



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)
24122.642	43	WATERWAY	MINOR	BH-01	207767	2989466	104.56

SUBMITTED BY:

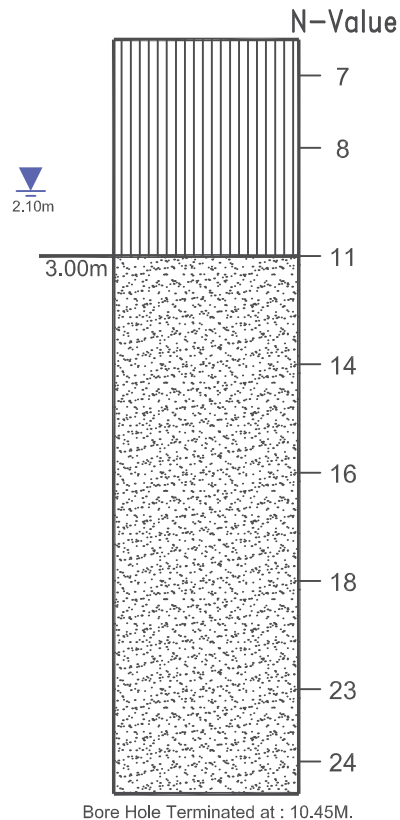


BOREHOLE PROFILE

SECTION: CHITAUNI - MADHUBANI

BRIDGE NO.- 43

BOREHOLE NO.: BH- 01



LEGENDS



Sandy Silt (ML)



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)



CALCULATIONS FOR CORRECTED SPT (N) VALUES

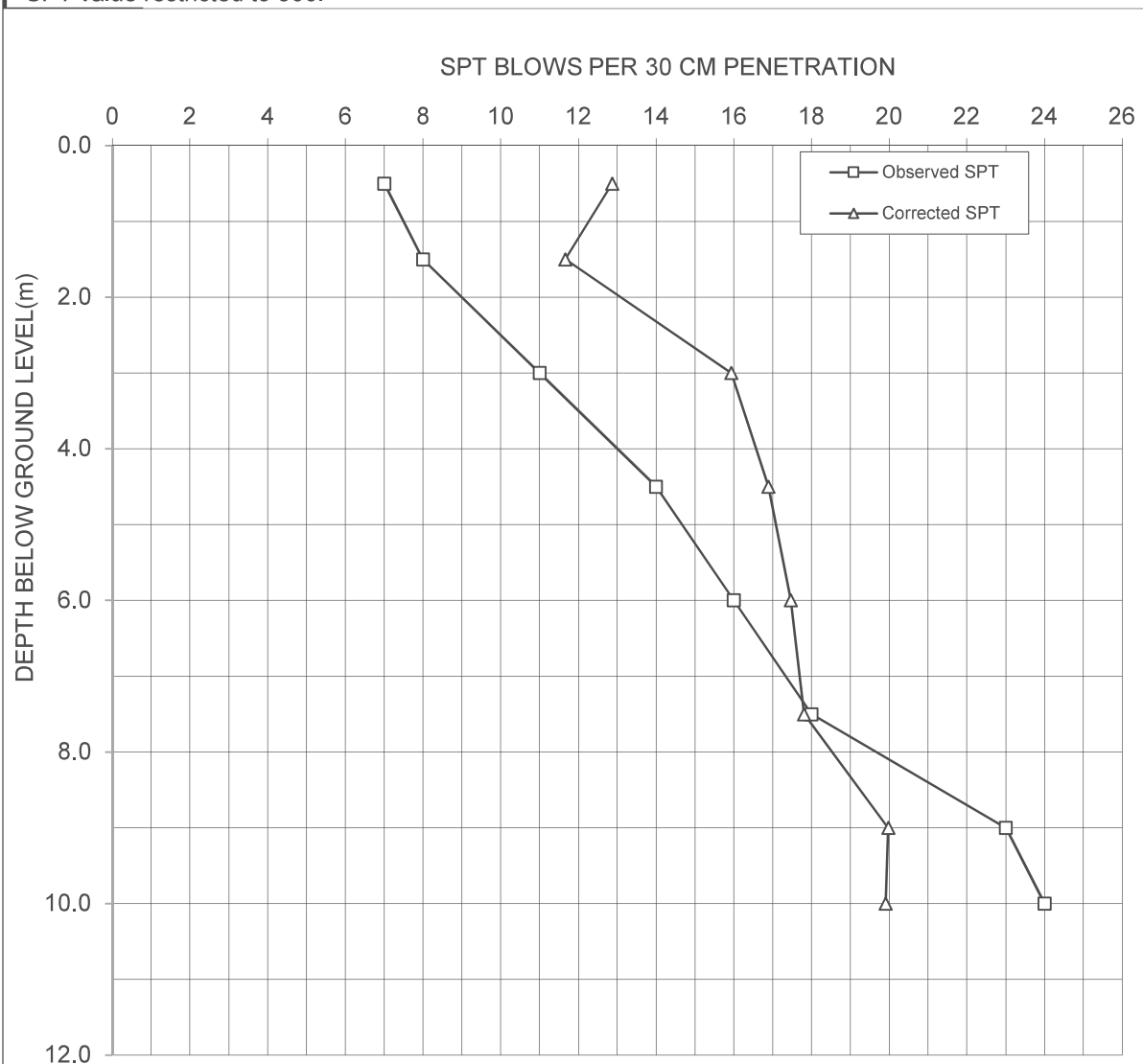
Project: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BOREHOLE NO. BH- 01

