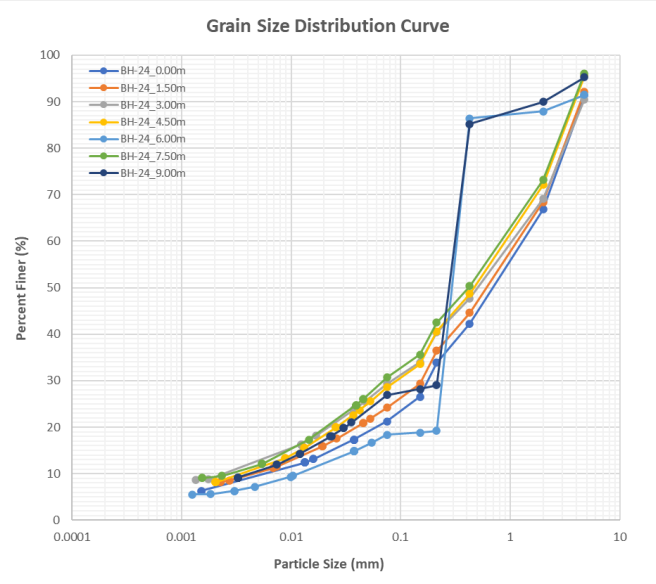
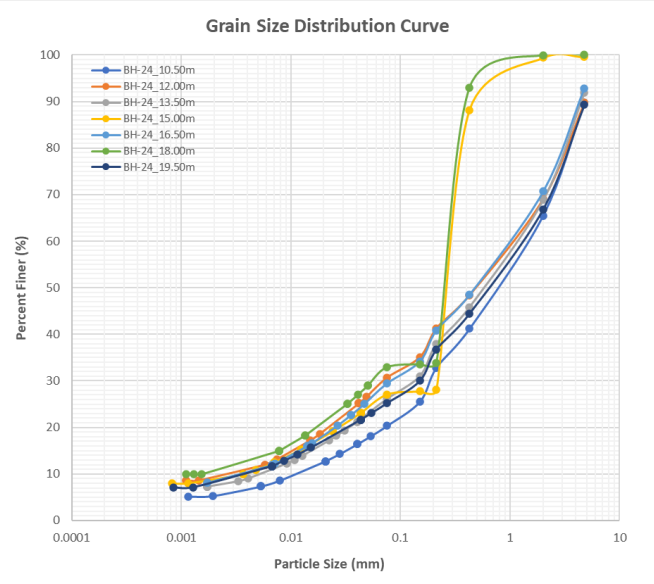
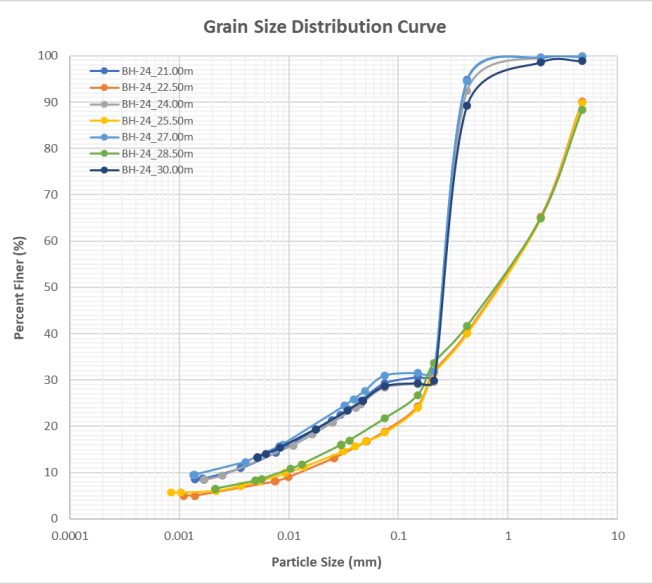
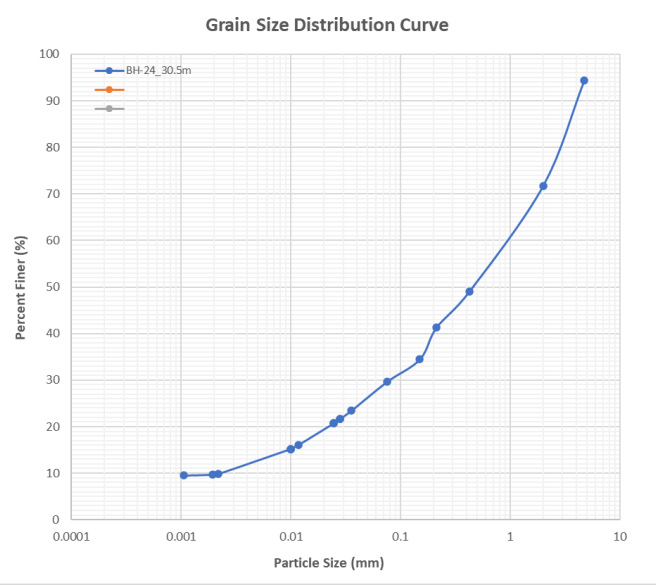
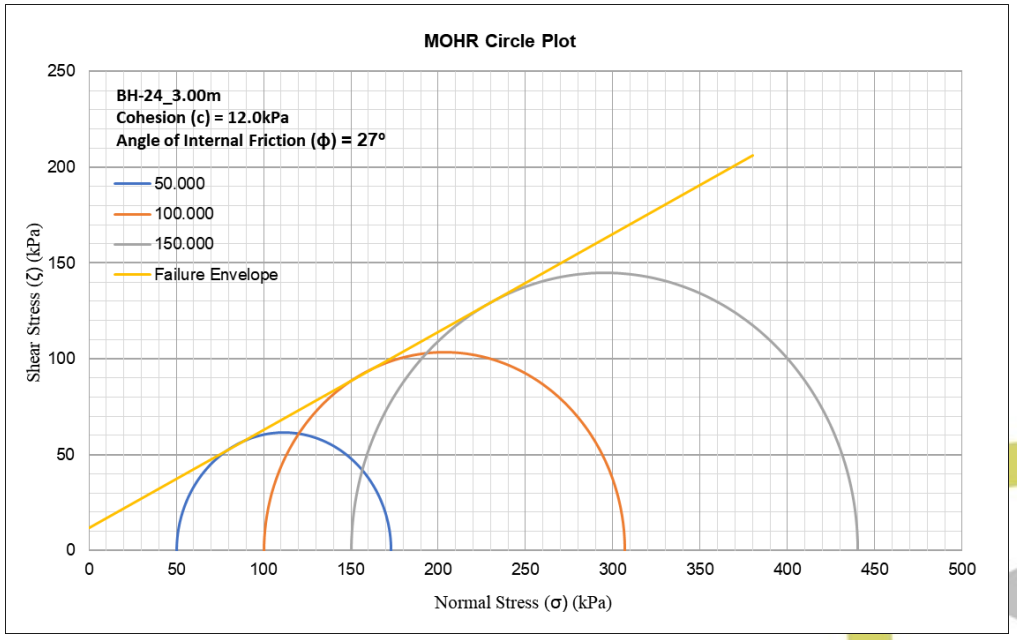
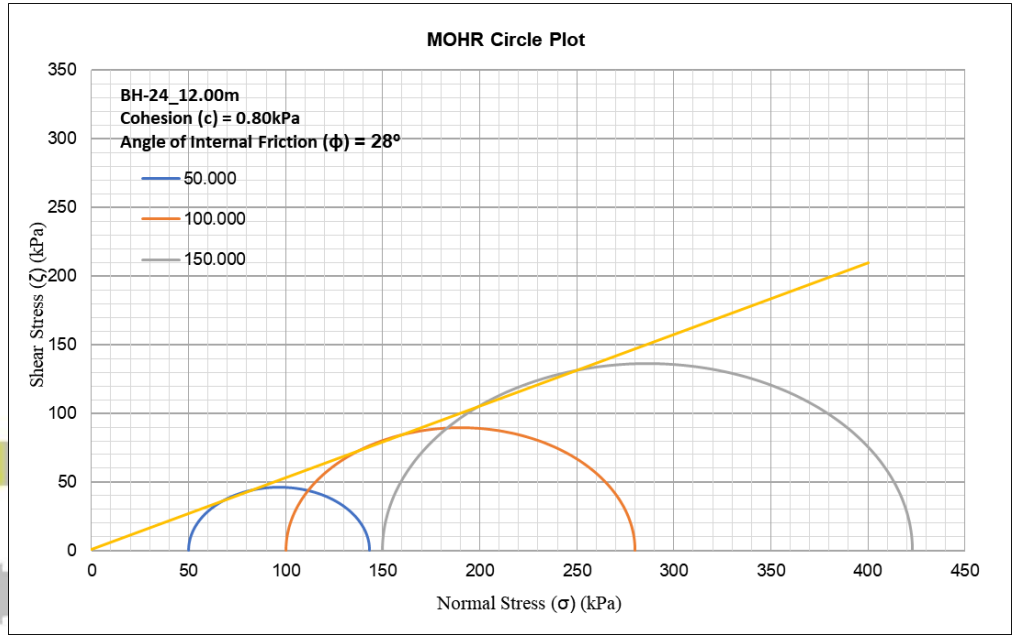

Grain Size Distribution Curve
BH-24_0.00m
BH-24_1.50m
BH-24_3.00m
BH-24_4.50m
BH-24_6.00m
BH-24_7.50m
BH-24_9.00m
Percent Finer (%)
Particle Size (mm)

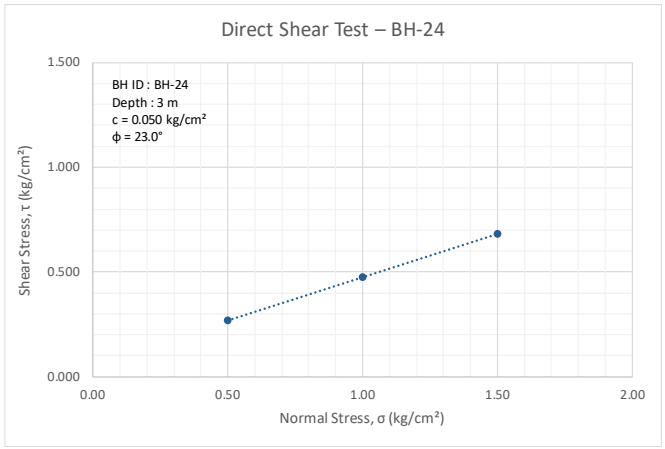

Grain Size Distribution Curve
BH-24_10.50m
BH-24_12.00m
BH-24_13.50m
BH-24_15.00m
BH-24_16.50m
BH-24_18.00m
BH-24_19.50m
Percent Finer (%)
Particle Size (mm)

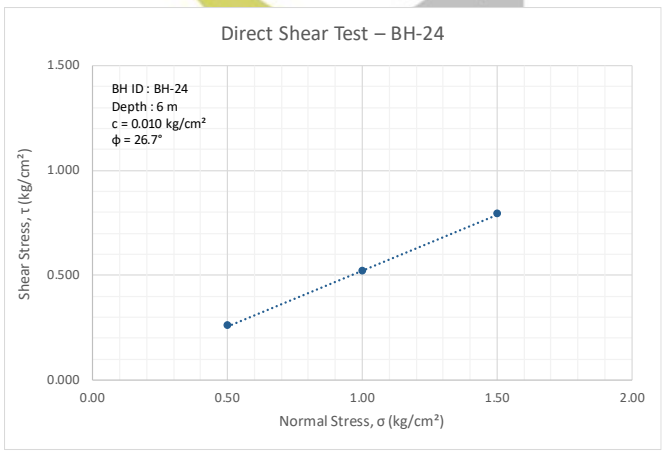

Grain Size Distribution Curve
BH-24_21.00m
BH-24_22.50m
BH-24_24.00m
BH-24_25.50m
BH-24_27.00m
BH-24_28.50m
BH-24_30.00m
Percent Finer (%)
Particle Size (mm)

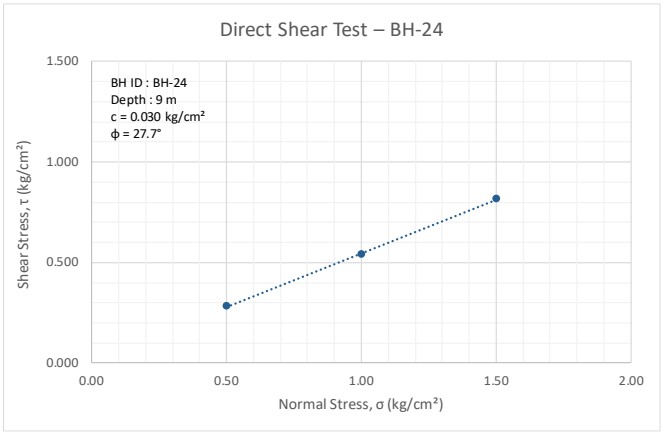

Grain Size Distribution Curve
BH-24_30.5m
Percent Finer (%)
Particle Size (mm)

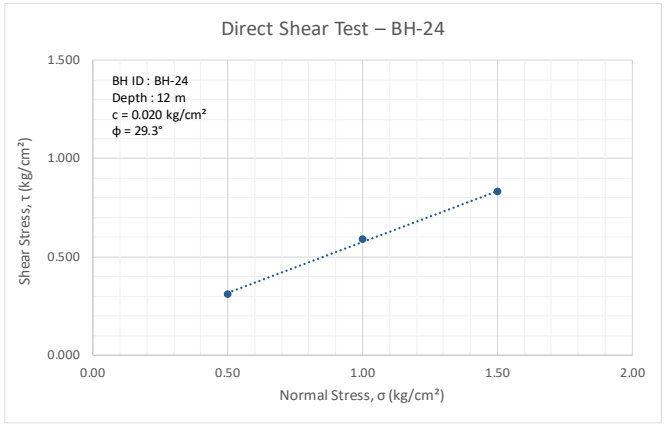

MOHR Circle Plot
BH-24_3.00m
Cohesion (c) = 12.0kPa
Angle of Internal Friction (ϕ) = 27°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

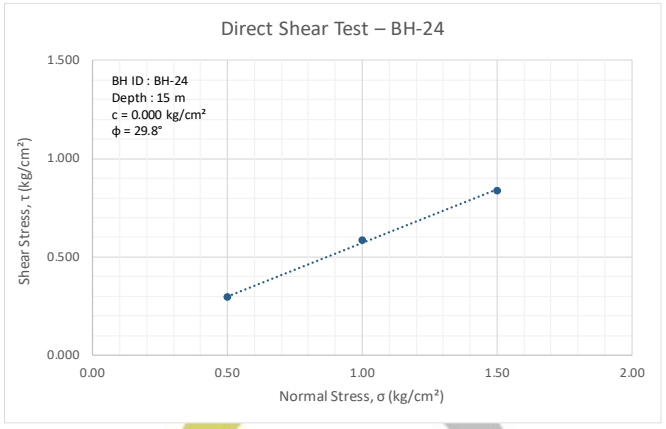

MOHR Circle Plot
BH-24_12.00m
Cohesion (c) = 0.80kPa
Angle of Internal Friction (ϕ) = 28°
50.000
100.000
150.000
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

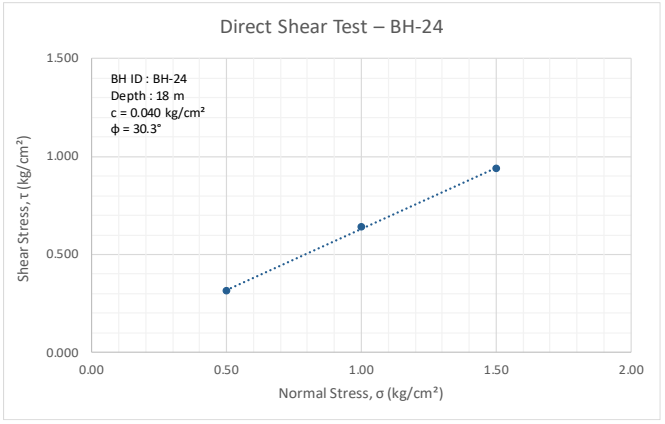

Direct Shear Test – BH-24
BH ID : BH-24
Depth : 3 m
c = 0.050 kg/cm²
ϕ = 23.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

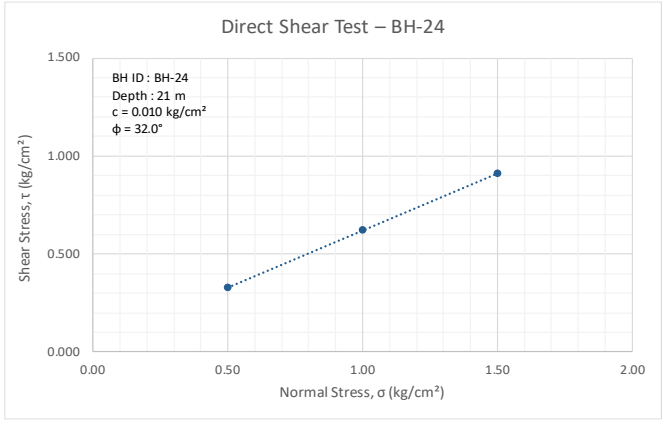

Direct Shear Test – BH-24
BH ID : BH-24
Depth : 6 m
c = 0.010 kg/cm²
ϕ = 26.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

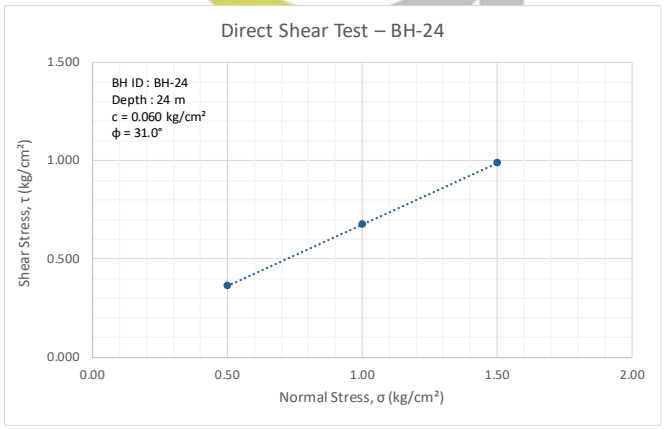

Direct Shear Test – BH-24
BH ID : BH-24
Depth : 9 m
c = 0.030 kg/cm²
ϕ = 27.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

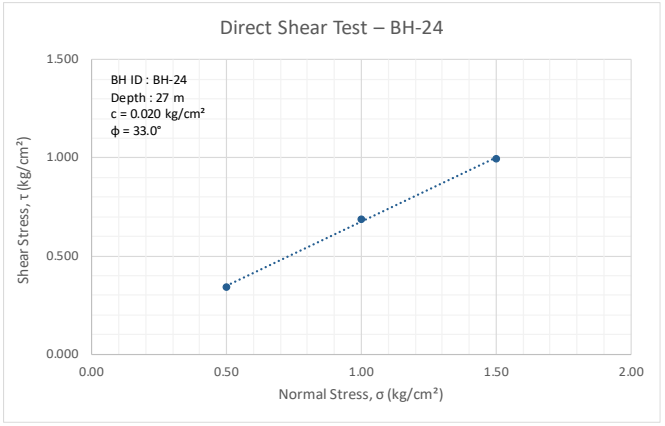

Direct Shear Test – BH-24
BH ID : BH-24
Depth : 12 m
c = 0.020 kg/cm²
ϕ = 29.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

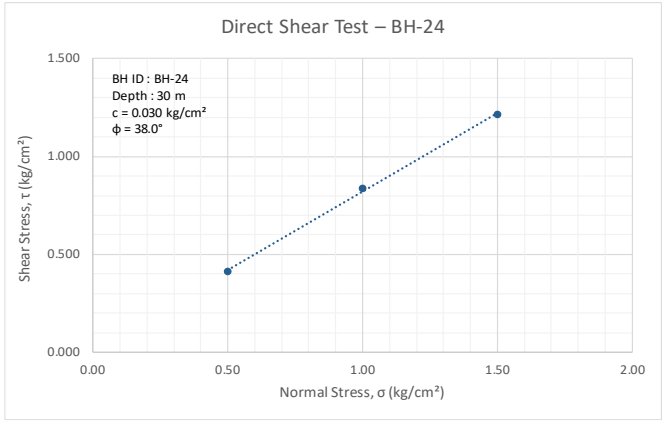

Direct Shear Test – BH-24
BH ID : BH-24
Depth : 15 m
c = 0.000 kg/cm²
ϕ = 29.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-24
BH ID : BH-24
Depth : 18 m
c = 0.040 kg/cm²
ϕ = 30.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-24
BH ID : BH-24
Depth : 21 m
c = 0.010 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-24
BH ID : BH-24
Depth : 24 m
c = 0.060 kg/cm²
ϕ = 31.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-24
BH ID : BH-24
Depth : 27 m
c = 0.020 kg/cm²
ϕ = 33.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-24
BH ID : BH-24
Depth : 30 m
c = 0.030 kg/cm²
ϕ = 38.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Noida Sector-142 to Botanical Garden (2+000 km TO 3+000 km)

BH ID : BH-25 | **Chainage** : 3+033 KM

Groundwater Level : - 16.00M | **Location** : Lat. 28.546816, Long. 77.336989

DEPTH	GWL	SAMPLE	SPT N VALUE	LAYER DESCRIPTION
				TOP Soil: (0.00 + 0.750m)
1.00				Medium Stiff , Yellowish to Brownish, fine-grained inorganic silt of low Plasticity with sand and Gravel (ML) (0.75 to 4.00m)
2.00		SPT/DS	N=7	
3.00		UDS		
		SPT/DS	N=8	
4.00				Medium Dense to Dense, Grayish to Brownish Gray, fine-grained silty sand(SM) (4.0 to 14.25m)
		SPT/DS	N=14	
5.00				
6.00		UDS		
		SPT/DS	N=21	
7.00				
		SPT/DS	N=27	
8.00				
9.00		UDS		
		SPT/DS	N=30	
10.00				
		SPT/DS	N=39	
11.00				
12.00		UDS		
		SPT/DS	N=39	
13.00				
		SPT/DS	N=45	
14.00				
15.00				Hard, Yellowish to Brownish, fine-grained inorganic silt of low Plasticity with sand and Gravel (ML) (14.25 to 17.25m)
		UDS		
		SPT/DS	N=50	
16.00				
		SPT/DS	N=52	
17.00				
18.00				Very Dense, Grayish to Brownish Gray, fine-grained silty sand(SM) (17.25 to 22.00m)
		UDS		
		SPT/DS	N=51	
19.00				
		SPT/DS	N=60	
20.00				
21.00		UDS		
		SPT/DS	N=65	
22.00				
		SPT/DS	N=70	Hard, Yellowish to Brownish, fine-grained inorganic silt of low Plasticity with sand and Gravel (ML)(22.00 to 26.25m)
23.00				
24.00		UDS		
		SPT/DS	N=75	
25.00				
		SPT/DS	N=86	
26.00				
27.00				Very Dense, Grayish to Brownish Gray, fine-grained silty sand(SM) (26.25 to 30.00m)
		UDS		
		SPT/DS	N=100	
28.00				
		SPT/DS	N=100	
29.00				
30.00		UDS		
		SPT/DS	N=100	
31.00				

LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

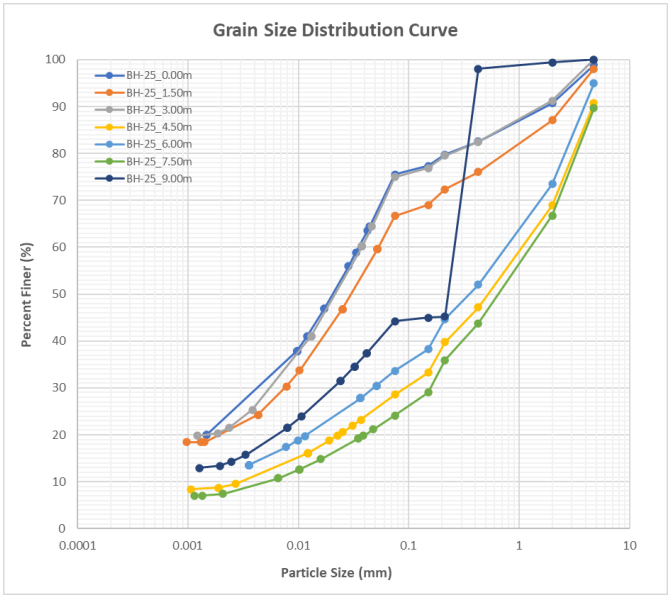
Soil

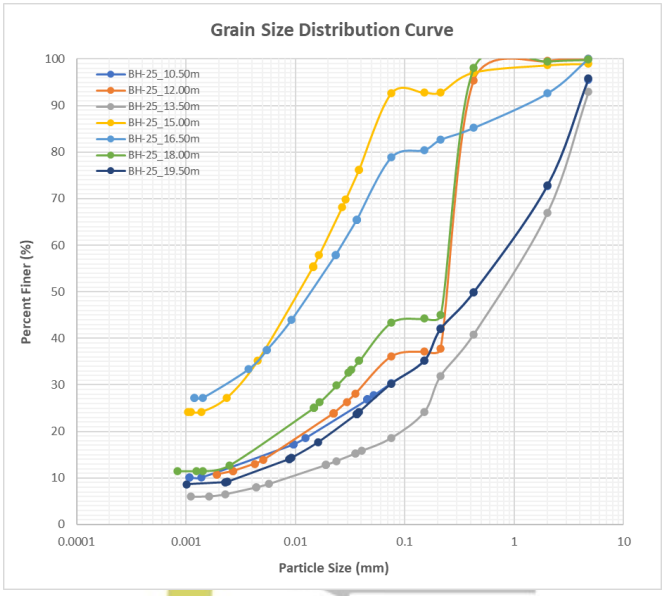
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

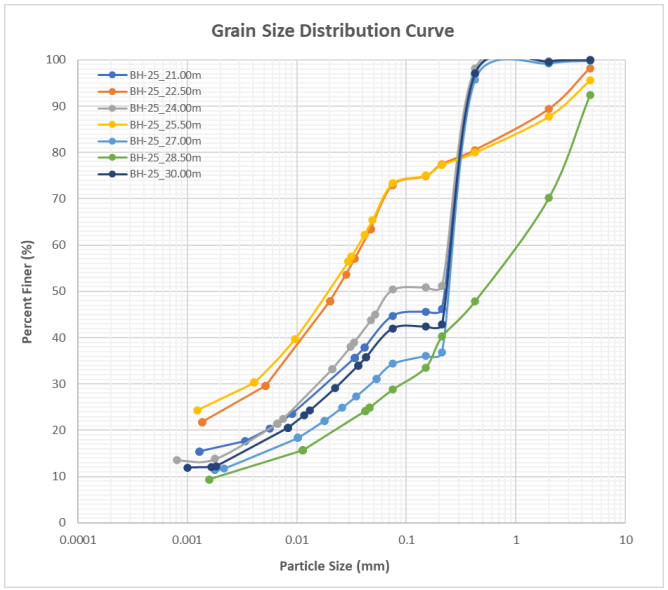
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-25	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	3+033	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	27-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	199.8	**End Date:**	28-01-2026
Project Code:	158_R4_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	16.00	**Location:**	Lat. 28.546816, Long. 77.336989

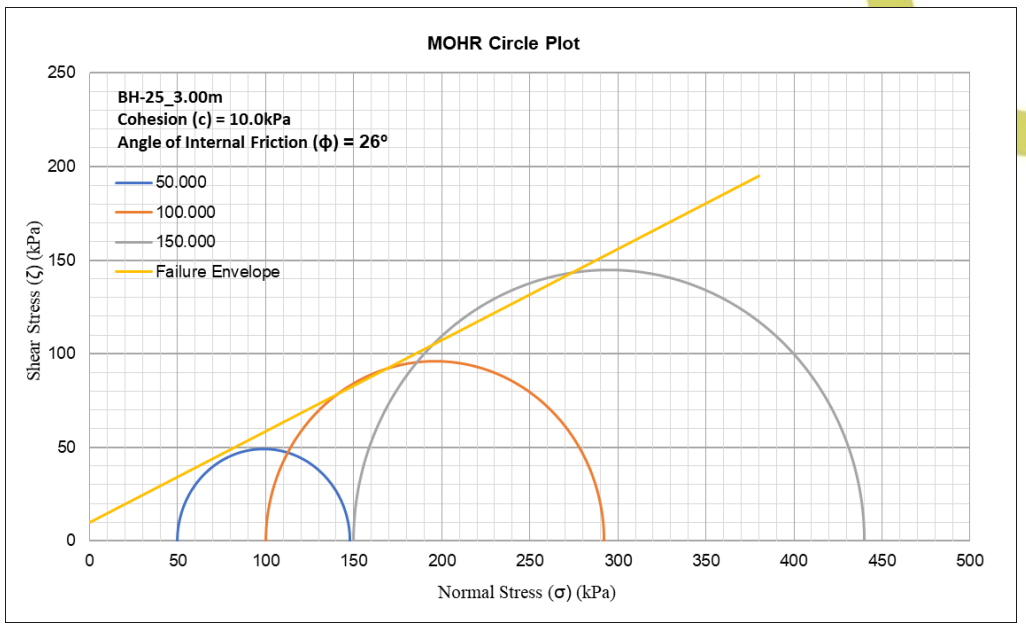
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						1.1	23.3	52.7	22.9	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Medium Stiff , Yellowish to Brownish, fine-grained inorganic silt of low Plasticity with sand and Gravel (ML)	2	3	4	7	10	2.0	31.4	46.4	20.3	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							0.0	25.0	54.3	20.7	27	NP	NP	17.4	1.8	1.56	2.6	F	0.1	23.0	UU	10.0	26.0	-	-	-
3.50	SPT/DS		3	3	5	8	9	-																			
4.50	SPT/DS	Medium Dense to Dense, Grayish to Brownish Gray, fine-grained silty sand(SM)	4	6	8	14	14	9.3	62.1	19.8	8.8	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							5.0	61.3	33.6	0.0	22	NP	NP	21.9	1.9	1.53	2.6	F	0.0	26.0	UU	9.0	28.0	-	-	-
6.50	SPT/DS		6	9	12	21	20	-																			
7.50	SPT/DS		7	12	15	27	25	10.3	65.5	16.8	7.4	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	DS							0.0	55.8	30.7	13.5	21	NP	NP	20.93	-	-	2.77	F	0.02	28	-	-	-	-	-	-
9.50	SPT/DS		12	14	16	30	26	-																			
10.50	SPT/DS		13	18	21	39	32	4.5	65.2	18.9	11.5	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							0.0	63.9	25.2	10.8	22	NP	NP	19.05	1.95	1.62	2.65	F	0.00	29	-	-	-	-	-	-
12.50	SPT/DS		14	16	23	39	29	-																			
13.50	SPT/DS		18	21	24	45	32	7.1	74.3	12.2	6.3	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS	Hard, Yellowish to Brownish, fine-grained inorganic silt of low Plasticity with sand and Gravel (ML)						1.0	6.3	66.3	26.3	25	NP	NP	23.89	2.00	1.61	2.60	F	0.08	27	-	-	-	-	-	-
15.50	SPT/DS		19	24	26	50	33	-																			
16.50	SPT/DS		21	25	27	52	24	0.0	21.2	49.4	29.4	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS	Very Dense, Grayish to Brownish Gray, fine-grained silty sand(SM)						0.1	56.5	31.1	12.3	24	NP	NP	20.68	-	-	2.61	F	0.04	29	-	-	-	-	-	-
18.50	SPT/DS		23	24	27	51	23	-																			
19.50	SPT/DS		24	27	33	60	26	4.2	65.5	21.2	9.0	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS							0.0	55.3	28.3	16.4	22	NP	NP	19.41	-	-	2.76	F	0.02	30	-	-	-	-	-	-
21.50	SPT/DS		25	30	35	65	27	-																			
22.50	SPT/DS	Hard, Yellowish to Brownish, fine-grained inorganic silt of low Plasticity with sand and Gravel (ML)	26	33	37	70	28	1.8	25.2	48.9	24.0	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							0.1	49.5	36.0	14.4	29	NP	NP	18.99	-	-	2.71	F	0.12	28	-	-	-	-	-	-
24.50	SPT/DS		29	35	40	75	29	-																			
25.50	SPT/DS		35	42	44	86	31	4.4	22.2	46.6	26.7	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS	Very Dense, Grayish to Brownish Gray, fine-grained silty sand(SM)						0.2	65.5	22.7	11.6	21	NP	NP	19.76	-	-	2.72	F	0.03	32	-	-	-	-	-	-
27.50	SPT/DS		44	(50/8cm)	-	100	34	-																			
28.50	SPT/DS		45	(50/6cm)	-	100	33	7.6	63.6	18.6	10.2	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							0.0	58.0	29.3	12.7	22	NP	NP	17.79	-	-	2.64	F	0.01	34	-	-	-	-	-	-
30.50	SPT/DS		(50/11cm)	-	-	100	32	-																			

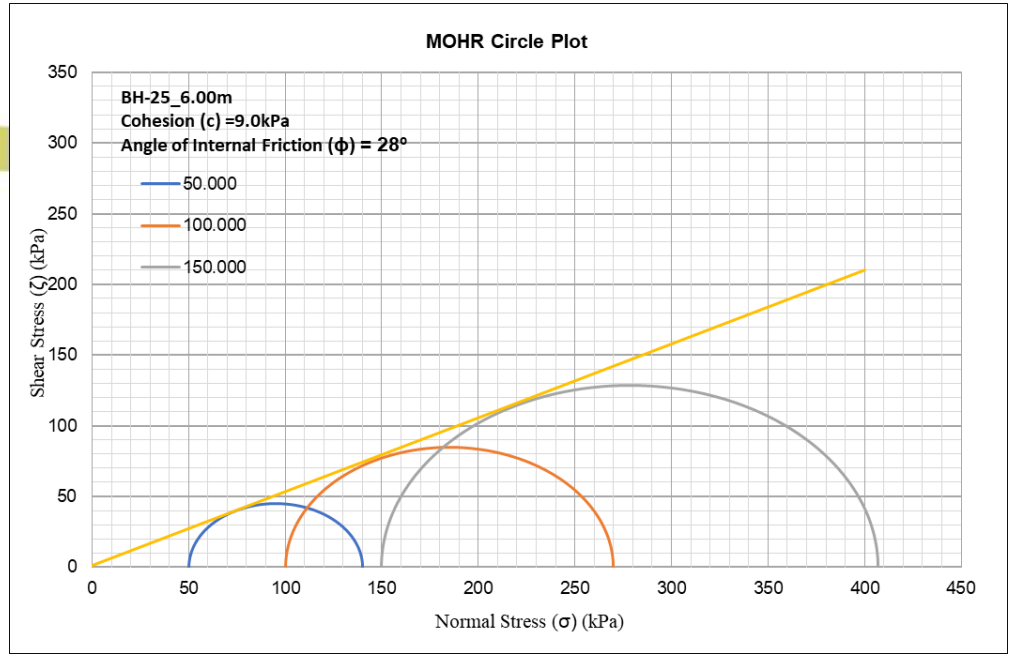
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

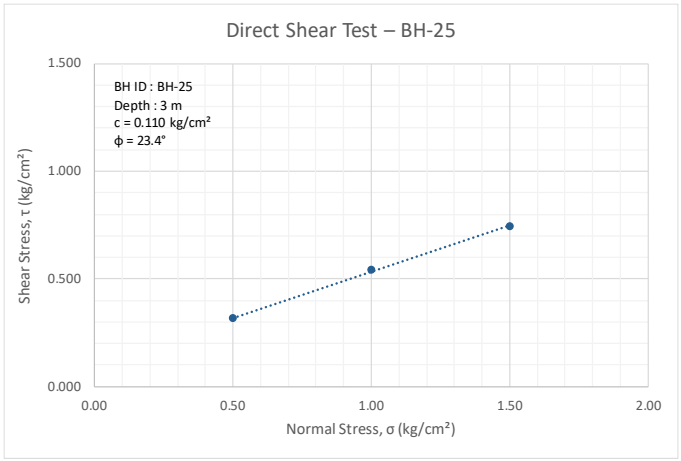

Grain Size Distribution Curve
BH-25_0.00m
BH-25_1.50m
BH-25_3.00m
BH-25_4.50m
BH-25_6.00m
BH-25_7.50m
BH-25_9.00m
Percent Finer (%)
Particle Size (mm)

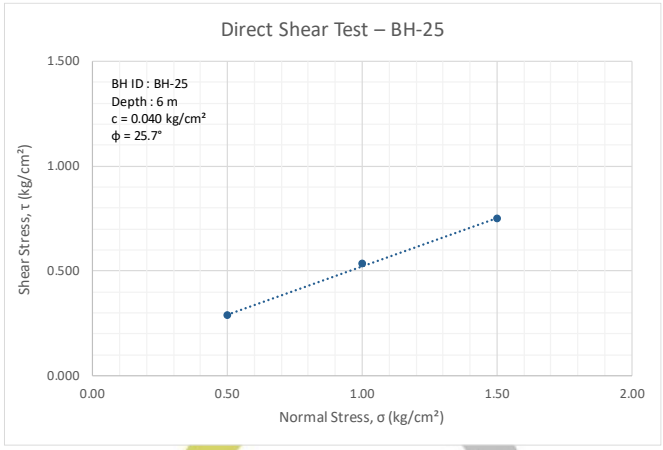

Grain Size Distribution Curve
BH-25_10.50m
BH-25_12.00m
BH-25_13.50m
BH-25_15.00m
BH-25_16.50m
BH-25_18.00m
BH-25_19.50m
Percent Finer (%)
Particle Size (mm)

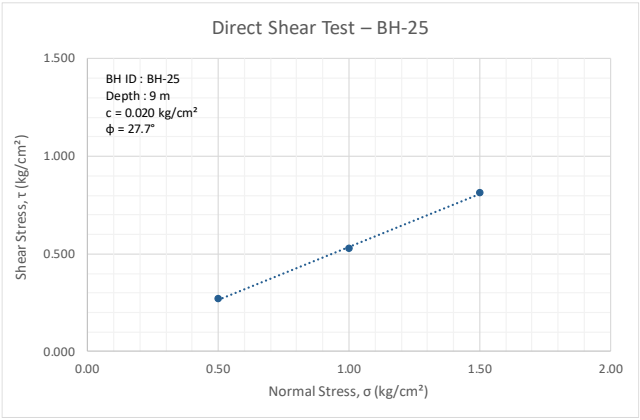

Grain Size Distribution Curve
BH-25_21.00m
BH-25_22.50m
BH-25_24.00m
BH-25_25.50m
BH-25_27.00m
BH-25_28.50m
BH-25_30.00m
Percent Finer (%)
Particle Size (mm)

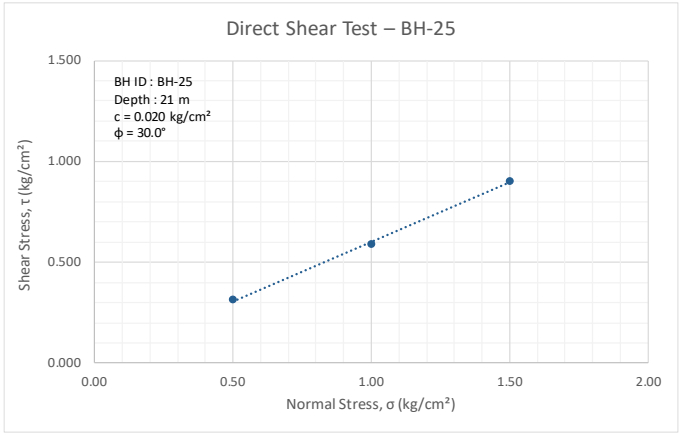

MOHR Circle Plot
BH-25_3.00m
Cohesion (c) = 10.0kPa
Angle of Internal Friction (ϕ) = 26°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

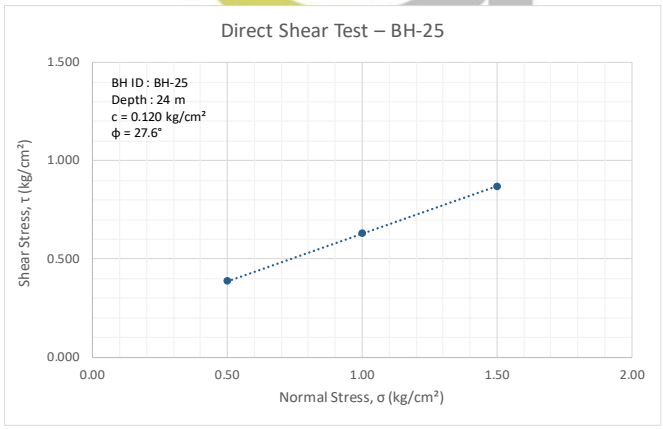

MOHR Circle Plot
BH-25_6.00m
Cohesion (c) =9.0kPa
Angle of Internal Friction (ϕ) = 28°
50.000
100.000
150.000
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

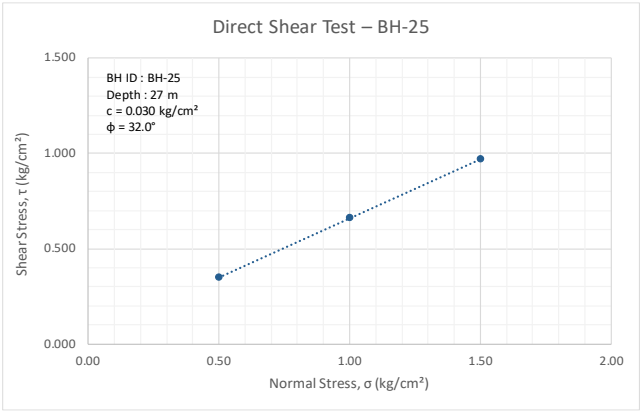

Direct Shear Test – BH-25
BH ID : BH-25
Depth : 3 m
c = 0.110 kg/cm²
ϕ = 23.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

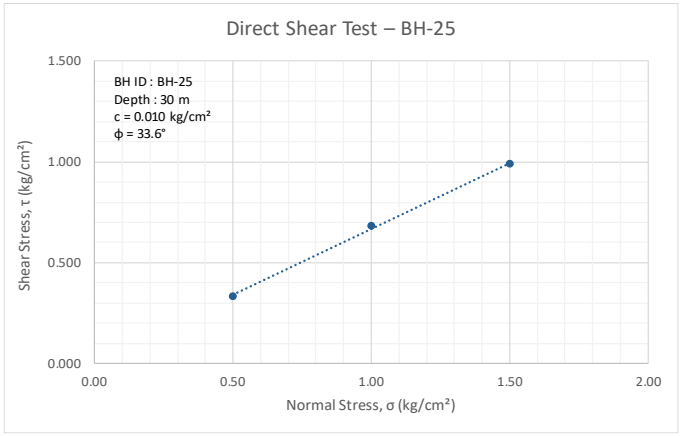

Direct Shear Test – BH-25
BH ID : BH-25
Depth : 6 m
c = 0.040 kg/cm²
ϕ = 25.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-25
BH ID : BH-25
Depth : 9 m
c = 0.020 kg/cm²
ϕ = 27.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-25
BH ID : BH-25
Depth : 21 m
c = 0.020 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-25
BH ID : BH-25
Depth : 24 m
c = 0.120 kg/cm²
ϕ = 27.6°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-25
BH ID : BH-25
Depth : 27 m
c = 0.030 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

