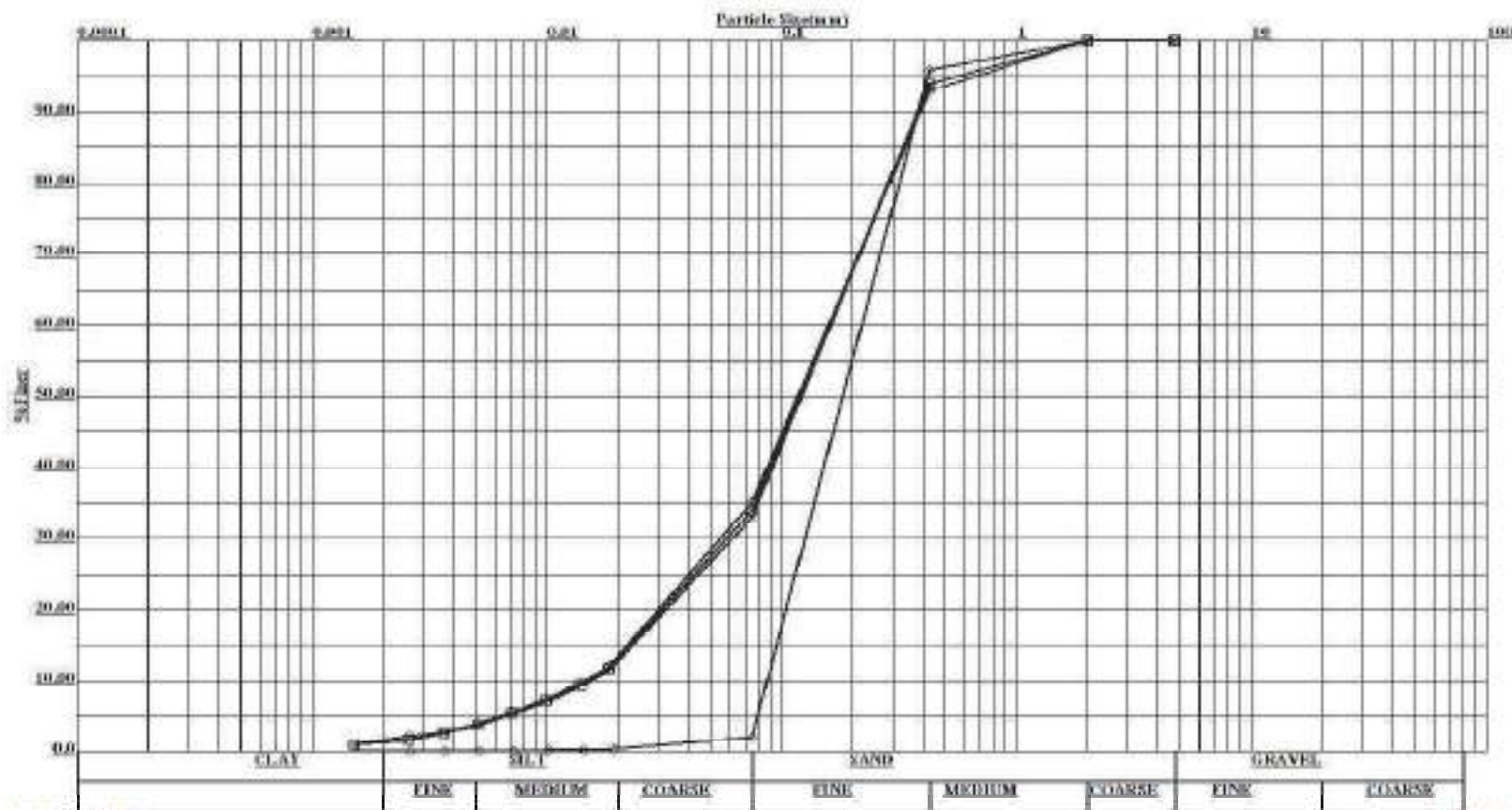
PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 14