WATER TABLE :-2.10 m

DEPTH OF SAMPLE	TYPE OF SOIL	OBSERVED SPT 'N' VALUE	CORRECTED SPT (N') VALUE (FOR OVERBURDEN)	FINAL CORRECTED VALUE AFTER DILATANCY CORRECTION (N'')
0.50	Non Plastic	7	13	13
1.50	Non Plastic	8	12	12
3.00	Non Plastic	11	17	16
4.50	Non Plastic	14	19	17
6.00	Non Plastic	16	20	17
7.50	Non Plastic	18	21	18
9.00	Non Plastic	23	25	20
10.00	Non Plastic	24	25	20

* 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: 43

BOREHOLE NO.

BH-01

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
0.50	ML-NP	7	1.73	0.73	72	IV	0.24	7.00	1.00	0.87	0.37	0.37	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	1.19	0.26	0.70	Liquefiable
1.50	ML-NP	8	1.73	0.73	72	IV	0.24	7.00	0.99	2.60	1.10	0.37	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	1.19	0.29	0.79	Liquefiable
3.00	SP	11	2.02	1.02	3	IV	0.24	7.00	0.98	5.19	2.19	0.36	1.70	1.33	1.000	1.05	0.85	1.00	22.20	0.00	1.00	22.20	0.24	47.44	0.76	1.00	1.00	1.19	0.29	0.81	Liquefiable
4.50	SP	14	2.02	1.02	3	IV	0.24	7.00	0.97	8.22	3.72	0.33	1.64	1.33	1.000	1.05	0.95	1.00	30.45	0.00	1.00	30.45	NA	65.45	0.67	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
6.00	SP	16	2.03	1.03	4	IV	0.24	7.00	0.95	11.25	5.25	0.32	1.38	1.33	1.000	1.05	0.95	1.00	29.30	0.00	1.00	29.30	0.43	63.42	0.68	1.00	1.00	1.19	0.51	1.59	Non Liquefiable
7.50	SP	18	2.03	1.03	4	IV	0.24	7.00	0.94	14.30	6.80	0.31	1.21	1.33	1.000	1.05	0.95	1.00	28.97	0.00	1.00	28.97	0.41	62.68	0.69	1.00	1.00	1.19	0.49	1.58	Non Liquefiable
9.00	SP	23	2.04	1.04	3	IV	0.24	7.00	0.93	17.34	8.34	0.30	1.10	1.33	1.000	1.05	1	1.00	35.17	0.00	1.00	35.17	NA	70.17	0.65	1.00	1.00	1.19	NA	>1.0	Non Liquefiable
10.00	SP	24	2.04	1.04	3	IV	0.24	7.00	0.91	19.38	9.38	0.29	1.03	1.33	1.000	1.05	1	1.00	34.61	0.00	1.00	34.61	NA	69.61	0.65	1.00	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



aarvee associates
architects engineers & consultants pvt. ltd.