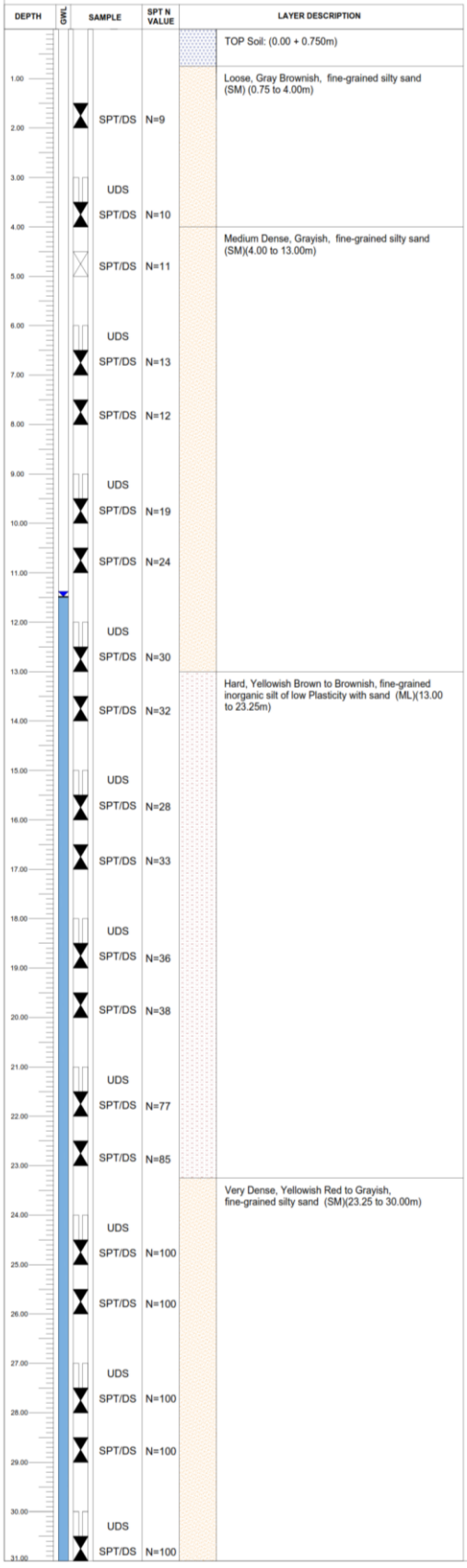

Direct Shear Test – BH-25
BH ID : BH-25
Depth : 30 m
c = 0.010 kg/cm²
ϕ = 33.6°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Noida Sector-142 to Botanical Garden (2+000 km TO 3+000 km)

BH ID : BH-26 | **Chainage** : 3+122 KM

Groundwater Level : - 11.50M | **Location** : Lat. 28.54624, Long. 77.337649



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

Soil

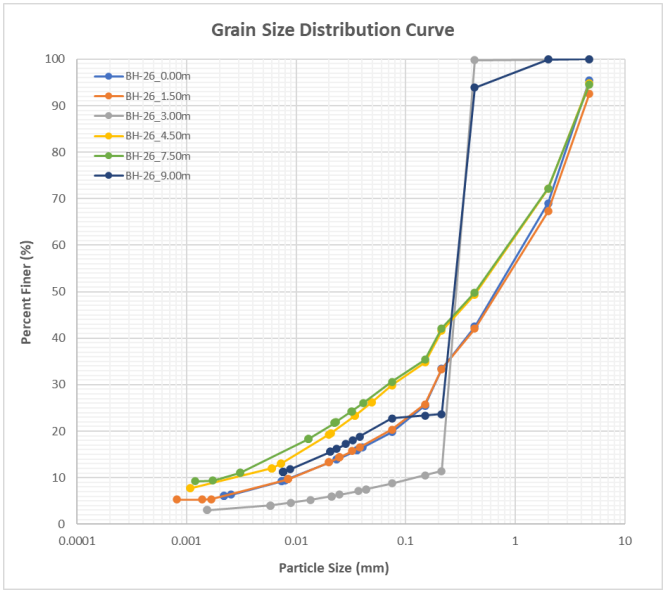
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

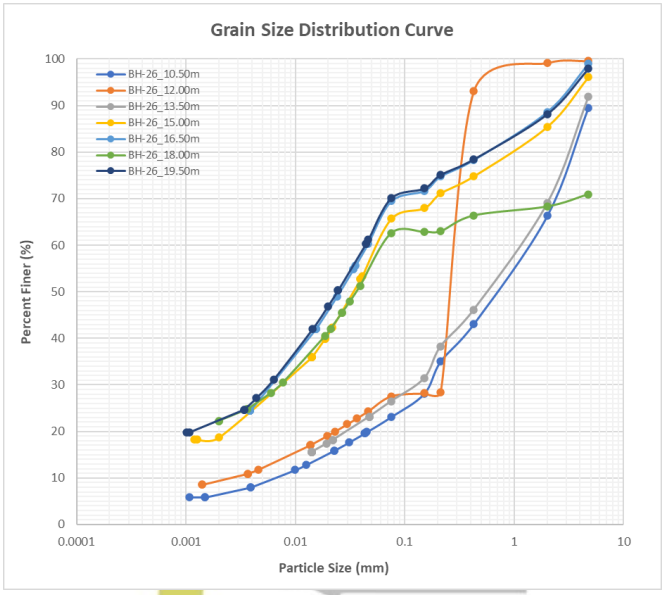
GOMA ENGINEERING AND CONSULTANCY
Quality we put forward

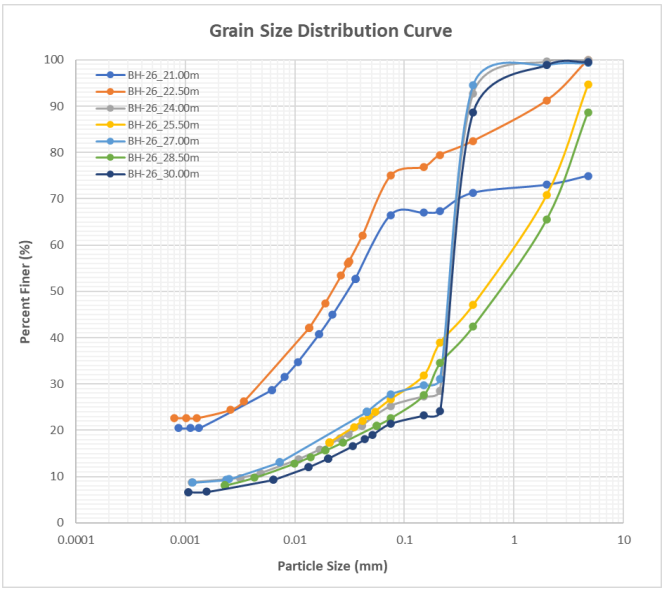
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-26	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	3+122	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	24-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	202	**End Date:**	24-01-2026
Project Code:	158_R4_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	11.50	**Location:**	Lat. 28.54624, Long. 77.337649

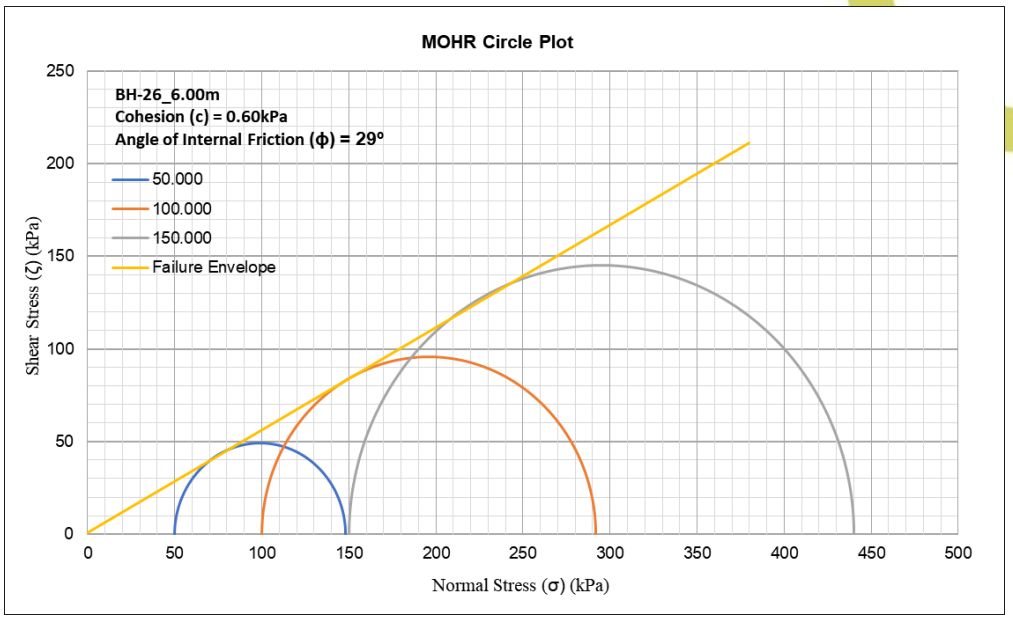
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						4.5	75.7	13.6	6.2	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Loose, Gray Brownish, fine-grained silty sand (SM)	3	4	5	9	13	7.4	72.2	14.5	5.9	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							0.0	91.3	5.5	3.2	29	NP	NP	11.6	1.9	1.66	2.67	F	0.0	22.0	UU	0.6	29.0	-	-	-
3.50	SPT/DS		3	4	6	10	11	-																			
4.50	SPT/DS	Medium Dense, Grayish, fine-grained silty sand (SM)	4	5	6	11	11	5.1	65.0	20.6	9.3	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	DS							9.9	64.9	17.6	7.6	25	NP	NP	12.18	-	-	2.62	F	0.02	24	-	-	-	-	-	-
6.50	SPT/DS		5	6	7	13	12	-																			
7.50	SPT/DS		5	6	6	12	11	5.4	64.0	20.8	9.8	21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	DS							0.0	77.2	15.1	7.7	26	NP	NP	15.88	-	-	2.60	F	0.07	25	-	-	-	-	-	-
9.50	SPT/DS		7	9	10	19	16	-																			
10.50	SPT/DS		9	11	13	24	20	10.5	66.4	16.6	6.5	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	DS							0.4	72.1	18.2	9.4	26	NP	NP	14.52	-	-	2.67	F	0.03	28	-	-	-	-	-	-
12.50	SPT/DS		11	14	16	30	19	-																			
13.50	SPT/DS	Hard, Yellowish Brown to Brownish, fine-grained inorganic silt of low Plasticity with sand (ML)	12	15	17	32	20	8.1	65.4	17.7	8.8	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS							3.9	30.4	46.9	18.7	29	NP	NP	16.71	1.9	1.60	2.69	F	0.06	26	UU	0.9	27.0	-	-	-
15.50	SPT/DS		10	13	15	28	18	.																			
16.50	SPT/DS		12	15	18	33	19	1.1	29.5	49.1	20.4	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS							29.1	8.3	40.3	22.3	29	NP	NP	19.21	-	-	2.64	F	0.09	27	-	-	-	-	-	-
18.50	SPT/DS		14	17	19	36	20	-																			
19.50	SPT/DS		15	18	20	38	20	2.1	27.8	47.7	22.4	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS							25.1	8.4	43.9	22.6	21	NP	NP	18.72	-	-	2.68	F	0.10	30	-	-	-	-	-	-
21.50	SPT/DS		31	37	40	77	33	-																			
22.50	SPT/DS		38	40	45	85	35	0.0	25.0	51.3	23.7	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS	Very Dense, Yellowish Red to Grayish, fine-grained silty sand (SM)						0.0	74.8	16.0	9.2	24	NP	NP	13.18	-	-	2.65	F	0.02	31	-	-	-	-	-	-
24.50	SPT/DS		32	40	50/4cm	100	38	-																			
25.50	SPT/DS		37	45	50/6cm	100	38	5.3	67.9	18.5	8.2	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							0.7	71.5	18.7	9.1	26	NP	NP	12.67	-	-	2.70	F	0.01	33	-	-	-	-	-	-
27.50	SPT/DS		40	50/9cm	-	100	37	-																			
28.50	SPT/DS		45	50/7cm	-	100	37	11.3	66.1	14.9	7.7	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							0.4	78.2	14.3	7.1	23	NP	NP	13.66	-	-	2.62	F	0.00	32	-	-	-	-	-	-
30.50	SPT/DS		50/11cm	-	-	100	36	-																			

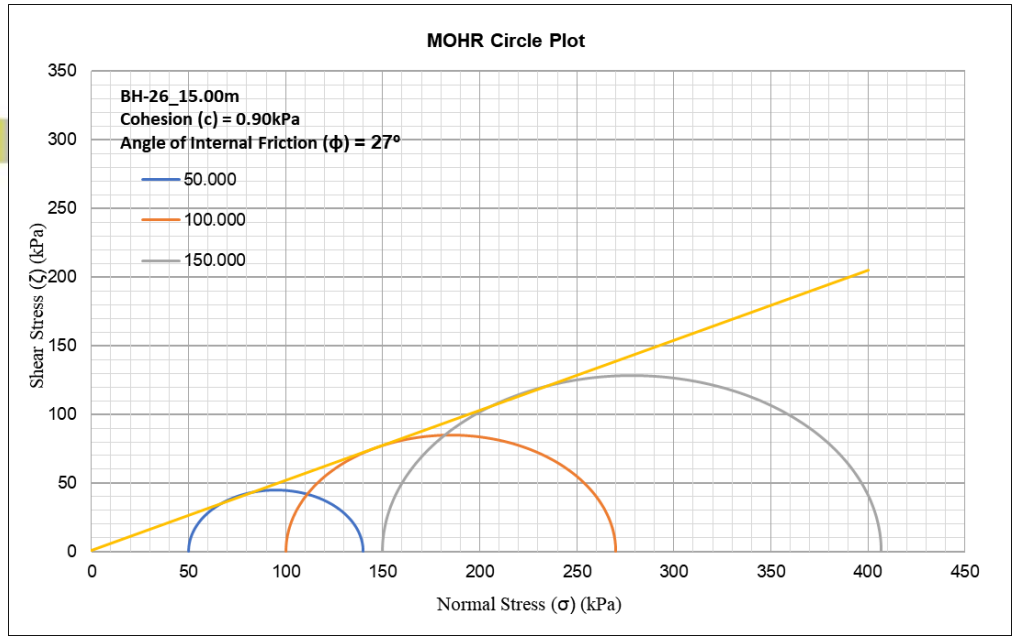
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

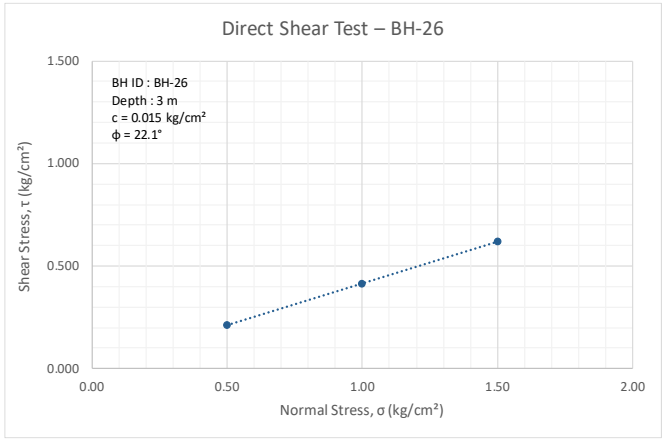

Grain Size Distribution Curve
BH-26_0.00m
BH-26_1.50m
BH-26_3.00m
BH-26_4.50m
BH-26_7.50m
BH-26_9.00m
Percent Finer (%)
Particle Size (mm)

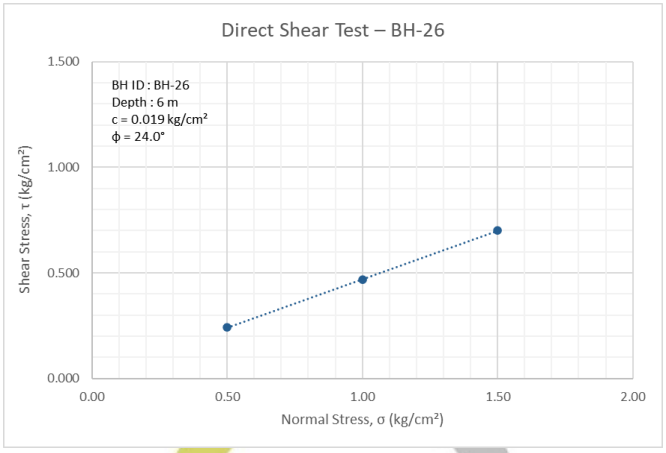

Grain Size Distribution Curve
BH-26_10.50m
BH-26_12.00m
BH-26_13.50m
BH-26_15.00m
BH-26_16.50m
BH-26_18.00m
BH-26_19.50m
Percent Finer (%)
Particle Size (mm)

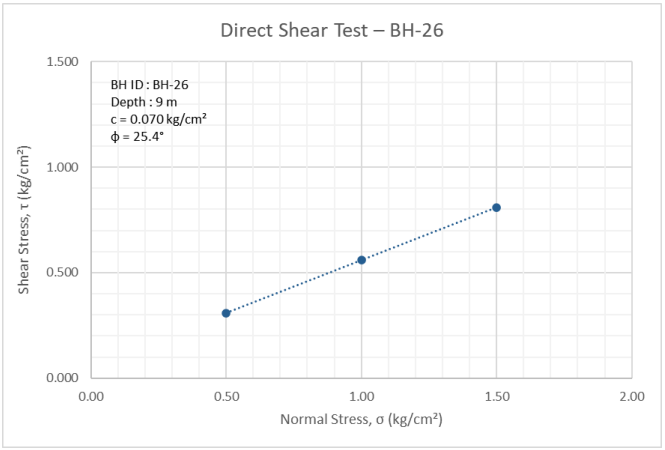

Grain Size Distribution Curve
BH-26_21.00m
BH-26_22.50m
BH-26_24.00m
BH-26_25.50m
BH-26_27.00m
BH-26_28.50m
BH-26_30.00m
Percent Finer (%)
Particle Size (mm)

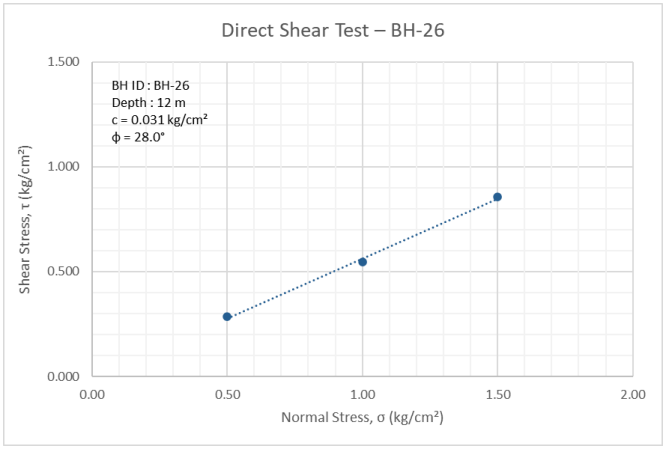

MOHR Circle Plot
BH-26_6.00m
Cohesion (c) = 0.60kPa
Angle of Internal Friction (ϕ) = 29°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

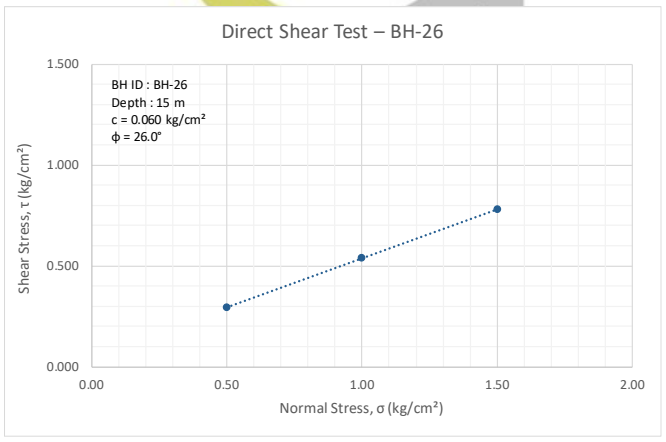

MOHR Circle Plot
BH-26_15.00m
Cohesion (c) = 0.90kPa
Angle of Internal Friction (ϕ) = 27°
50.000
100.000
150.000
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

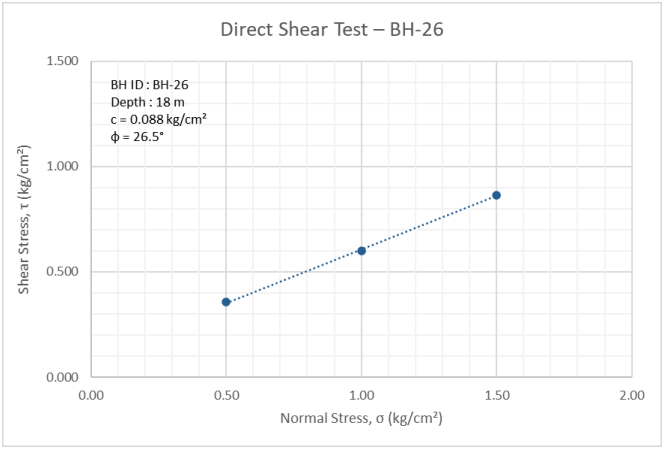

Direct Shear Test – BH-26
BH ID : BH-26
Depth : 3 m
c = 0.015 kg/cm²
ϕ = 22.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

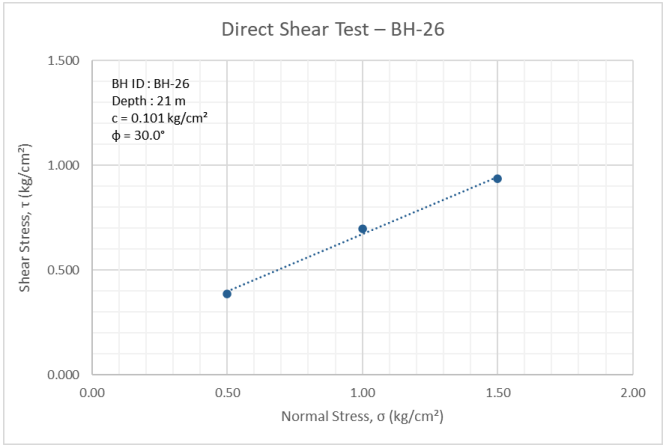

Direct Shear Test – BH-26
BH ID : BH-26
Depth : 6 m
c = 0.019 kg/cm²
ϕ = 24.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

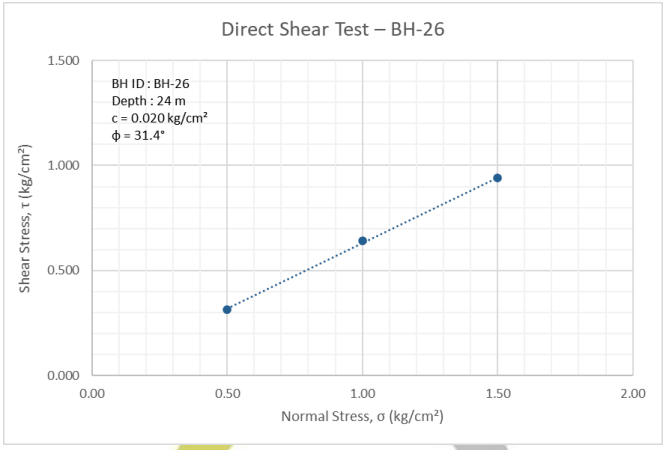

Direct Shear Test – BH-26
BH ID : BH-26
Depth : 9 m
c = 0.070 kg/cm²
ϕ = 25.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