BOREHOLE NO. - 01

SECTION:CHITAUNI TO MADHUBANI

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel (%)	Sand (%)	Silt (%)	Clay (%)	C _u	C _c
×	9.0	LOOSE TO MEDIUM DENSE LITE GREY SILTY SAND (SM)	0.00	67.00	32.00	1.00	10.41	1.52
○	12.0		0.00	65.00	33.00	2.00	11.02	1.34
□	15.0		0.00	66.00	33.00	1.00	10.66	1.44
◇	18.0	MEDIUM DENSE TO VERY DENSE DARK GREY POORLY GRADED SAND (SP)	0.00	98.00	2.00	0.00	2.52	0.83



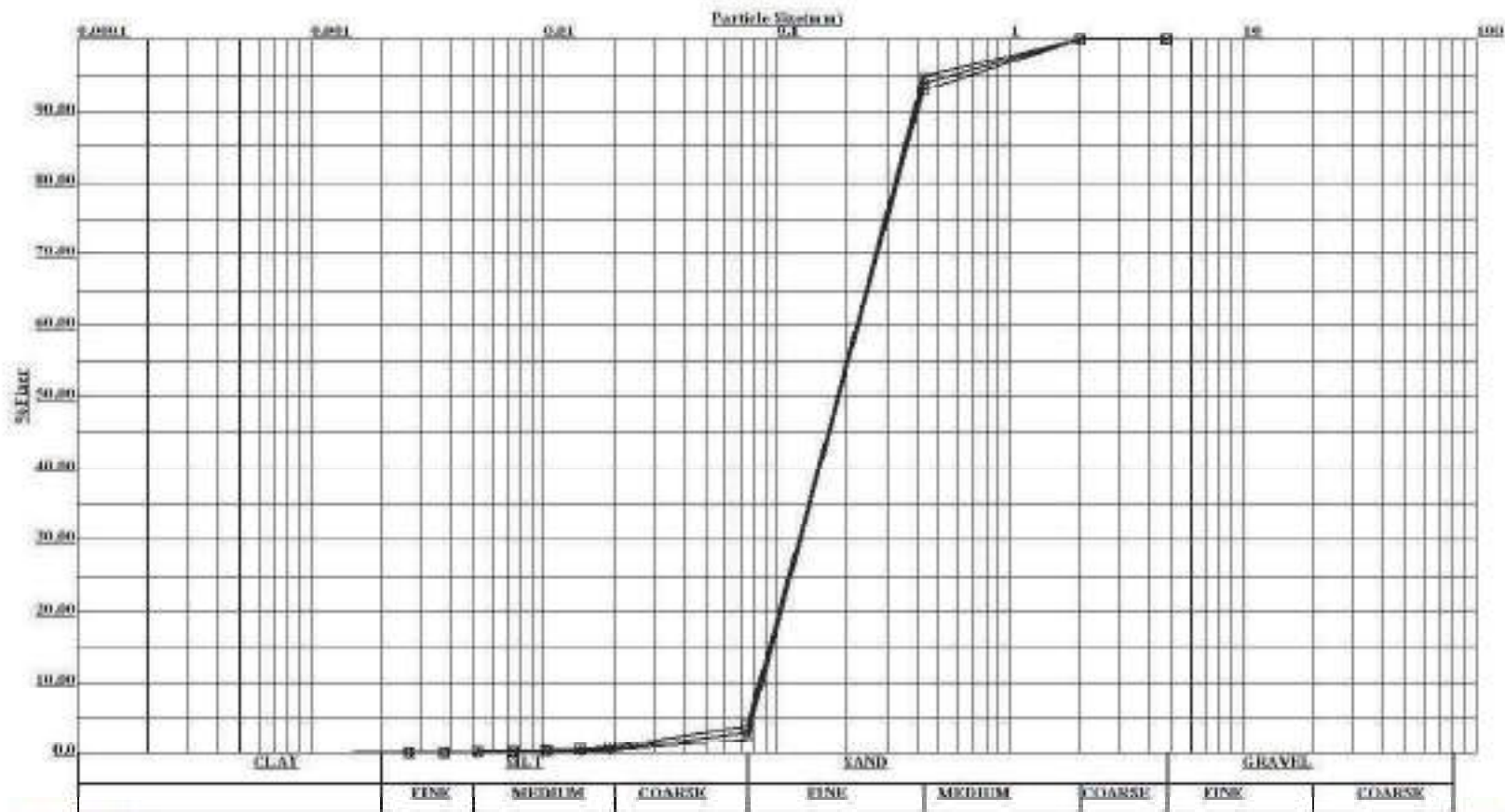
PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 14