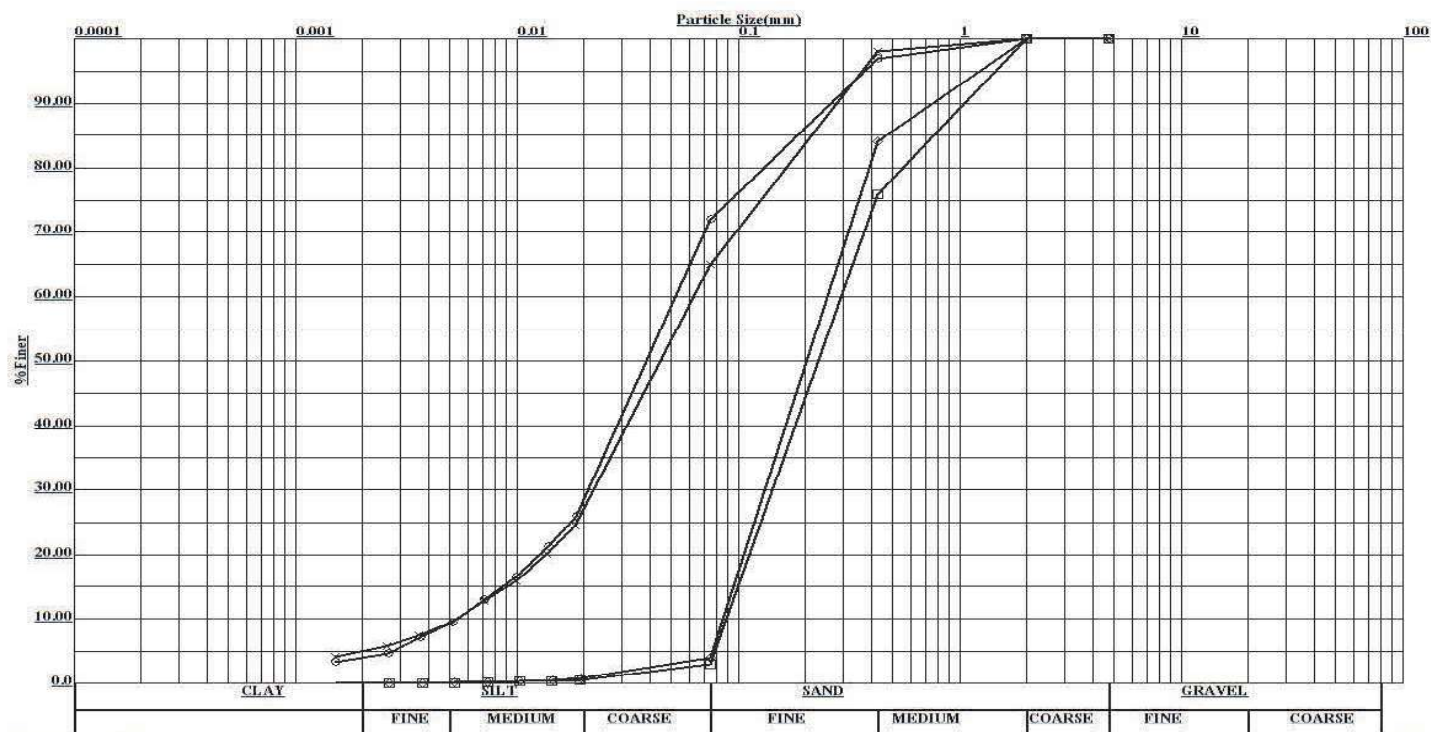
PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 43

BOREHOLE NO. - BH-01

SECTION:CHITAUNI TO MADHUBANI

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C_u	C_c
			(%)	(%)	(%)	(%)		
x	0.0	MEDIUM DENSE, LITE BROWN, SANDY SILT (ML)	0.00	35.00	60.00	5.00	11.82	1.47
o	0.5		0.00	28.00	68.00	4.00	9.61	1.55
□	3.0	MEDIUM DENSE, LITE GREY, POORLY GRADED SAND (SP)	0.00	97.00	3.00	0.00	3.28	0.79
◇	6.0		0.00	96.00	4.00	0.00	2.96	0.81