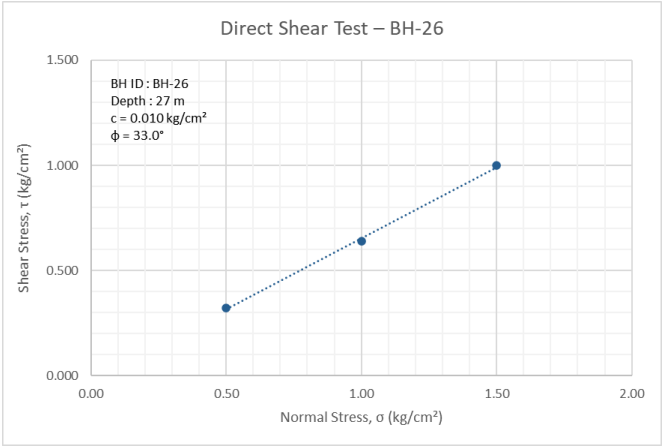

Direct Shear Test – BH-26
BH ID : BH-26
Depth : 12 m
c = 0.031 kg/cm²
ϕ = 28.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

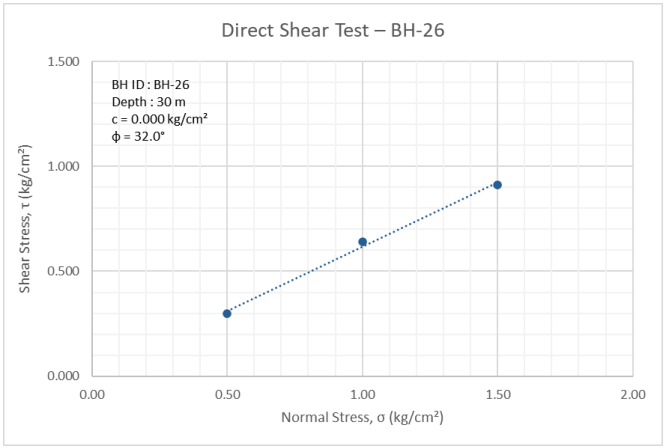

Direct Shear Test – BH-26
BH ID : BH-26
Depth : 15 m
c = 0.060 kg/cm²
ϕ = 26.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-26
BH ID : BH-26
Depth : 18 m
c = 0.088 kg/cm²
ϕ = 26.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-26
BH ID : BH-26
Depth : 21 m
c = 0.101 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-26
BH ID : BH-26
Depth : 24 m
c = 0.020 kg/cm²
ϕ = 31.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

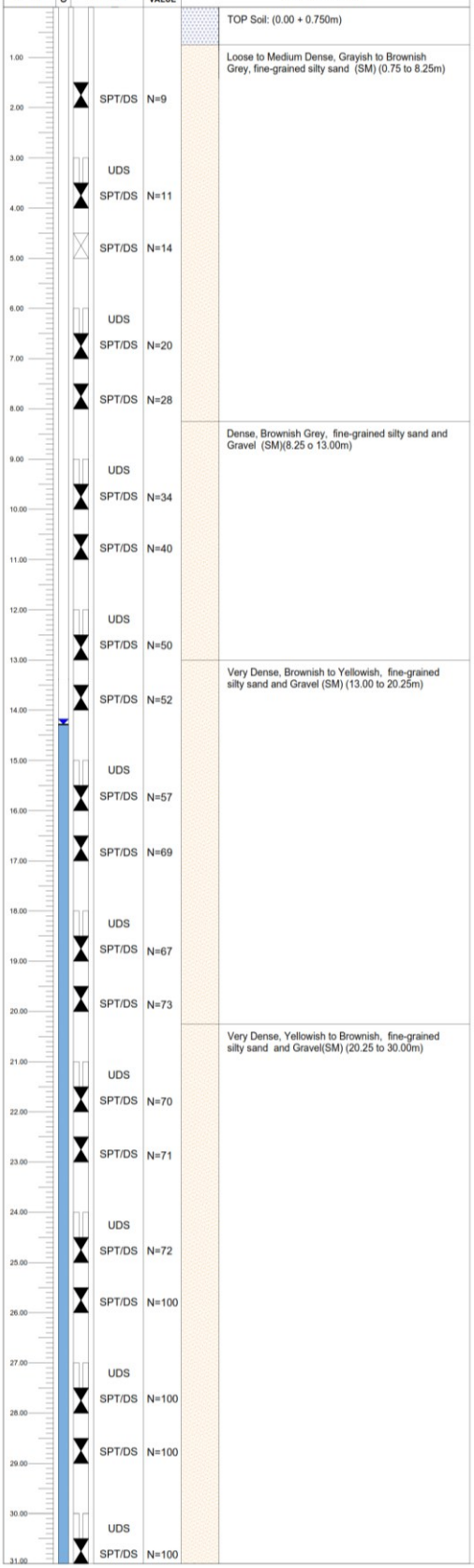

Direct Shear Test – BH-26
BH ID : BH-26
Depth : 27 m
c = 0.010 kg/cm²
ϕ = 33.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-26
BH ID : BH-26
Depth : 30 m
c = 0.000 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Noida Sector-142 to Botanical Garden (2+000 km TO 3+000 km)

BH ID : BH-27	**Chainage** : 3+205 KM
Groundwater Level : - 14.30M	**Location** : **Lat. 28.545705, Long. 77.33827**



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

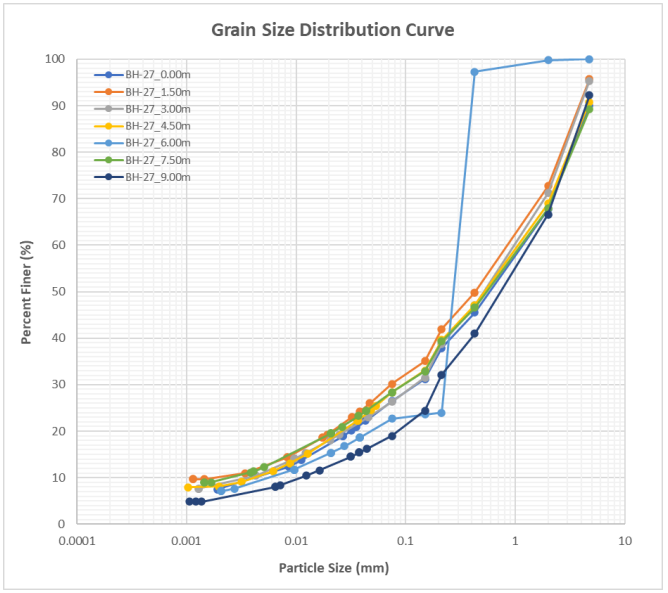
Soil

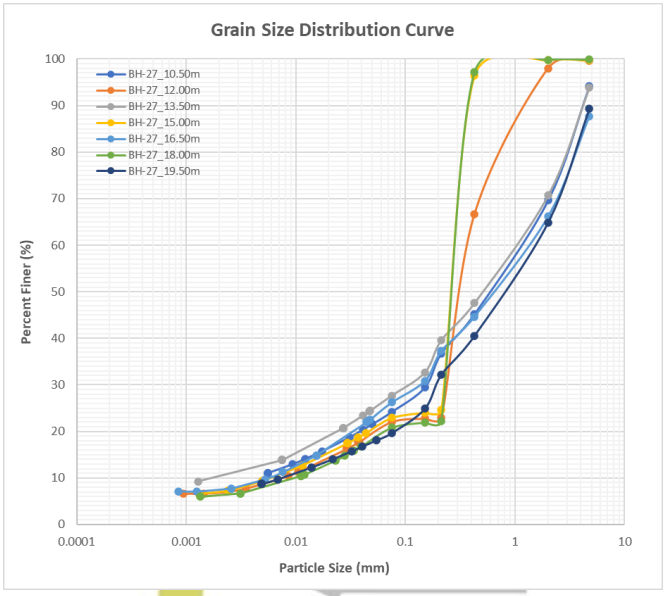
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

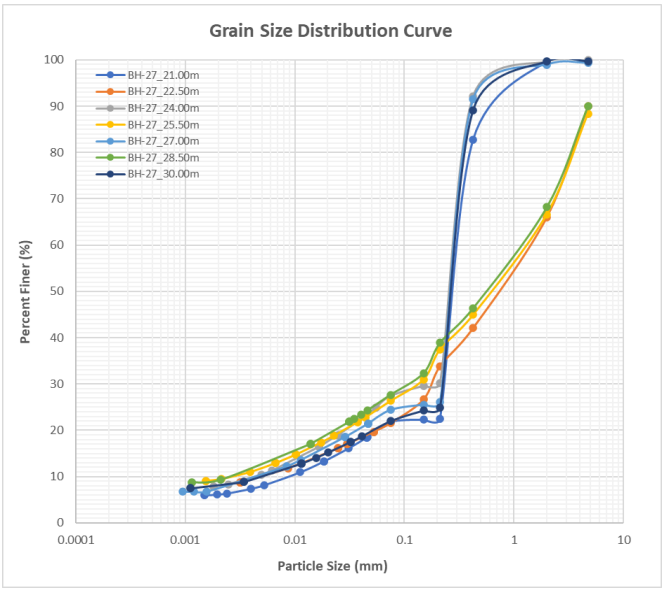
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-27	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	3+205	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	29-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	197.4	**End Date:**	30-01-2026
Project Code:	158_R4_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	14.30	**Location:**	Lat. 28.545705, Long. 77.33827

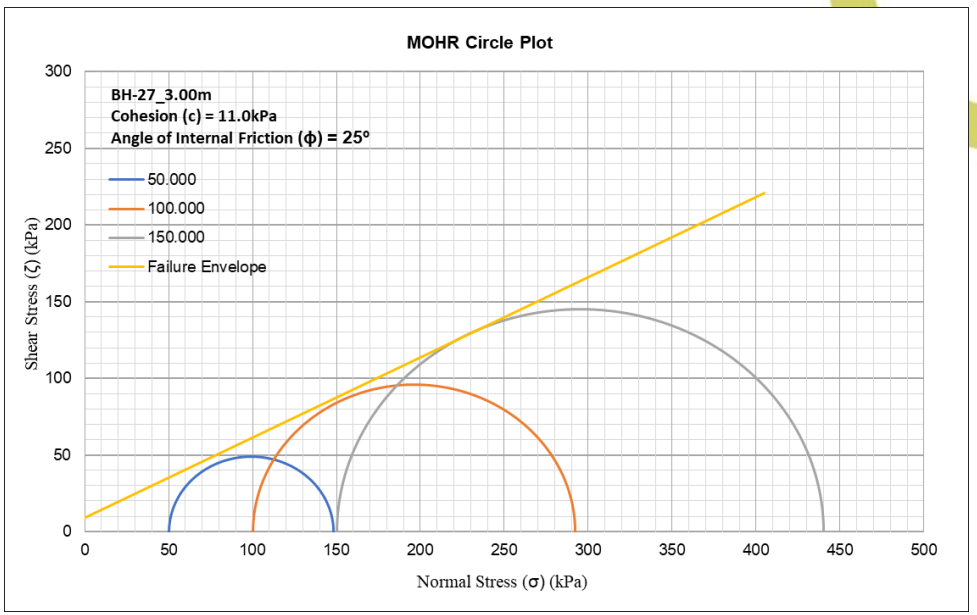
			SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
Depth [m]	Sample Type	Descriptions	N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						10.0	63.6	18.8	7.6	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Loose to Medium Dense, Grayish to Brownish Grey, fine-grained silty sand (SM)	3	4	5	9	13	4.3	65.5	20.0	10.2	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							4.7	6.0	17.7	8.7	26.0	NP	NP	11.6	1.8	1.65	2.7	F	0.0	22.0	UU	11.0	25.0	-	-	-
3.50	SPT/DS		3	5	6	11	12	-																			
4.50	SPT/DS		4	6	8	14	14	9.2	62.4	20.2	8.1	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	DS							0.0	77.3	14.8	7.9	23	NP	NP	12.36	-	-	2.69	F	0.05	25	-	-	-	-	-	-
6.50	SPT/DS		6	8	12	20	19	-																			
7.50	SPT/DS		8	13	15	28	26	10.8	60.8	18.9	9.5	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS	Dense, Brownish Grey, fine-grained silty sand and Gravel (SM)						7.8	73.3	13.3	5.6	22	NP	NP	15.87	1.9	1.60	2.70	F	0.03	27	UU	10.0	27.0	-	-	-
9.50	SPT/DS		14	16	18	34	29	-																			
10.50	SPT/DS		15	19	21	40	33	5.8	70.0	18.3	5.9	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							0.4	77.6	15.1	6.9	27	NP	NP	15.59	2.13	1.84	2.70	F	0.03	29	-	-	-	-	-	-
12.50	SPT/DS		21	24	26	50	38	-																			
13.50	SPT/DS	Very Dense, Brownish to Yellowish, fine-grained silty sand and Gravel (SM)	23	25	27	52	37	6.2	66.2	17.3	10.4	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS							0.2	76.8	15.9	7.1	21	NP	NP	13.49	-	-	2.73	F	0.11	29	-	-	-	-	-	-
15.50	SPT/DS		24	27	30	57	27	-																			
16.50	SPT/DS		26	33	36	69	30	12.3	61.5	18.7	7.5	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS							0.1	79.1	14.5	6.3	22	NP	NP	11.12	-	-	2.85	F	0.03	30	-	-	-	-	-	-
18.50	SPT/DS		30	32	35	67	29	-																			
19.50	SPT/DS		24	35	38	73	31	10.7	69.6	12.7	7.0	21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS	Very Dense, Yellowish to Brownish, fine-grained silty sand and Gravel(SM)						0.2	78.0	15.7	6.1	25	NP	NP	18.65	-	-	2.69	F	0.02	31	-	-	-	-	-	-
21.50	SPT/DS		25	34	36	70	29	-																			
22.50	SPT/DS		27	33	38	71	29	10.0	68.5	15.0	6.5	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							0.1	72.5	19.4	8.0	23	NP	NP	19.43	-	-	2.80	F	0.03	32	-	-	-	-	-	-
24.50	SPT/DS		30	35	37	72	29	-																			
25.50	SPT/DS		42	50	(50/6cm)	100	36	11.6	62.0	16.9	9.4	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							0.6	75.0	16.9	7.5	29	NP	NP	13.64	-	-	2.79	F	0.05	34	-	-	-	-	-	-
27.50	SPT/DS		40	(50/8cm)	-	100	35	-																			
28.50	SPT/DS		39	(50/10cm)	-	100	35	10.0	62.3	18.4	9.3	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							0.3	77.7	13.8	8.2	23	NP	NP	16.57	-	-	2.70	F	0.00	35	-	-	-	-	-	-
30.50	SPT/DS		37	(50/11cm)	-	100	34	-																			

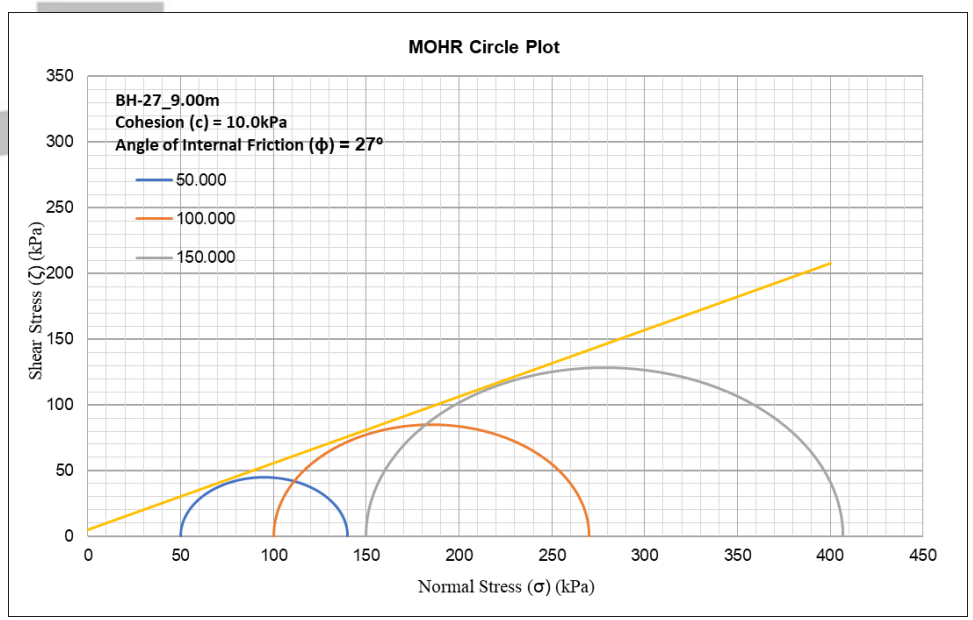
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

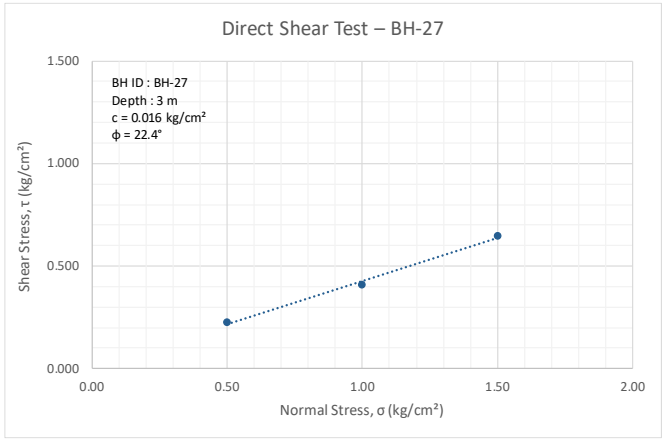

Grain Size Distribution Curve
BH-27_0.00m
BH-27_1.50m
BH-27_3.00m
BH-27_4.50m
BH-27_6.00m
BH-27_7.50m
BH-27_9.00m
Percent Finer (%)
Particle Size (mm)

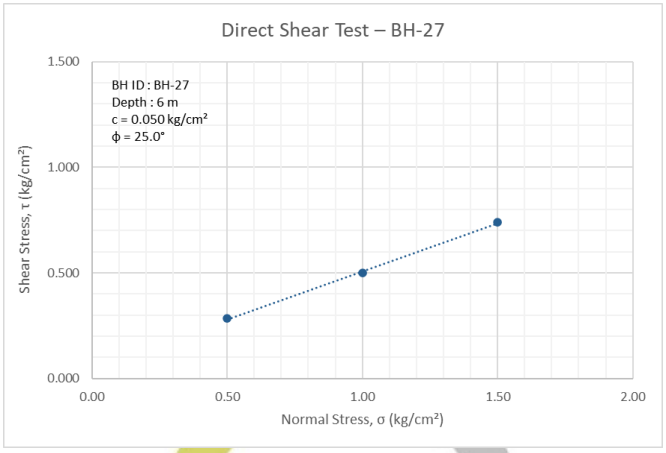

Grain Size Distribution Curve
BH-27_10.50m
BH-27_12.00m
BH-27_13.50m
BH-27_15.00m
BH-27_16.50m
BH-27_18.00m
BH-27_19.50m
Percent Finer (%)
Particle Size (mm)

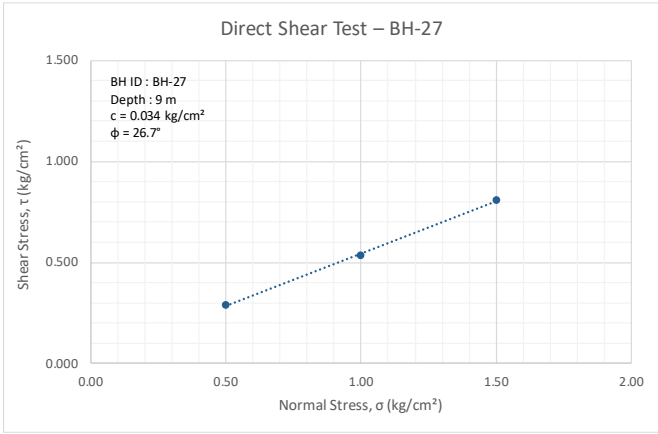

Grain Size Distribution Curve
BH-27_21.00m
BH-27_22.50m
BH-27_24.00m
BH-27_25.50m
BH-27_27.00m
BH-27_28.50m
BH-27_30.00m
Percent Finer (%)
Particle Size (mm)

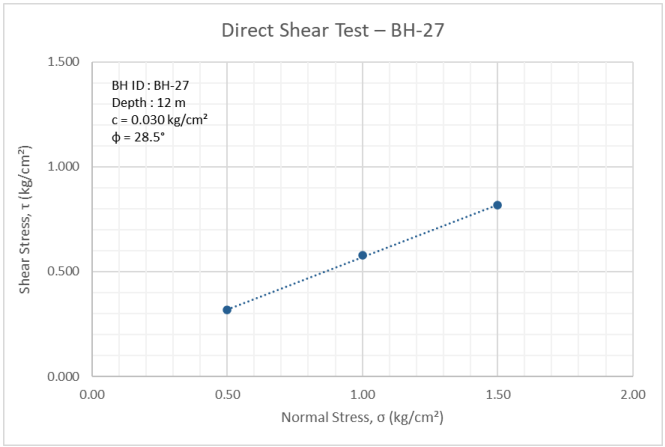

MOHR Circle Plot
BH-27_3.00m
Cohesion (c) = 11.0kPa
Angle of Internal Friction (ϕ) = 25°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