BOREHOLE NO. - 01

SECTION:CHITAUNI TO MADHUBANI

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C _u	C _c
			(%)	(%)	(%)	(%)		
×	21.0	MEDIUM DENSE TO VERY DENSE DARK GREY POORLY GRADED SAND (SP)	0.00	97.00	3.00	0.00	2.57	0.83
○	24.0		0.00	98.00	2.00	0.00	2.57	0.83
□	27.0		0.00	96.00	4.00	0.00	2.65	0.82
◇	30.0		0.00	97.00	3.00	0.00	2.57	0.83



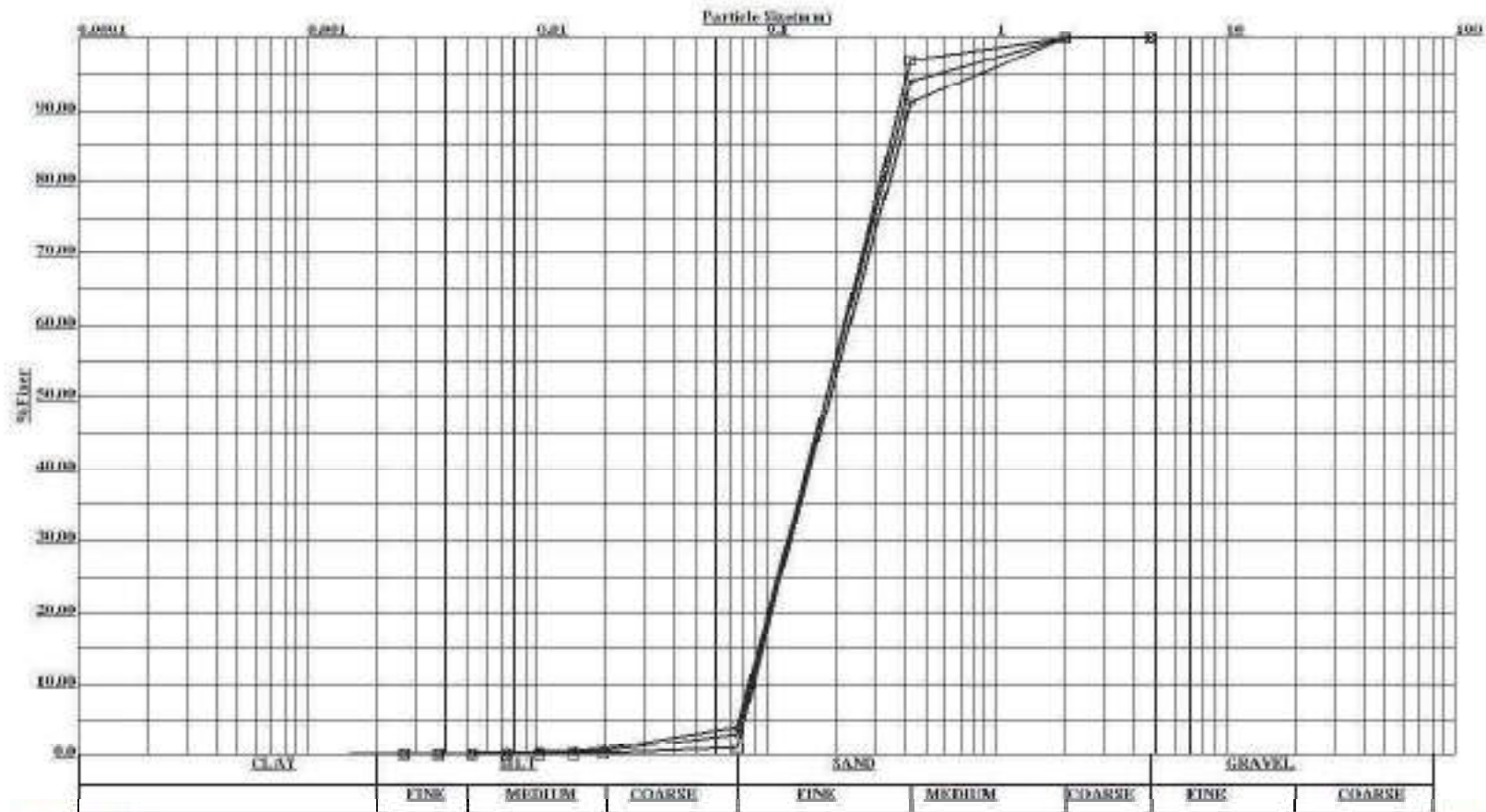
PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 14