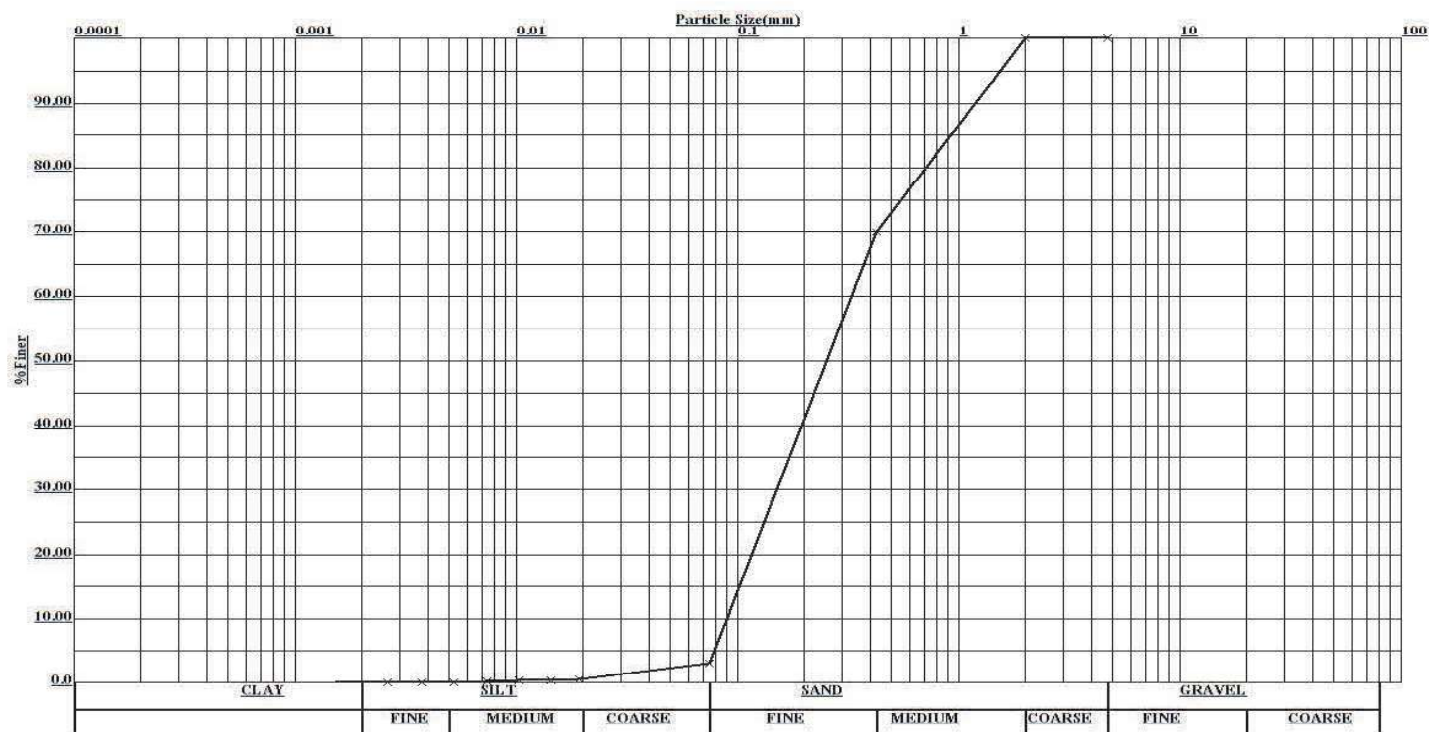
PROJECT: Final location survey for New B.G Railway line projects (770.00 km.) and Final location survey for construction of Doubling/Third line/ 3rd & 4th line (252.00 km.) of North Eastern Railway (Total 1022.00 km)

BRIDGE NO. - 43

BOREHOLE NO. - BH-01

SECTION:CHITAUNI TO MADHUBANI

GRAIN SIZE ANALYSIS



Symbol	Depth, m	Soil Description	Gravel	Sand	Silt	Clay	C _u	C _c
			(%)	(%)	(%)	(%)		
x	9.0	MEDIUM DENSE, LITE GREY, POORLY GRADED SAND (SP)	0.00	97.00	3.00	0.00	3.65	0.77

COMPUTATION OF WEIGHTED MEAN DIAMETER OF PARTICLES AND SILT FACTOR

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. 43

BOREHOLE NO- 1

Section : CHITAUNI - MADHUBANI

Sl.No.	Borehole No.	Depth (m)		Description of the Soil Strata	IS Classification	Percentage Retained							Mean Particle Size (mm)							Sandy Strata		Clayey Soil			
		From	To			5.60 to 4.00	4.00 to 2.80	2.80 to 1.00	1.00 to 0.425	0.425 to 0.180	0.180 to 0.075	0.075 to 0	4.8	3.4	1.9	0.7125	0.3025	0.1275	0.0375	Mean Particle Size (dm)	Silt Factor in the layer= 1.76 x sqrt(dm)	Average Cohesion Intercept - c (kg/sqcm)	Average Angle of Internal Friction (°)	F	Silt Factor = K _{sf} c = F x (1 + sqrt(c))
1	BH-1	0.50	0.95	SANDY SILT	ML	0.0	0.0	0.0	3.0	19.0	6.0	72.0	0.00	0.00	0.00	2.14	5.75	0.77	2.700	0.114	0.593	-	-	-	-
2		3.00	3.45	POORLY GRADED SAND	SP	0.0	0.0	0.0	23.0	54.0	20.0	3.0	0.00	0.00	0.00	16.39	16.34	2.55	0.113	0.354	1.047	-	-	-	-
3		6.00	6.45	POORLY GRADED SAND	SP	0.0	0.0	0.0	14.0	55.0	27.0	4.0	0.00	0.00	0.00	9.98	16.64	3.44	0.150	0.302	0.967	-	-	-	-