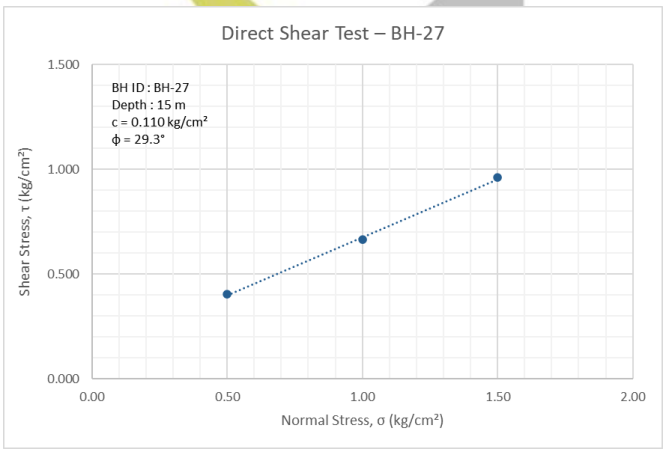

MOHR Circle Plot
BH-27_9.00m
Cohesion (c) = 10.0kPa
Angle of Internal Friction (ϕ) = 27°
50.000
100.000
150.000
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

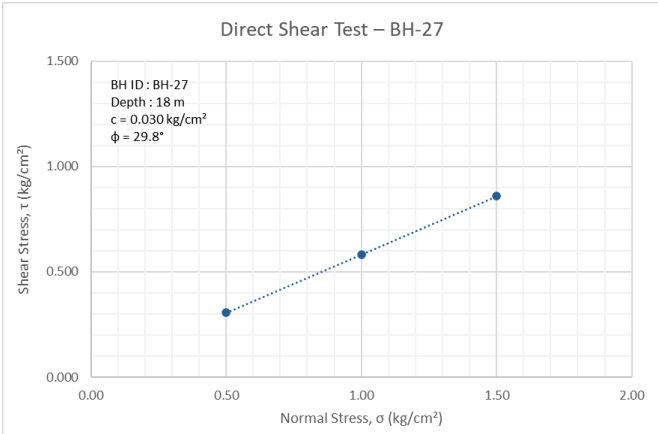

Direct Shear Test – BH-27
BH ID : BH-27
Depth : 3 m
c = 0.016 kg/cm²
ϕ = 22.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

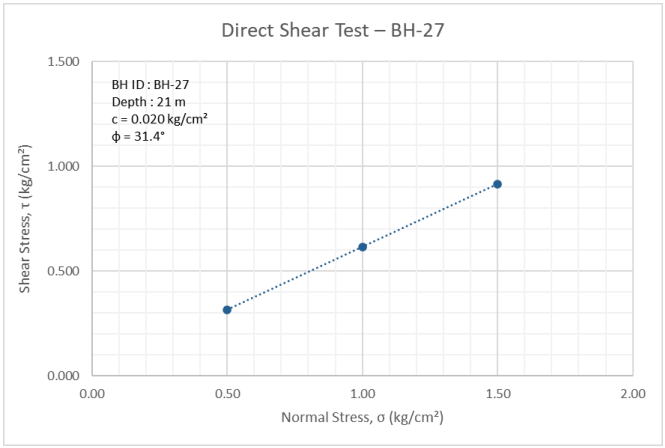

Direct Shear Test – BH-27
BH ID : BH-27
Depth : 6 m
c = 0.050 kg/cm²
ϕ = 25.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

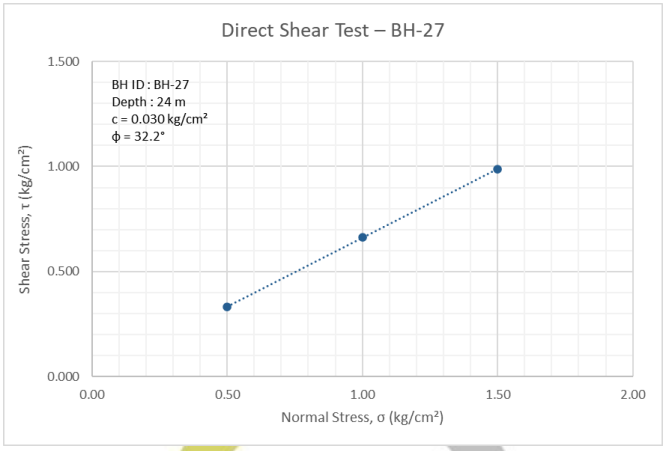

Direct Shear Test – BH-27
BH ID : BH-27
Depth : 9 m
c = 0.034 kg/cm²
ϕ = 26.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

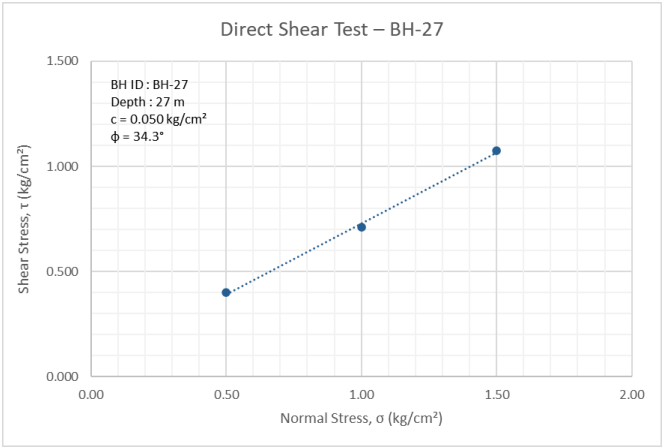

Direct Shear Test – BH-27
BH ID : BH-27
Depth : 12 m
c = 0.030 kg/cm²
ϕ = 28.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

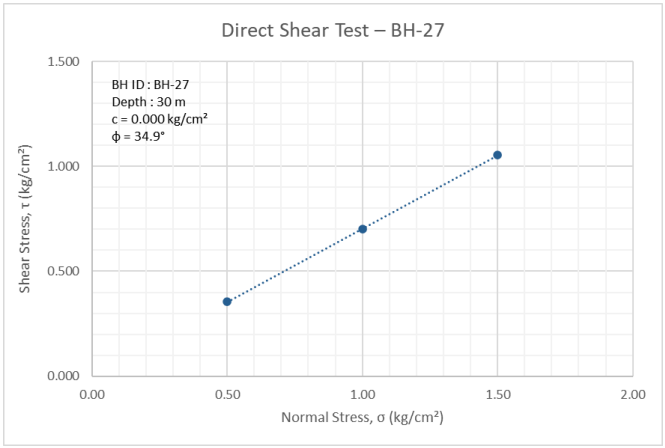

Direct Shear Test – BH-27
BH ID : BH-27
Depth : 15 m
c = 0.110 kg/cm²
ϕ = 29.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-27
BH ID : BH-27
Depth : 18 m
c = 0.030 kg/cm²
ϕ = 29.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-27
BH ID : BH-27
Depth : 21 m
c = 0.020 kg/cm²
ϕ = 31.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-27
BH ID : BH-27
Depth : 24 m
c = 0.030 kg/cm²
ϕ = 32.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-27
BH ID : BH-27
Depth : 27 m
c = 0.050 kg/cm²
ϕ = 34.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

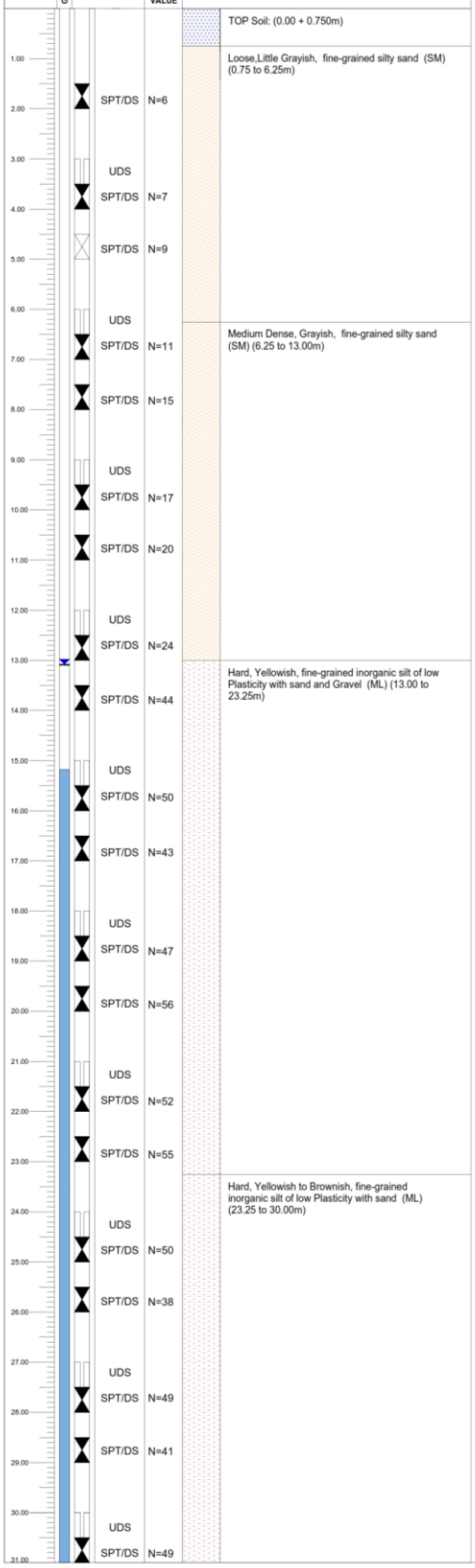

Direct Shear Test – BH-27
BH ID : BH-27
Depth : 30 m
c = 0.000 kg/cm²
ϕ = 34.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Noida Sector-142 to Botanical Garden (2+000 km TO 3+000 km)

BH ID : BH-28 | **Chainage** : 3+304 KM

Groundwater Level : - 13.10M | **Location** : **Lat. 28.545145, Long. 77.339078**



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

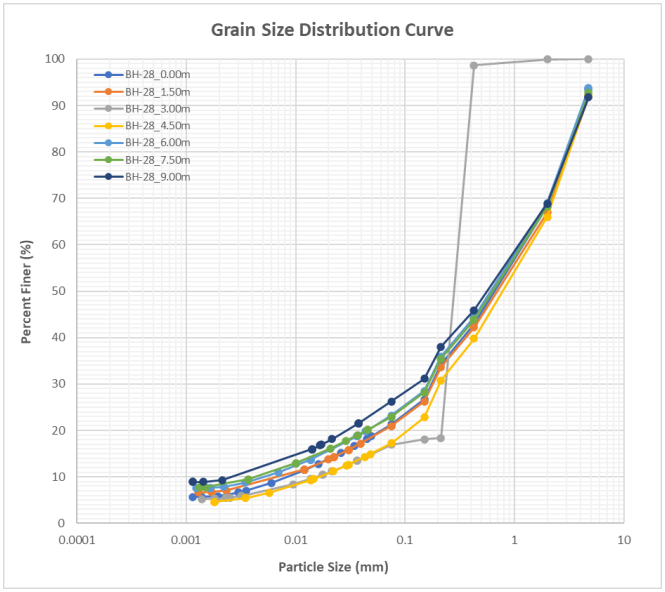
Soil

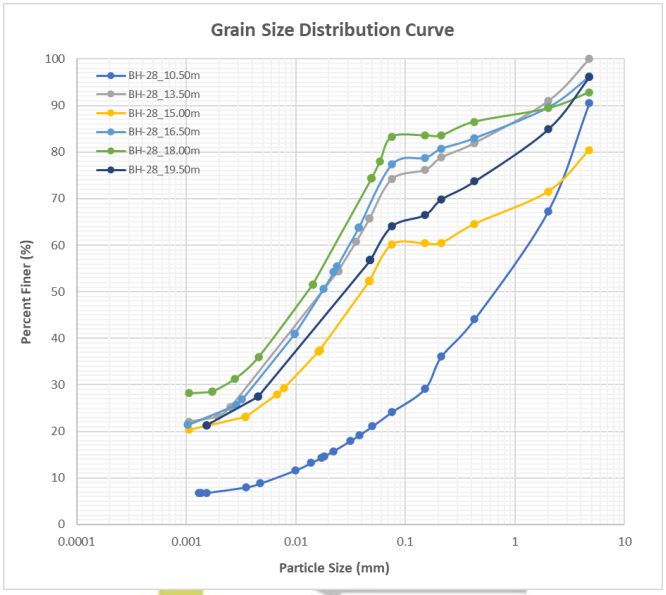
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

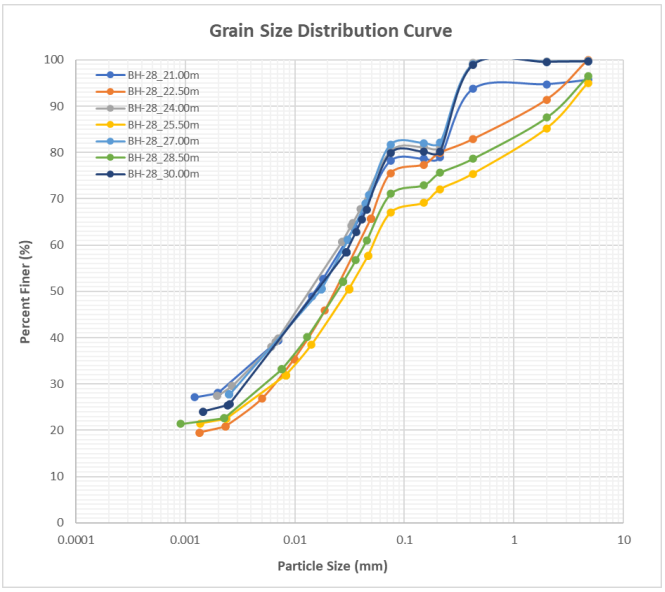
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-28	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	3+304	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	29-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	200.7	**End Date:**	30-01-2026
Project Code:	158_R4_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	13.10	**Location:**	Lat. 28.545145, Long. 77.339078

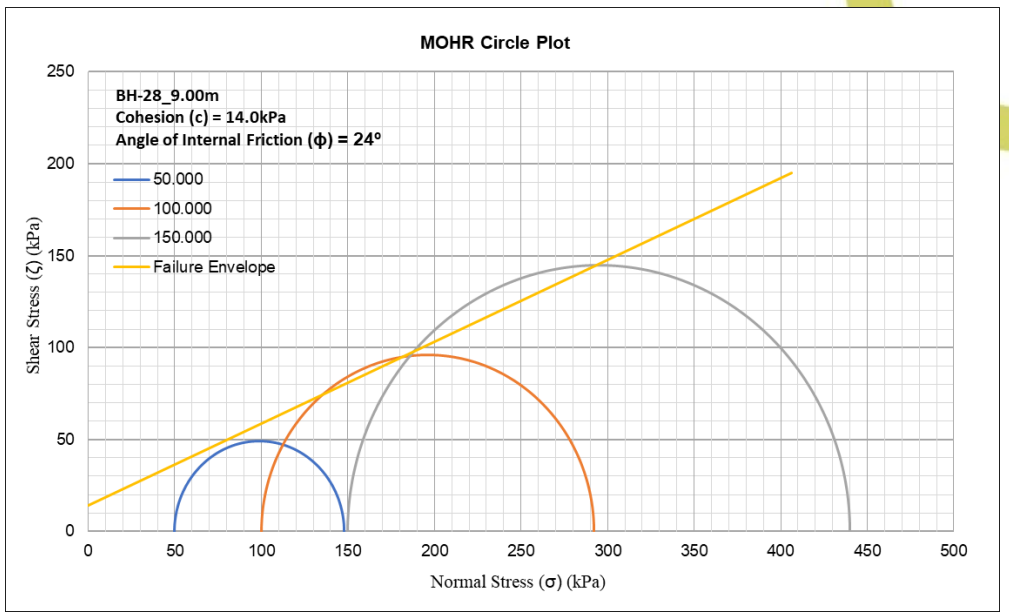
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						6.5	72.2	15.4	5.9	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Loose,Little Grayish, fine-grained silty sand (SM)	2	3	3	6	8	8.2	70.9	14.0	6.9	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	DS							0.0	83.0	11.6	5.3	29	NP	NP	5.02	-	-	2.76	F	0.01	22	-	-	-	-	-	-	-
3.50	SPT/DS		2	3	4	7	8	-																				
4.50	SPT/DS		3	4	5	9	9	7.8	75.0	12.5	4.8	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	DS							6.3	70.5	15.4	7.8	24	NP	NP	8.01	-	-	2.73	F	0.02	24	-	-	-	-	-	-	-
6.50	SPT/DS	Medium Dense, Grayish, fine-grained silty sand (SM)	4	5	6	11	10	-																				
7.50	SPT/DS		5	7	8	15	14	7.3	69.7	14.6	8.3	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS							8.2	65.6	17.0	9.2	22	NP	NP	11.23	1.8	1.65	2.68	F	0.03	25	UU	14.0	24.0	-	-	-	-
9.50	SPT/DS		6	8	9	17	15	-																				
10.50	SPT/DS		7	9	11	20	16	9.5	66.4	16.9	7.2	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							10.3	61.2	19.5	9.0	29	NP	NP	16.87	1.9	1.58	2.68	F	0.04	28	UU	13.0	26.0	-	-	-	-
12.50	SPT/DS		9	11	13	24	18	-																				
13.50	SPT/DS	Hard, Yellowish, fine-grained inorganic silt of low Plasticity with sand and Gravel (ML)	8	21	23	44	23	0.0	25.8	50.7	23.5	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS							19.5	20.3	38.3	21.9	21	NP	NP	22.08	-	-	2.75	F	0.12	27	-	-	-	-	-	-	-
15.50	SPT/DS		9	24	26	50	25	-																				
16.50	SPT/DS		10	18	25	43	22	3.8	18.9	53.2	24.2	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS							7.1	9.6	54.0	29.4	25	NP	NP	23.76	-	-	2.61	F	0.08	29	-	-	-	-	-	-	-
18.50	SPT/DS		12	20	27	47	23	-																				
19.50	SPT/DS		18	25	31	56	26	3.9	32.0	41.2	22.9	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS							4.3	17.5	50.2	28.0	28	NP	NP	18.02	-	-	2.66	F	0.05	30	-	-	-	-	-	-	-
21.50	SPT/DS		16	23	29	52	24	-																				
22.50	SPT/DS		10	20	35	55	24	0.0	24.5	55.1	20.4	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS	Hard, Yellowish to Brownish, fine-grained inorganic silt of low Plasticity with sand (ML)						0.2	19.4	52.8	27.5	21	NP	NP	21.06	-	-	2.62	F	0.12	30	-	-	-	-	-	-	-
24.50	SPT/DS		11	21	29	50	22	-																				
25.50	SPT/DS		9	17	21	38	19	5.0	28.0	44.8	22.2	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							0.3	17.9	54.0	27.8	24	NP	NP	23.24	-	-	2.62	F	0.04	32	-	-	-	-	-	-	-
27.50	SPT/DS		13	19	30	49	22	-																				
28.50	SPT/DS		8	17	24	41	19	3.5	25.4	48.6	22.4	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							0.3	19.8	55.0	24.9	23	NP	NP	22.08	-	-	2.67	F	0.08	33	-	-	-	-	-	-	-
30.50	SPT/DS		12	20	29	49	21	-																				

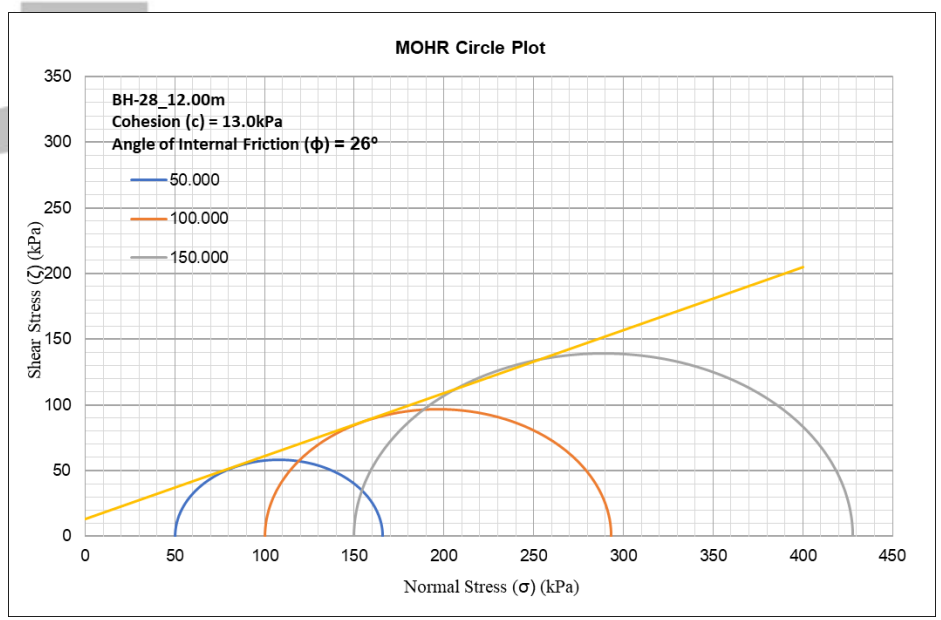
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

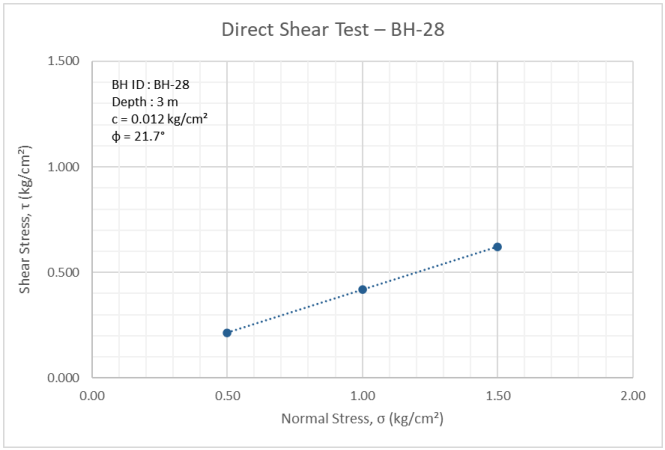

Grain Size Distribution Curve
BH-28_0.00m
BH-28_1.50m
BH-28_3.00m
BH-28_4.50m
BH-28_6.00m
BH-28_7.50m
BH-28_9.00m
Percent Finer (%)
Particle Size (mm)