BOREHOLE NO. - 01

SECTION:CHITAUNI TO MADHUBANI

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C_u	C_c
			(%)	(%)	(%)	(%)		
x	33.0	MEDIUM DENSE TO VERY DENSE DARK GREY POORLY GRADED SAND (SP)	0.00	96.00	4.00	0.00	2.62	0.82
O	36.0		0.00	97.00	3.00	0.00	2.68	0.82
□	39.0		0.00	99.00	1.00	0.00	2.47	0.83



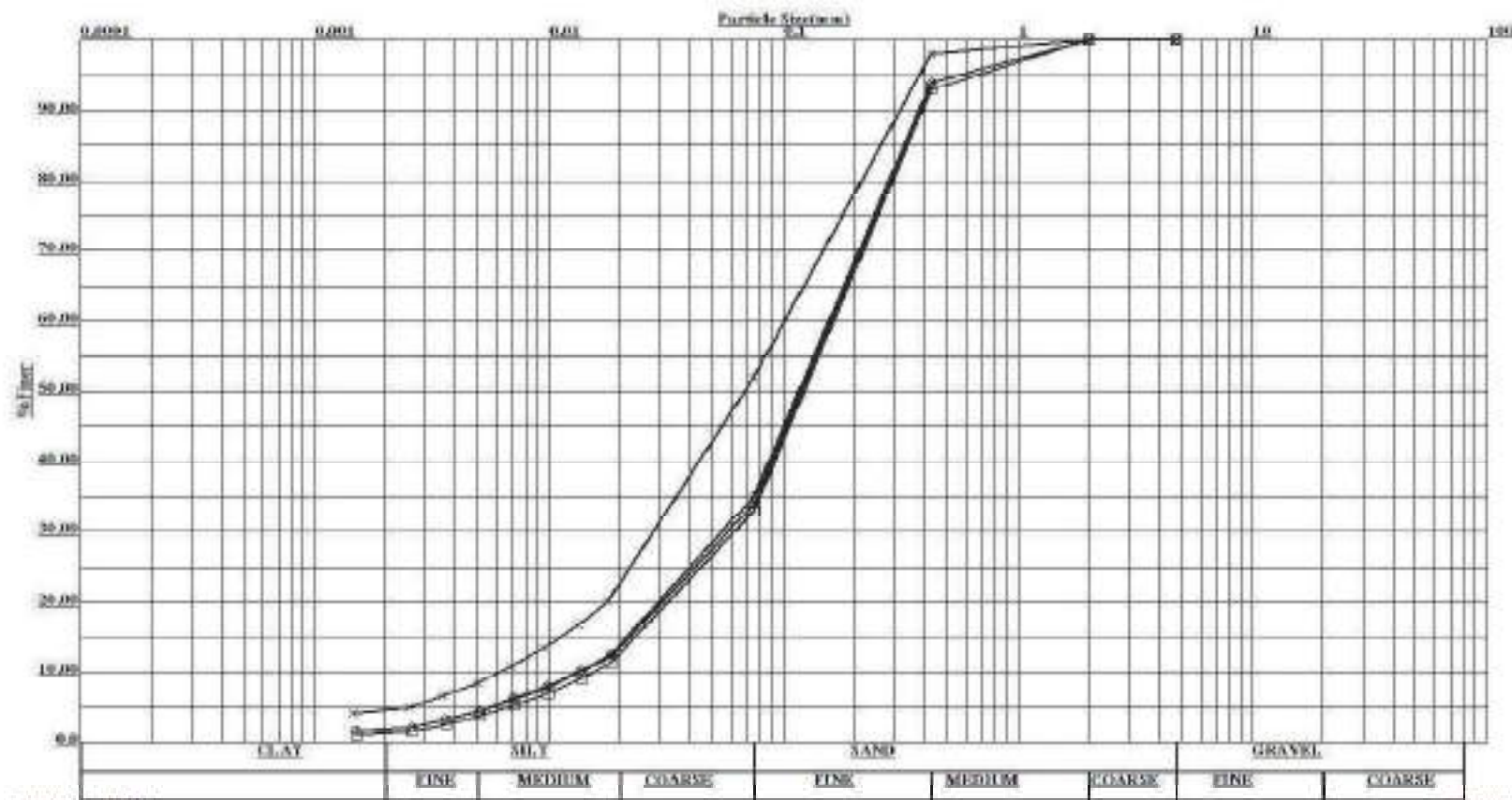
PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 14