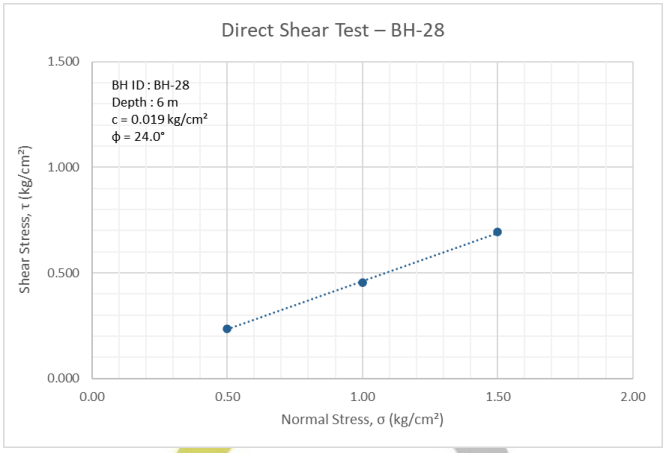

Grain Size Distribution Curve
BH-28_10.50m
BH-28_13.50m
BH-28_15.00m
BH-28_16.50m
BH-28_18.00m
BH-28_19.50m
Percent Finer (%)
Particle Size (mm)

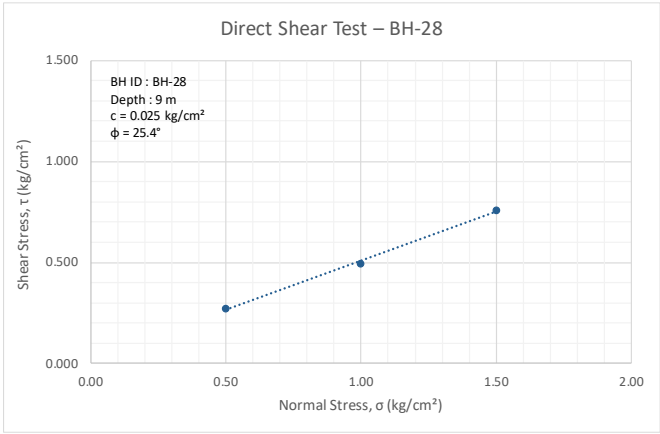

Grain Size Distribution Curve
BH-28_21.00m
BH-28_22.50m
BH-28_24.00m
BH-28_25.50m
BH-28_27.00m
BH-28_28.50m
BH-28_30.00m
Percent Finer (%)
Particle Size (mm)

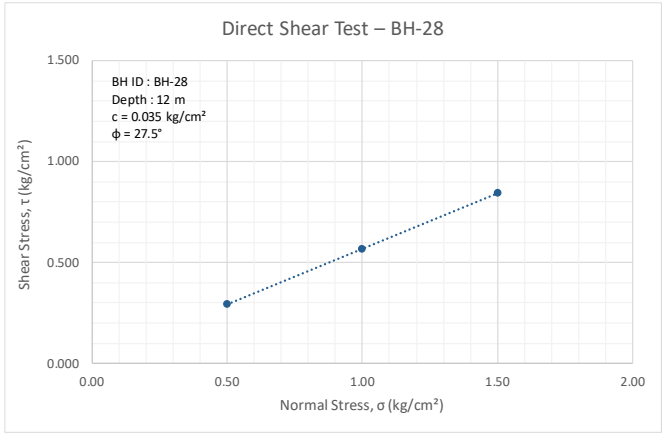

MOHR Circle Plot
BH-28_9.00m
Cohesion (c) = 14.0kPa
Angle of Internal Friction (ϕ) = 24°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

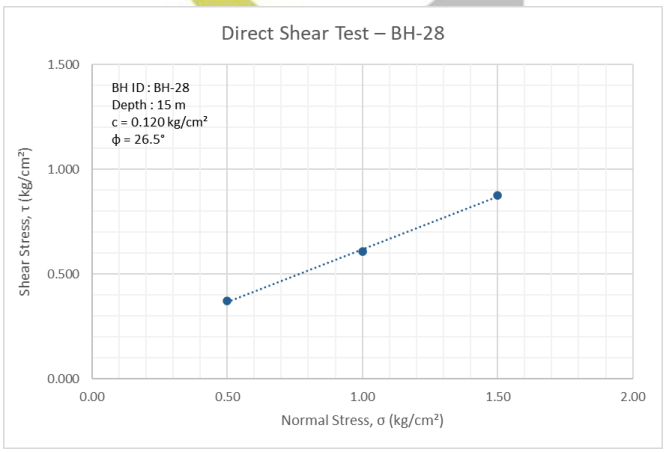

MOHR Circle Plot
BH-28_12.00m
Cohesion (c) = 13.0kPa
Angle of Internal Friction (ϕ) = 26°
50.000
100.000
150.000
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

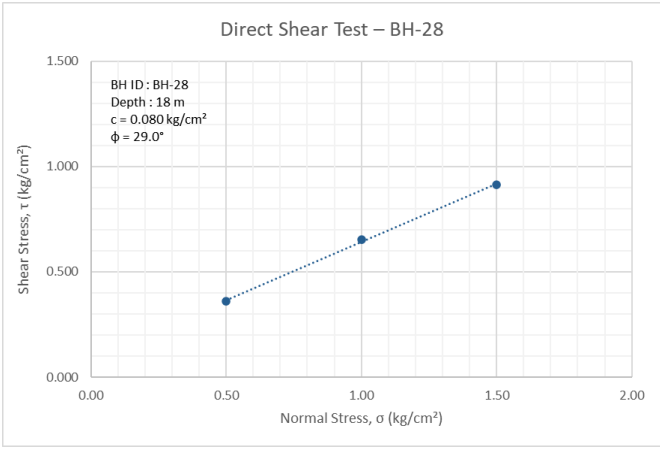

Direct Shear Test – BH-28
BH ID : BH-28
Depth : 3 m
c = 0.012 kg/cm²
ϕ = 21.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

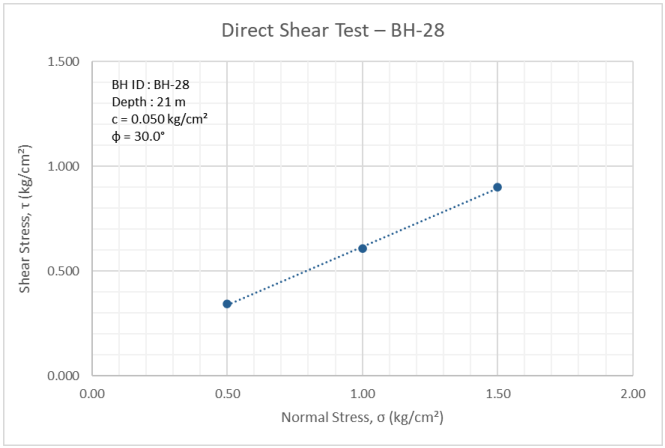

Direct Shear Test – BH-28
BH ID : BH-28
Depth : 6 m
c = 0.019 kg/cm²
ϕ = 24.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

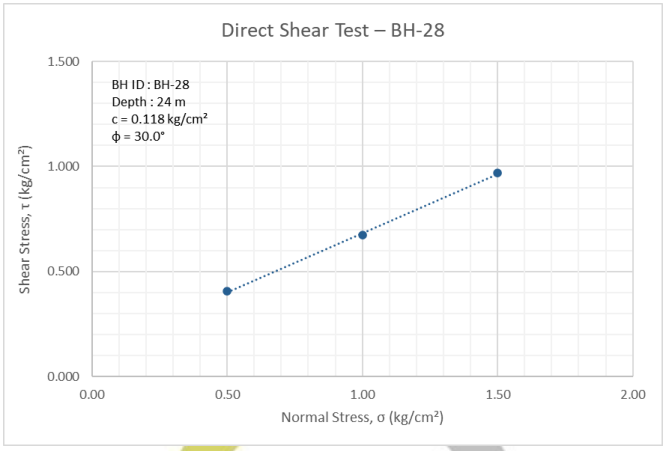

Direct Shear Test – BH-28
BH ID : BH-28
Depth : 9 m
c = 0.025 kg/cm²
ϕ = 25.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

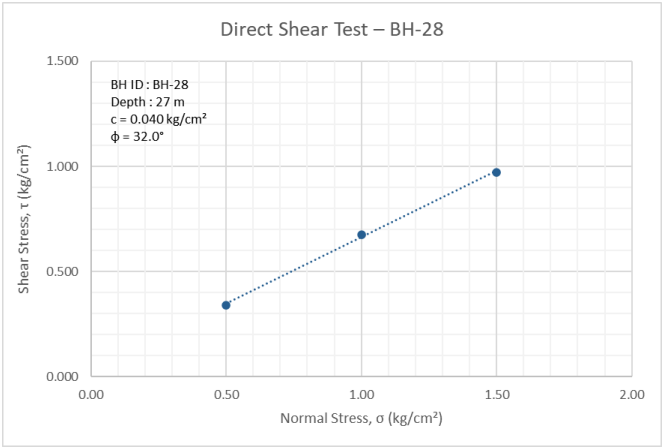

Direct Shear Test – BH-28
BH ID : BH-28
Depth : 12 m
c = 0.035 kg/cm²
ϕ = 27.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

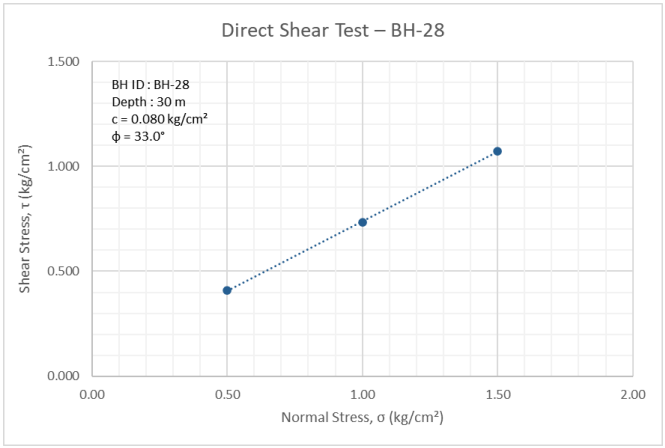

Direct Shear Test – BH-28
BH ID : BH-28
Depth : 15 m
c = 0.120 kg/cm²
ϕ = 26.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-28
BH ID : BH-28
Depth : 18 m
c = 0.080 kg/cm²
ϕ = 29.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-28
BH ID : BH-28
Depth : 21 m
c = 0.050 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-28
BH ID : BH-28
Depth : 24 m
c = 0.118 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-28
BH ID : BH-28
Depth : 27 m
c = 0.040 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

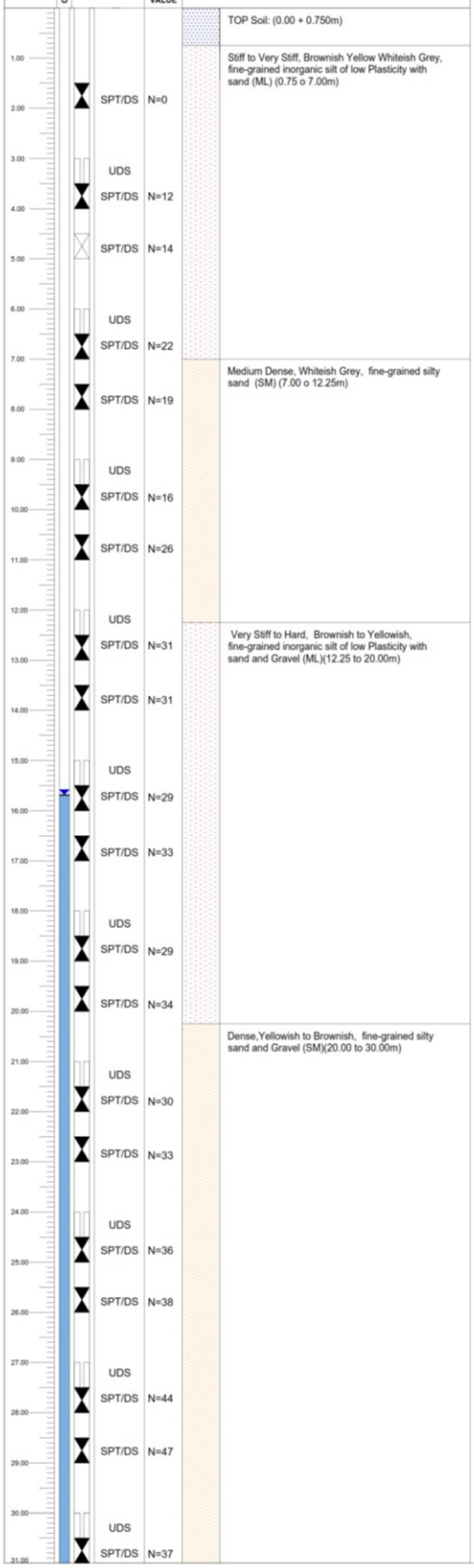

Direct Shear Test – BH-28
BH ID : BH-28
Depth : 30 m
c = 0.080 kg/cm²
ϕ = 33.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Noida Sector-142 to Botanical Garden (2+000 km TO 3+000 km)

BH ID : BH-28A | **Chainage** : 3+367 KM

Groundwater Level : - 15.70M | **Location** : **Lat. 28.544812, Long. 77.339591**



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

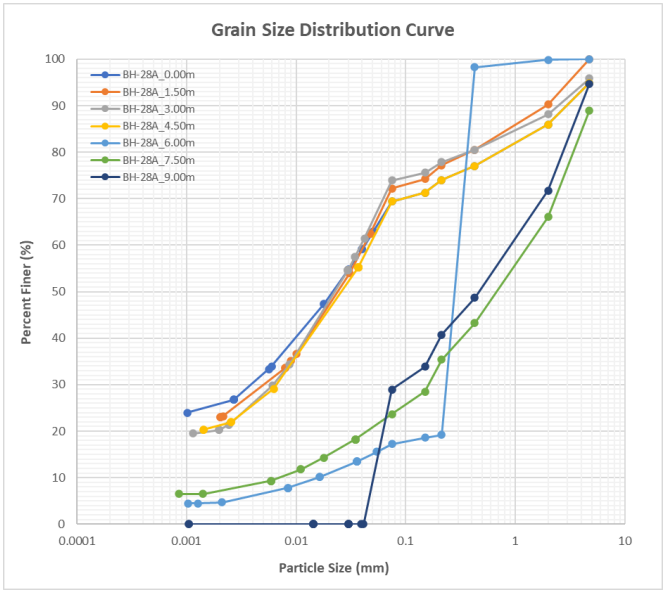
Soil

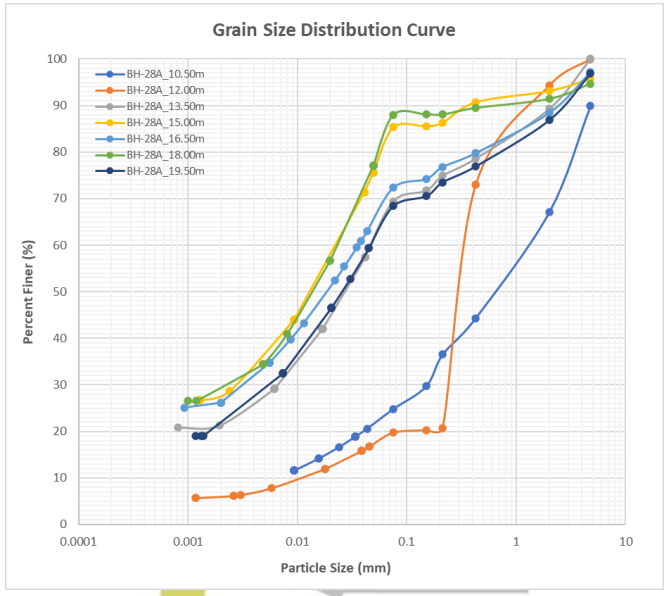
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

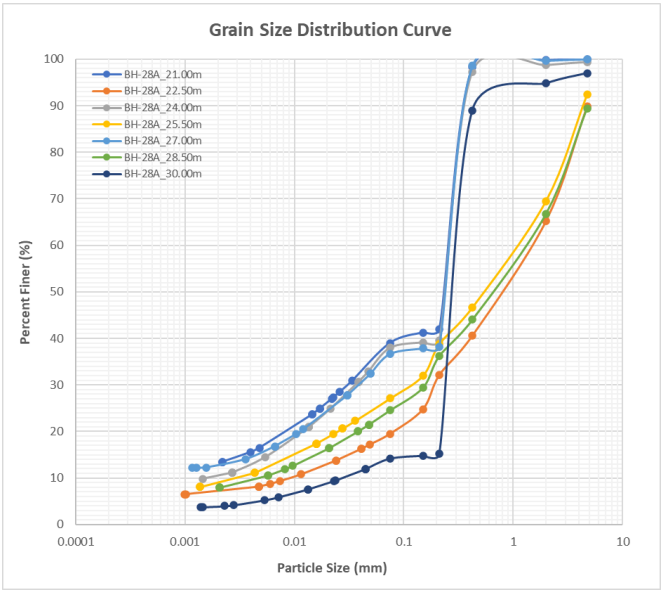
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-28A	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	3+367	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	29-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	201.2	**End Date:**	30-01-2026
Project Code:	158_R4_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	15.70	**Location:**	Lat. 28.544812, Long. 77.339591

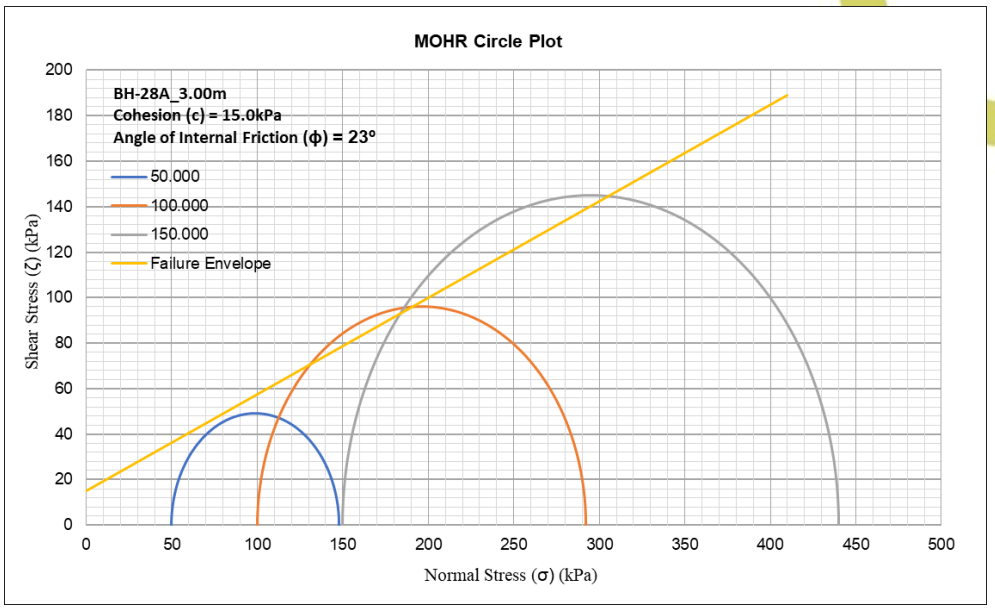
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						5.1	25.5	43.4	25.9	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Stiff to Very Stiff, Brownish Yellow Whiteish Grey, fine-grained inorganic silt of low Plasticity with sand (ML)						0.0	27.8	72.2	0.0	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							4.2	21.9	53.6	20.3	25	NP	NP	13.6	1.8	1.61	2.6	F	0.02	23.0	UU	15.0	23.0	-	-	-
3.50	SPT/DS		4	5	7	12	13	-																			
4.50	SPT/DS		5	6	8	14	14	5.1	25.5	48.1	21.3	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							0.0	82.8	48.1	21.3	24	NP	NP	15.96	1.83	1.58	2.67	F	0.04	26	-	-	-	-	-	-
6.50	SPT/DS		8	10	12	22	21	-																			
7.50	SPT/DS	Medium Dense, Whiteish Grey, fine-grained silty sand (SM)	7	9	10	19	17	11.0	65.4	16.4	7.2	21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS							6.1	67.9	18.00	8.0	28	NP	NP	12.86	1.79	1.58	2.68	F	0.03	25	-	-	-	-	-	-
9.50	SPT/DS		6	8	8	16	14	-																			
10.50	SPT/DS		5	10	16	26	21	10.1	65.1	24.8	0.0	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							0.0	80.2	13.8	6.0	24	NP	NP	15.50	1.84	1.59	2.70	F	0.04	28	UU	14.0	25.0	-	-	-
12.50	SPT/DS	Very Stiff to Hard, Brownish to Yellowish, fine-grained inorganic silt of low Plasticity with sand and Gravel (ML)	8	14	17	31	23	-																			
13.50	SPT/DS		6	11	20	31	22	0.0	30.6	48.0	21.5	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS							4.3	10.4	57.2	28.1	21	NP	NP	26.28	-	-	2.71	F	0.08	27	-	-	-	-	-	-
15.50	SPT/DS		9	14	15	29	19	-																			
16.50	SPT/DS		11	16	17	33	18	2.9	24.8	46.2	26.2	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS							5.3	6.7	58.5	29.5	24	NP	NP	29.22	-	-	2.66	F	0.05	29	-	-	-	-	-	-
18.50	SPT/DS		8	11	18	29	17	-																			
19.50	SPT/DS		10	13	21	34	18	3.2	28.4	46.4	22.0	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS	Dense,Yellowish to Brownish, fine-grained silty sand and Gravel (SM)						0.0	61.0	39.0	0.0	27	NP	NP	17.09	-	-	2.60	F	0.05	30	-	-	-	-	-	-
21.50	SPT/DS		8	14	16	30	16	-																			
22.50	SPT/DS		11	15	18	33	17	10.2	70.3	12.3	7.2	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							0.6	61.5	27.5	10.5	23	NP	NP	19.86	-	-	2.69	F	0.03	32	-	-	-	-	-	-
24.50	SPT/DS		8	16	20	36	18	-																			
25.50	SPT/DS		10	17	21	38	18	7.6	65.3	18.0	9.1	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							0.0	63.3	23.8	12.8	29	NP	NP	19.75	-	-	2.61	F	0.00	33	-	-	-	-	-	-
27.50	SPT/DS		12	20	24	44	19	-																			
28.50	SPT/DS		10	22	25	47	20	10.5	64.9	24.6	0.0	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							3.0	82.8	10.3	3.9	26	NP	NP	10.70	-	-	2.67	F	0.05	34	-	-	-	-	-	-
30.50	SPT/DS		9	15	22	37	17	-																			