BOREHOLE NO. - 02

SECTION:CHITAUNI TO MADHUBANI

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C _u	C _c
			(%)	(%)	(%)	(%)		
×	0.0	LITE BROWN SANDY SILT (ML)	0.00	48.00	47.00	5.00	16.45	1.24
○	1.5	LOOSE TO MEDIUM DENSE LITE GREY SILTY SAND (SM)	0.00	65.00	33.00	2.00	11.81	1.45
□	3.0		0.00	67.00	32.00	1.00	10.54	1.50
◇	6.0		0.00	66.00	32.00	2.00	11.53	1.53

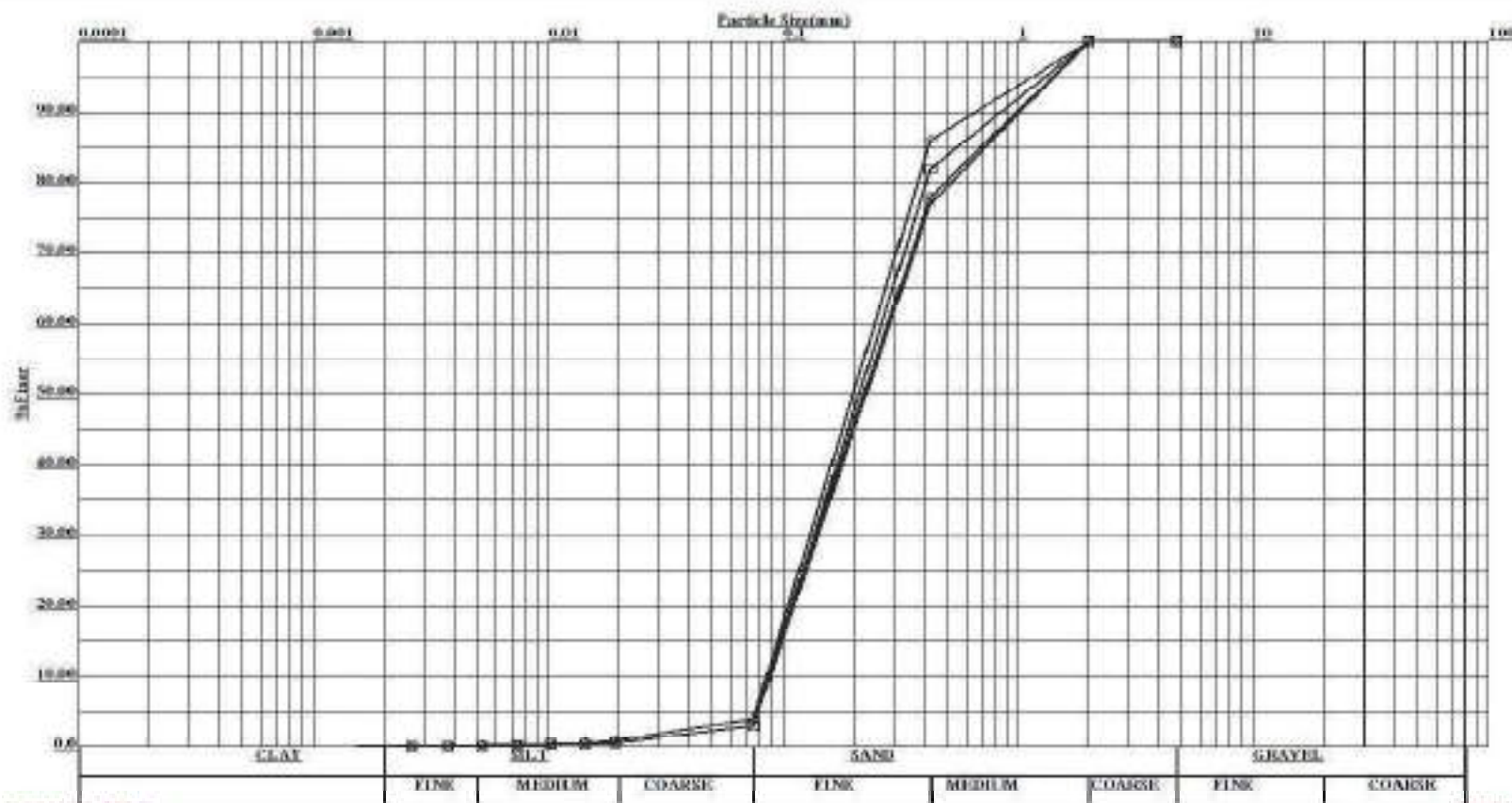
PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 14

BOREHOLE NO. - 02

SECTION:CHITAUNI TO MADHUBANI

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C _u	C _c
			(%)	(%)	(%)	(%)		
×	9.0	MEDIUM DENSE TO VERY DENSE DARK GREY POORLY GRADED SAND (SP)	0.00	97.00	3.00	0.00	3.23	0.79
○	12.0		0.00	96.00	4.00	0.00	3.23	0.79
□	15.0		0.00	97.00	3.00	0.00	3.00	0.80
◇	18.0		0.00	96.00	4.00	0.00	2.88	0.81



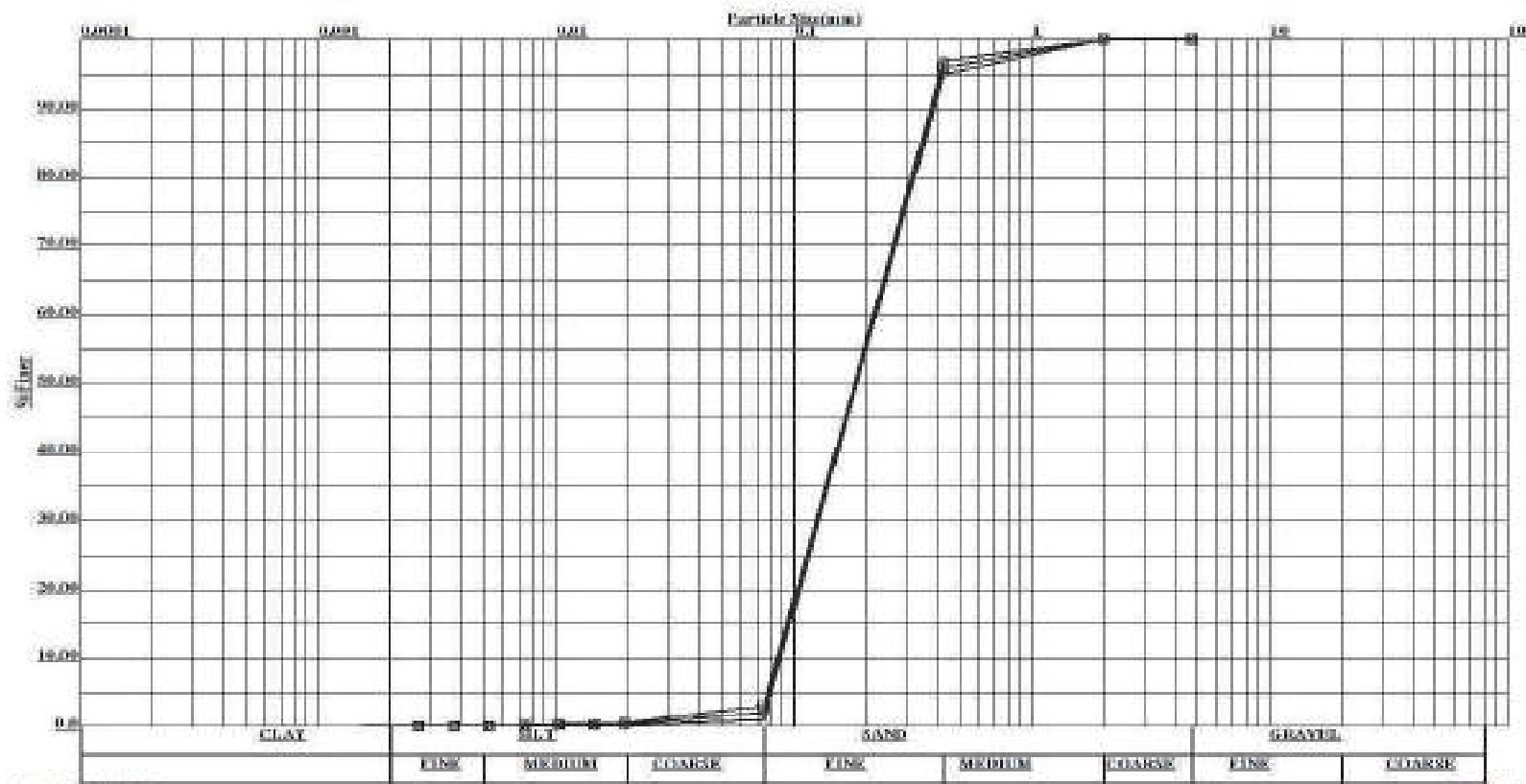
PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 14

BOREHOLE NO. - 02

SECTION:CHITAUNI TO MADHUBANI

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C _u	C _c
			(%)	(%)	(%)	(%)		
×	21.0	MEDIUM DENSE TO VERY DENSE DARK GREY POORLY GRADED SAND (SP)	0.00	99.00	1.00	0.00	2.49	0.83
○	24.0		0.00	98.00	2.00	0.00	2.49	0.83
□	27.0		0.00	97.00	3.00	0.00	2.54	0.83
◇	30.0		0.00	98.00	2.00	0.00	2.54	0.83