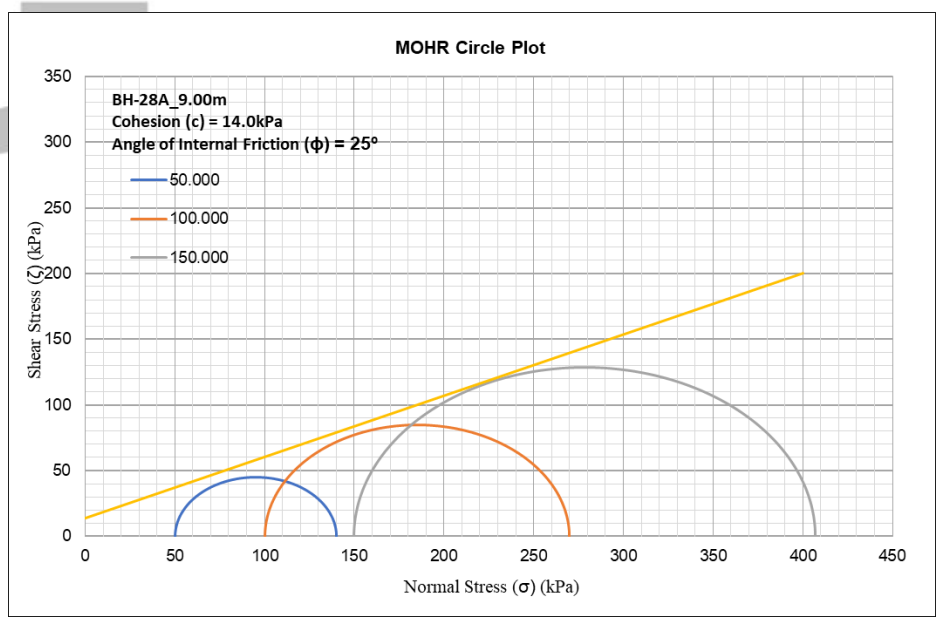
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

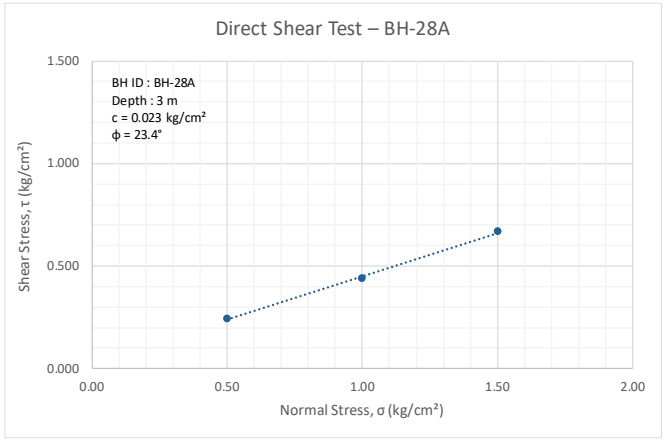

Grain Size Distribution Curve
BH-28A_0.00m
BH-28A_1.50m
BH-28A_3.00m
BH-28A_4.50m
BH-28A_6.00m
BH-28A_7.50m
BH-28A_9.00m
Percent Finer (%)
Particle Size (mm)

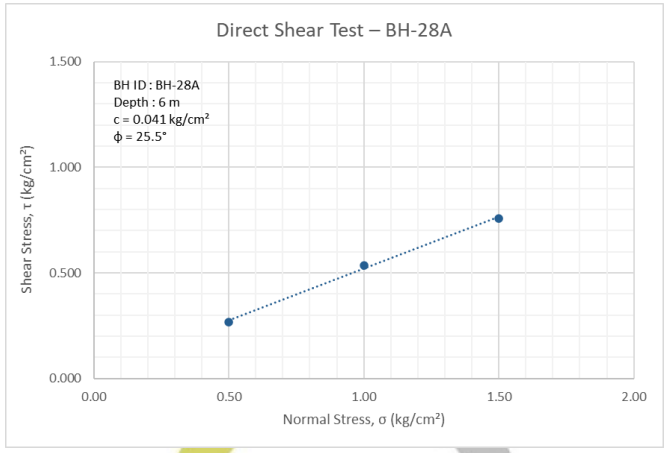

Grain Size Distribution Curve
BH-28A_10.50m
BH-28A_12.00m
BH-28A_13.50m
BH-28A_15.00m
BH-28A_16.50m
BH-28A_18.00m
BH-28A_19.50m
Percent Finer (%)
Particle Size (mm)

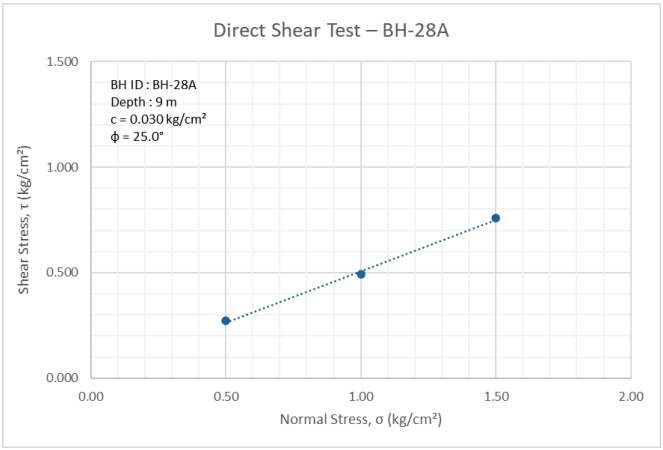

Grain Size Distribution Curve
BH-28A_21.00m
BH-28A_22.50m
BH-28A_24.00m
BH-28A_25.50m
BH-28A_27.00m
BH-28A_28.50m
BH-28A_30.00m
Percent Finer (%)
Particle Size (mm)

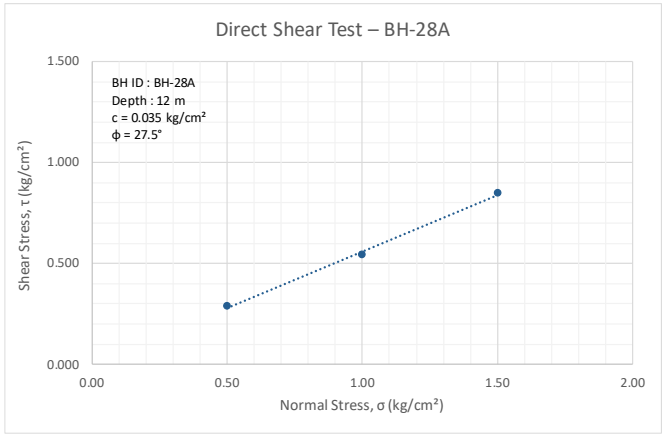

MOHR Circle Plot
BH-28A_3.00m
Cohesion (c) = 15.0kPa
Angle of Internal Friction (ϕ) = 23°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

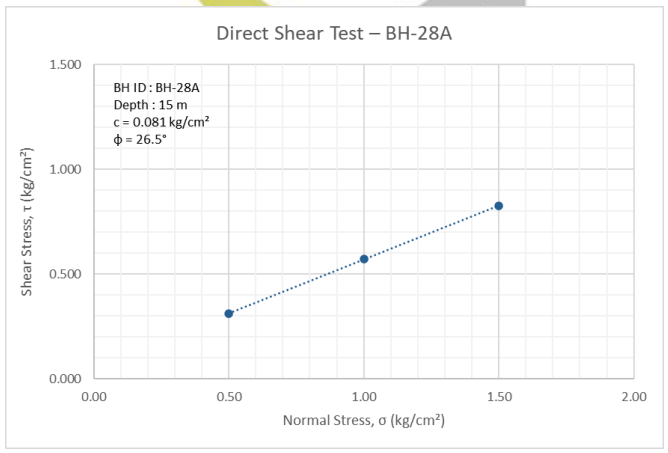

MOHR Circle Plot
BH-28A_9.00m
Cohesion (c) = 14.0kPa
Angle of Internal Friction (ϕ) = 25°
50.000
100.000
150.000
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

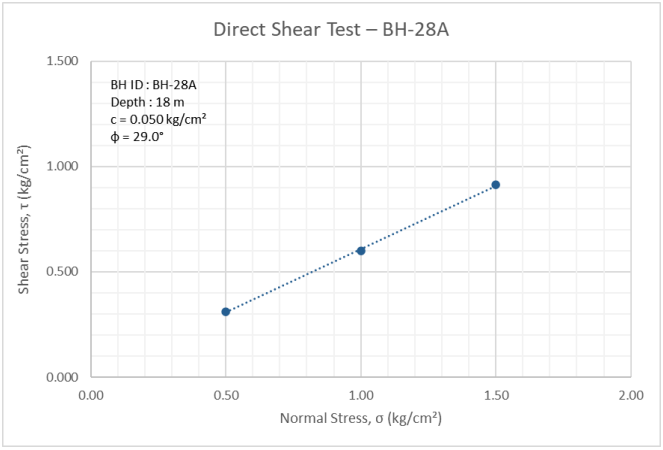

Direct Shear Test – BH-28A
BH ID : BH-28A
Depth : 3 m
c = 0.023 kg/cm²
ϕ = 23.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

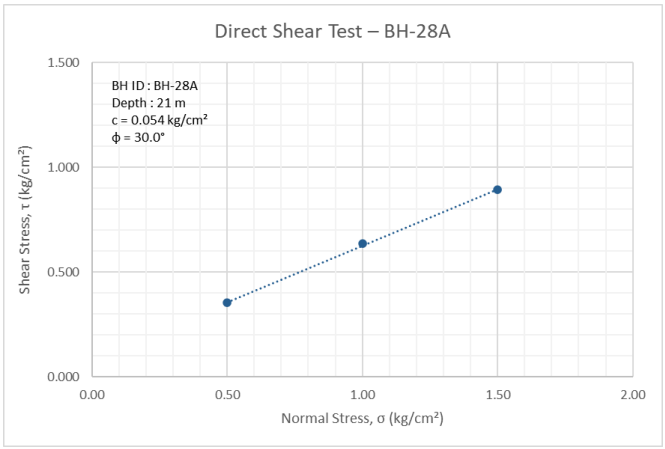

Direct Shear Test – BH-28A
BH ID : BH-28A
Depth : 6 m
c = 0.041 kg/cm²
ϕ = 25.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

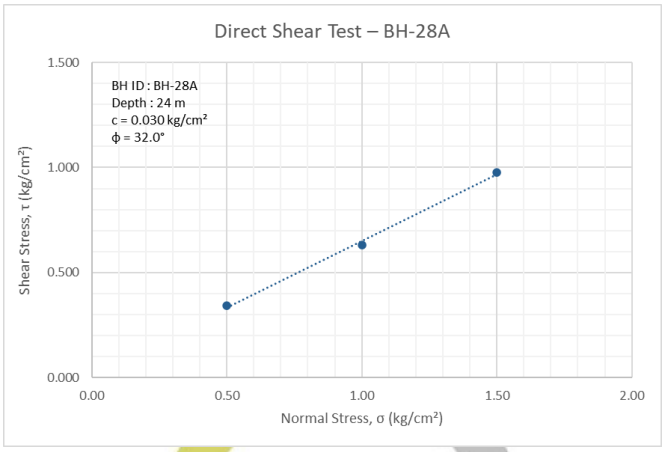

Direct Shear Test – BH-28A
BH ID : BH-28A
Depth : 9 m
c = 0.030 kg/cm²
ϕ = 25.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

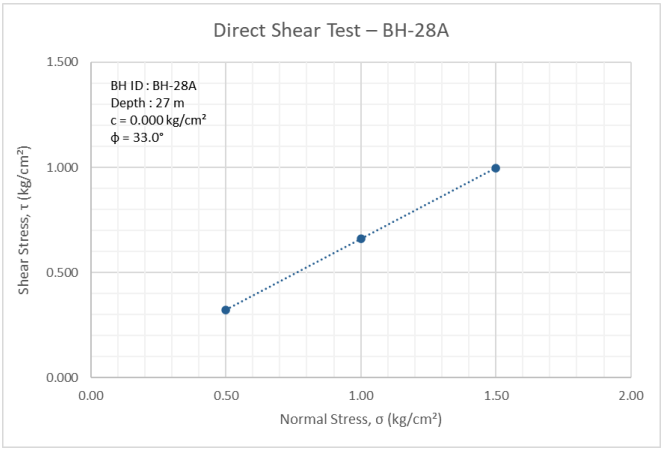

Direct Shear Test – BH-28A
BH ID : BH-28A
Depth : 12 m
c = 0.035 kg/cm²
ϕ = 27.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

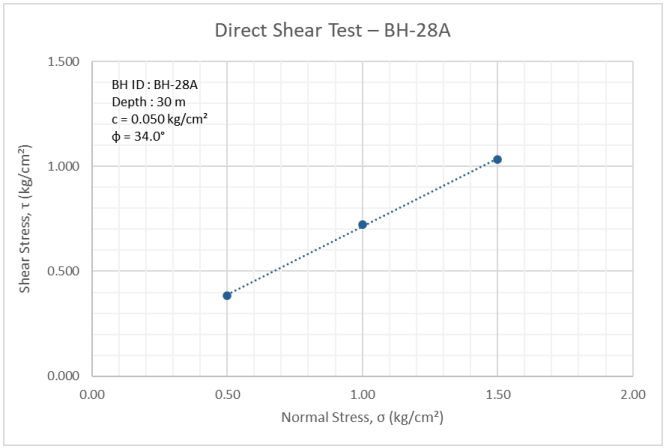

Direct Shear Test – BH-28A
BH ID : BH-28A
Depth : 15 m
c = 0.081 kg/cm²
ϕ = 26.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-28A
BH ID : BH-28A
Depth : 18 m
c = 0.050 kg/cm²
ϕ = 29.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-28A
BH ID : BH-28A
Depth : 21 m
c = 0.054 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-28A
BH ID : BH-28A
Depth : 24 m
c = 0.030 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

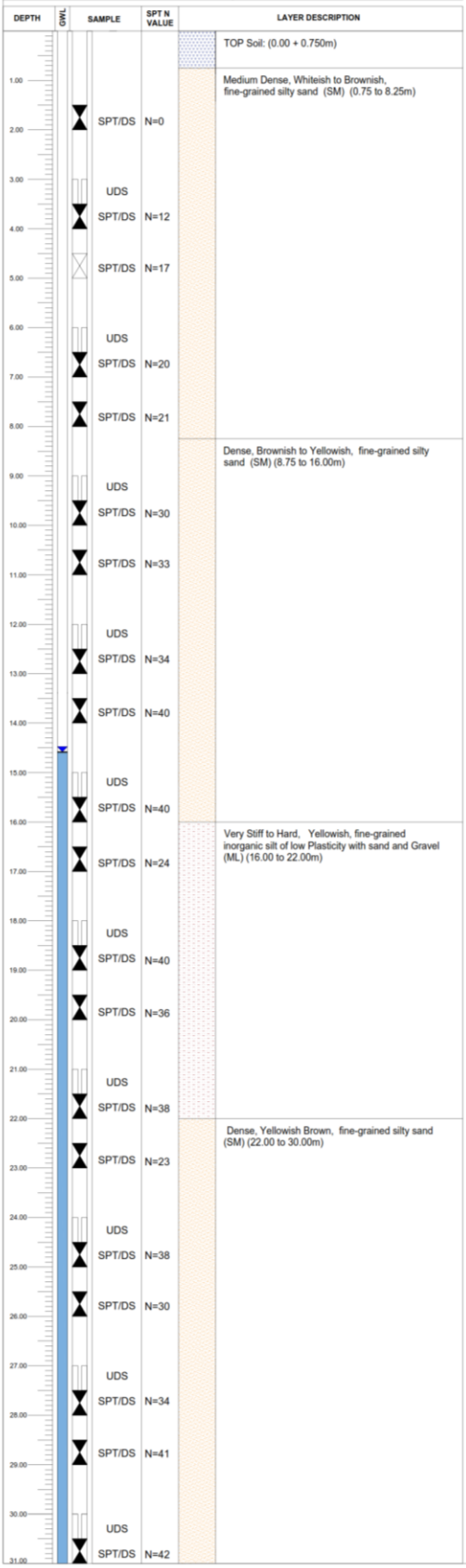

Direct Shear Test – BH-28A
BH ID : BH-28A
Depth : 27 m
c = 0.000 kg/cm²
ϕ = 33.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-28A
BH ID : BH-28A
Depth : 30 m
c = 0.050 kg/cm²
ϕ = 34.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Noida Sector-142 to Botanical Garden (2+000 km TO 3+000 km)

BH ID : BH-29	**Chainage** : 3+391 KM
Groundwater Level : - 14.60M	**Location** : **Lat. 28.54463, Long. 77.33975**



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

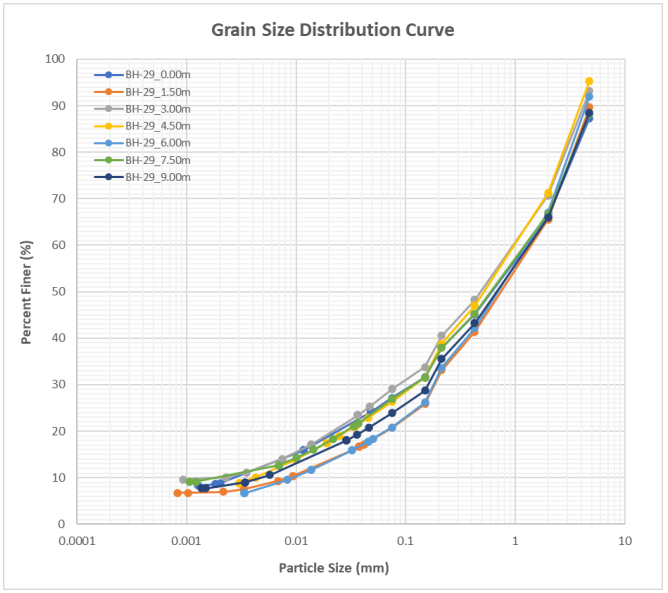
Soil

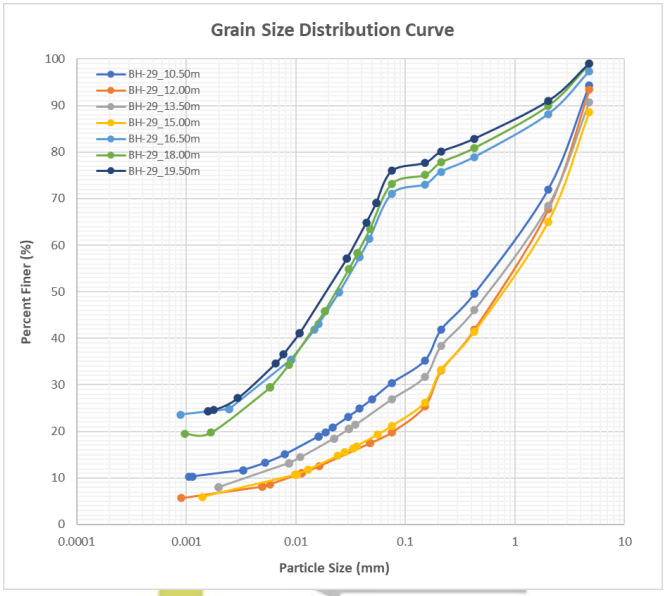
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

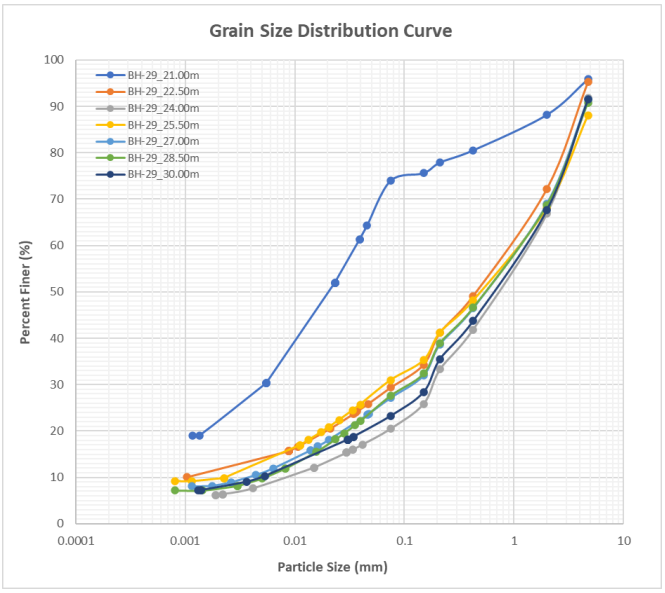
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-29	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	3+391	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	27-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	200.5	**End Date:**	28-01-2026
Project Code:	158_R4_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	14.60	**Location:**	Lat. 28.54463, Long. 77.33975