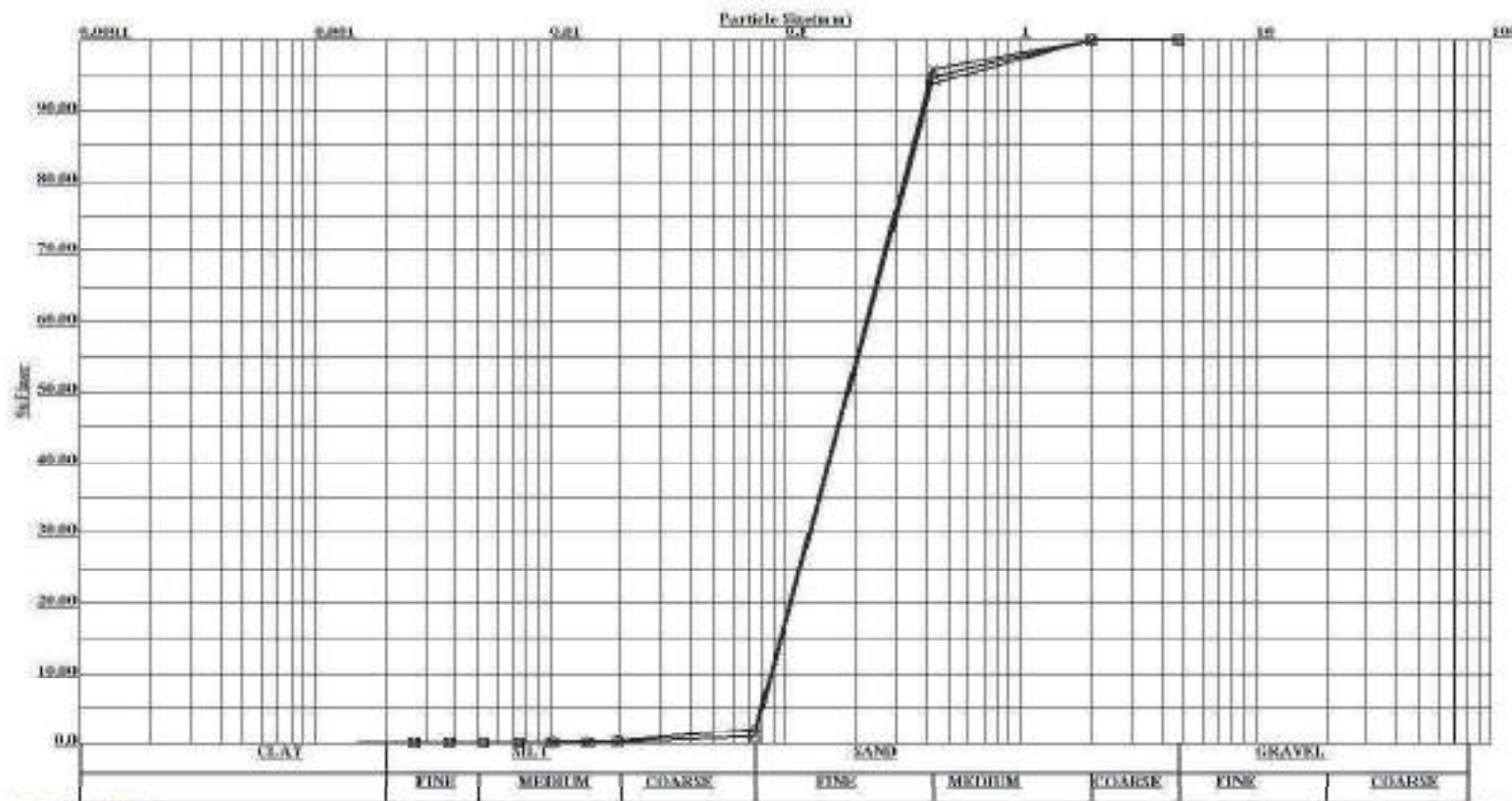
PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 14

BOREHOLE NO. - 02

SECTION:CHITAUNI TO MADHUBANI

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C _u	C _c
			(%)	(%)	(%)	(%)		
×	33.0	MEDIUM DENSE TO VERY DENSE DARK GREY POORLY GRADED SAND (SP)	0.00	99.00	1.00	0.00	2.49	0.83
○	36.0		0.00	98.00	2.00	0.00	2.54	0.83
□	39.0		0.00	99.00	1.00	0.00	2.54	0.83