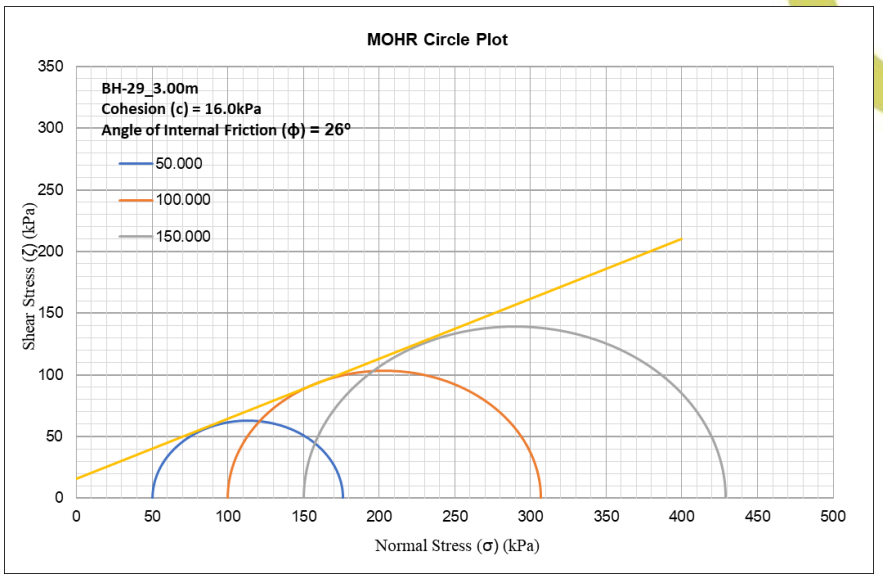
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						12.7	60.2	18.3	8.8	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Medium Dense, Whiteish to Brownish, fine-grained silty sand (SM)						10.3	69.0	13.8	6.9	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							6.9	64.1	19.0	10.0	28	NP	NP	11.4	1.9	1.69	2.6	F	0.0	23.0	UU	16.0	26.0	-	-	-
3.50	SPT/DS		4	6	6	12	13	-																			
4.50	SPT/DS		5	8	9	17	17	4.7	69.0	19.3	7.1	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							8.0	71.2	14.7	6.1	23	NP	NP	7.89	1.80	1.67	2.62	F	0.05	26	-	-	-	-	-	-
6.50	SPT/DS		6	10	10	20	19	-																			
7.50	SPT/DS		4	9	12	21	19	11.8	61.3	16.8	10.1	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS							11.5	64.6	15.8	8.1	24	NP	NP	9.25	1.8	1.68	2.63	F	0.03	27	UU	13.0	24.0	-	-	-
9.50	SPT/DS		6	12	18	30	26	-																			
10.50	SPT/DS		7	11	22	33	27	5.6	64.0	19.4	11.0	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	DS	Dense, Brownish to Yellowish, fine-grained silty sand (SM)						6.6	73.6	13.0	6.8	26	NP	NP	15.55	-	-	2.77	F	0.04	29	-	-	-	-	-	-
12.50	SPT/DS		8	14	20	34	26	-																			
13.50	SPT/DS		10	16	24	40	29	9.2	63.9	18.8	8.1	21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS							11.4	67.5	14.4	6.8	28	NP	NP	17.63	-	-	2.67	F	0.00	30	-	-	-	-	-	-
15.50	SPT/DS		10	16	24	40	21	-																			
16.50	SPT/DS	Very Stiff to Hard, Yellowish, fine-grained inorganic silt of low Plasticity with sand and Gravel (ML)	8	10	14	24	15	2.6	26.3	46.5	24.6	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS							1.0	25.8	52.1	21.1	24	NP	NP	23.07	-	-	2.73	F	0.07	27	-	-	-	-	-	-
18.50	SPT/DS		8	16	24	40	20	-																			
19.50	SPT/DS		9	15	21	36	19	1.0	23.1	50.8	25.2	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS							4.2	21.9	51.8	22.2	24	NP	NP	17.69	-	-	2.66	F	0.10	28	-	-	-	-	-	-
21.50	SPT/DS		11	18	20	38	19	-																			
22.50	SPT/DS	Dense, Yellowish Brown, fine-grained silty sand (SM)	8	10	13	23	14	4.8	65.9	17.6	11.8	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							8.2	71.3	14.2	6.3	29	NP	NP	23.71	-	-	2.60	F	0.02	30	-	-	-	-	-	-
24.50	SPT/DS		9	17	21	38	19	-																			
25.50	SPT/DS		11	14	16	30	16	11.9	57.1	21.2	9.7	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							8.5	64.3	18.7	8.4	23	NP	NP	21.46	-	-	2.69	F	0.00	33	-	-	-	-	-	-
27.50	SPT/DS		12	16	18	34	17	-																			
28.50	SPT/DS		16	20	21	41	19	9.2	63.1	20.0	7.7	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							8.5	68.2	15.3	7.9	21	NP	NP	20.81	-	-	2.60	F	0.03	34	-	-	-	-	-	-
30.50	SPT/DS		18	20	22	42	18	-																			

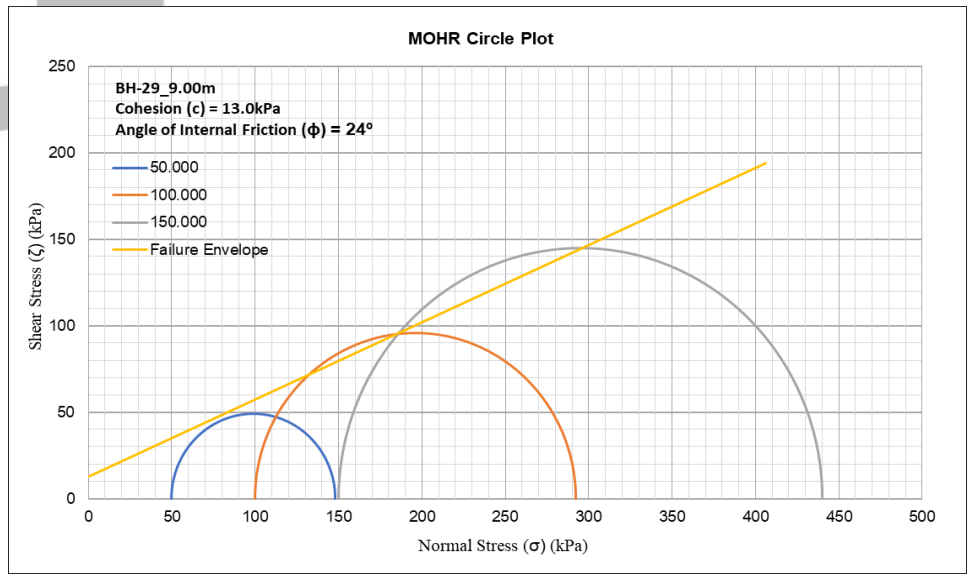
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

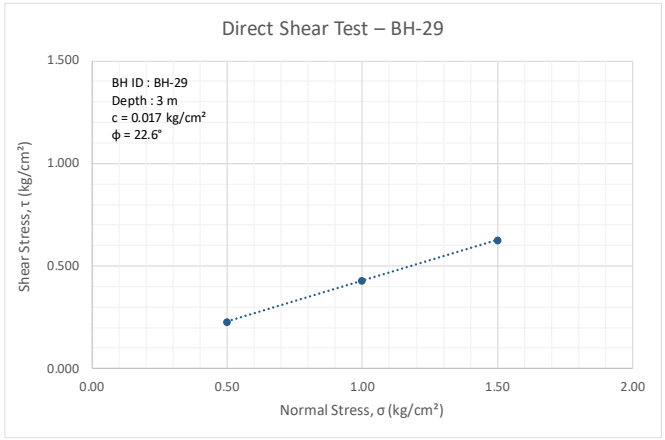

Grain Size Distribution Curve
BH-29_0.00m
BH-29_1.50m
BH-29_3.00m
BH-29_4.50m
BH-29_6.00m
BH-29_7.50m
BH-29_9.00m
Percent Finer (%)
Particle Size (mm)

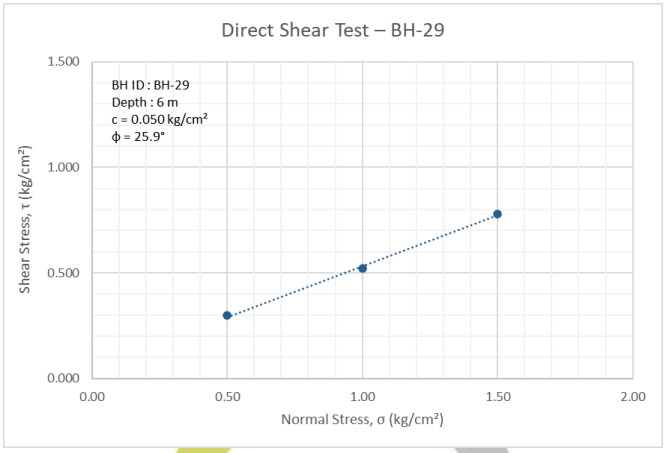

Grain Size Distribution Curve
BH-29_10.50m
BH-29_12.00m
BH-29_13.50m
BH-29_15.00m
BH-29_16.50m
BH-29_18.00m
BH-29_19.50m
Percent Finer (%)
Particle Size (mm)

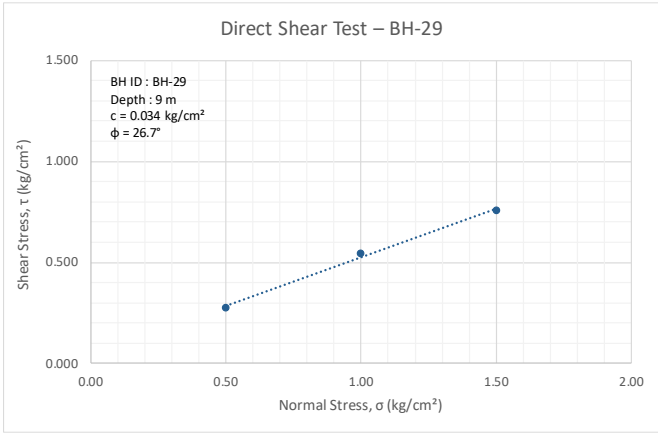

Grain Size Distribution Curve
BH-29_21.00m
BH-29_22.50m
BH-29_24.00m
BH-29_25.50m
BH-29_27.00m
BH-29_28.50m
BH-29_30.00m
Percent Finer (%)
Particle Size (mm)

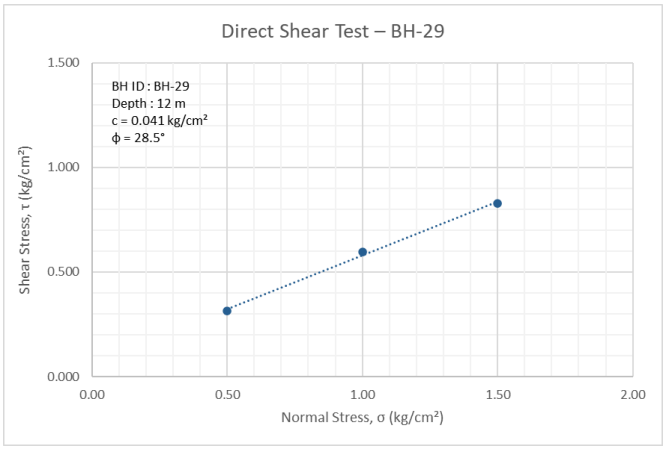

MOHR Circle Plot
BH-29_3.00m
Cohesion (c) = 16.0kPa
Angle of Internal Friction (ϕ) = 26°
50.000
100.000
150.000
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

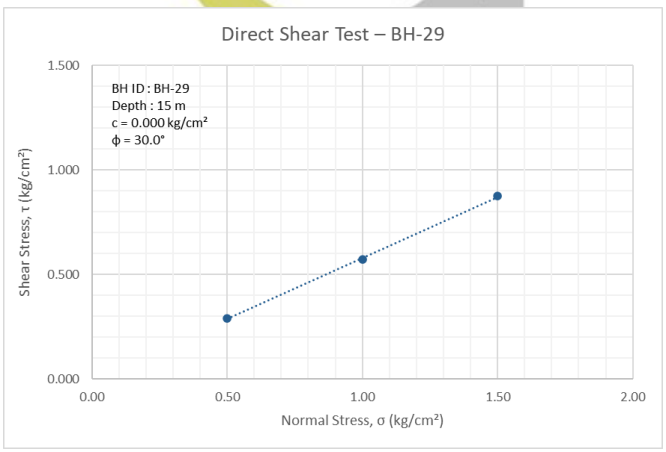

MOHR Circle Plot
BH-29_9.00m
Cohesion (c) = 13.0kPa
Angle of Internal Friction (ϕ) = 24°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

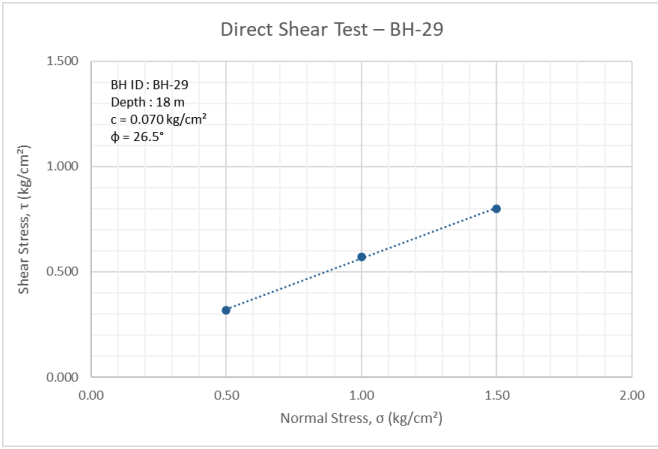

Direct Shear Test – BH-29
BH ID : BH-29
Depth : 3 m
c = 0.017 kg/cm²
ϕ = 22.6°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

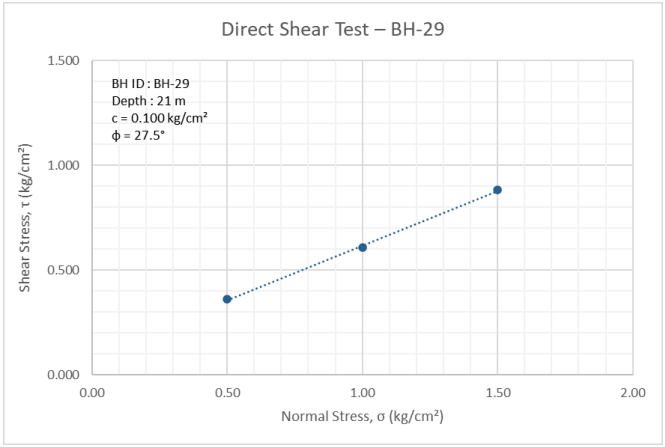

Direct Shear Test – BH-29
BH ID : BH-29
Depth : 6 m
c = 0.050 kg/cm²
ϕ = 25.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

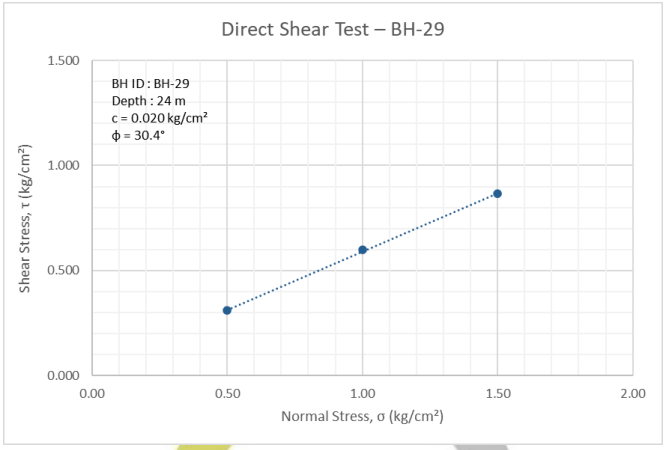

Direct Shear Test – BH-29
BH ID : BH-29
Depth : 9 m
c = 0.034 kg/cm²
ϕ = 26.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

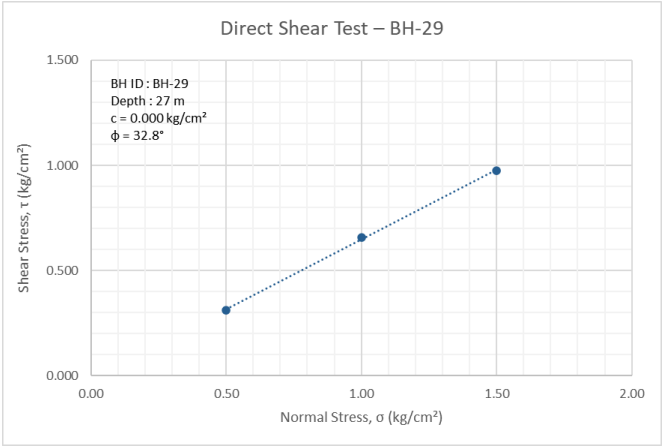

Direct Shear Test – BH-29
BH ID : BH-29
Depth : 12 m
c = 0.041 kg/cm²
ϕ = 28.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

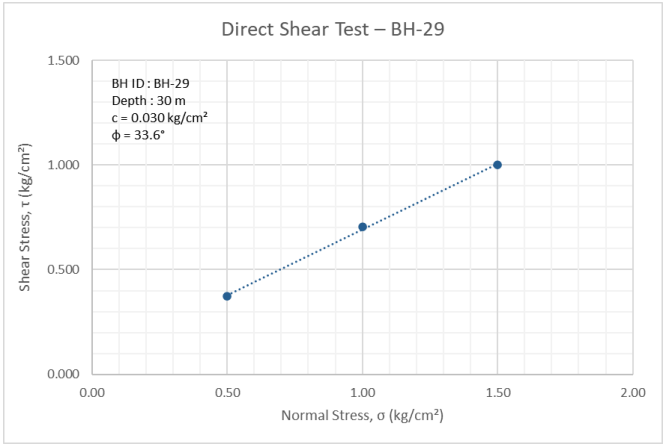

Direct Shear Test – BH-29
BH ID : BH-29
Depth : 15 m
c = 0.000 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-29
BH ID : BH-29
Depth : 18 m
c = 0.070 kg/cm²
ϕ = 26.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-29
BH ID : BH-29
Depth : 21 m
c = 0.100 kg/cm²
ϕ = 27.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-29
BH ID : BH-29
Depth : 24 m
c = 0.020 kg/cm²
ϕ = 30.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-29
BH ID : BH-29
Depth : 27 m
c = 0.000 kg/cm²
ϕ = 32.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

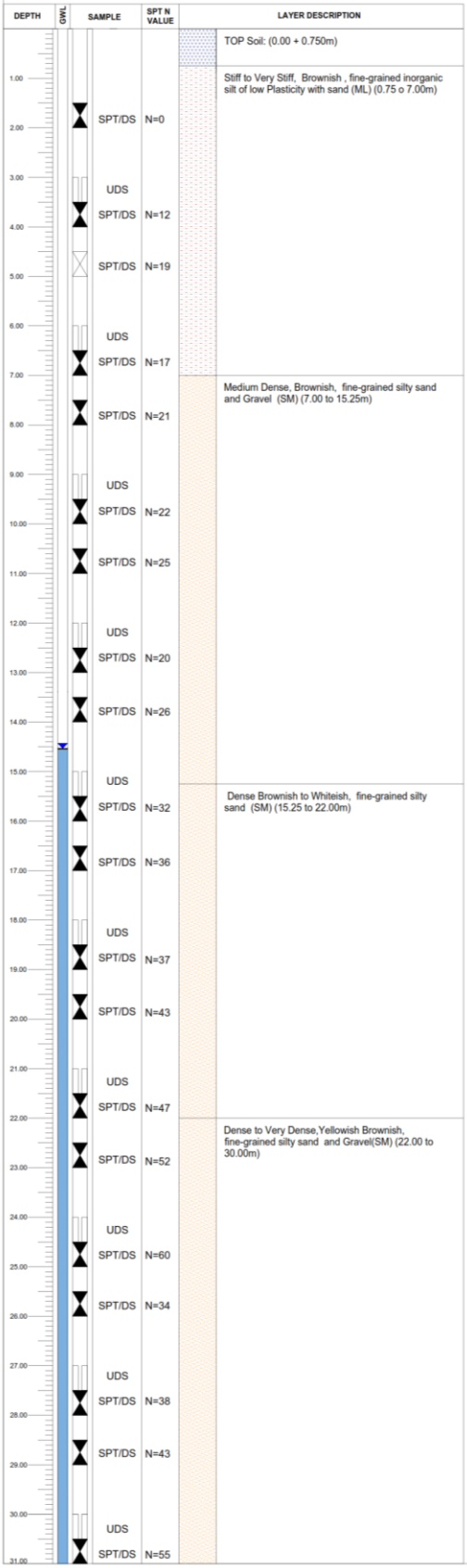

Direct Shear Test – BH-29
BH ID : BH-29
Depth : 30 m
c = 0.030 kg/cm²
ϕ = 33.6°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Noida Sector-142 to Botanical Garden (2+000 km TO 3+000 km)

BH ID : BH-30 | **Chainage** : 3+514 KM

Groundwater Level : - 14.55M | **Location** : **Lat. 28.544025, Long. 77.340743**



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

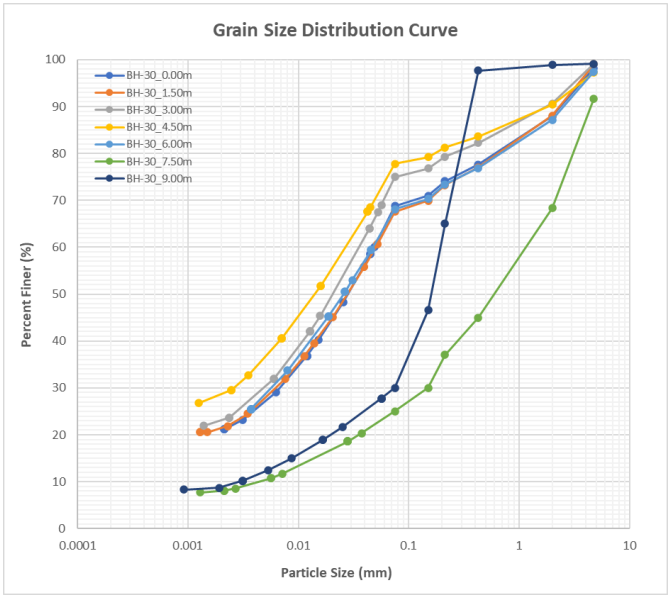
Soil

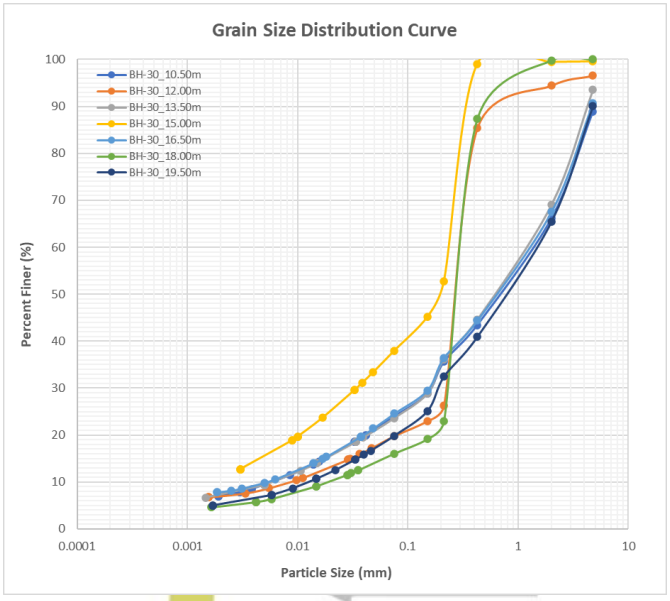
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

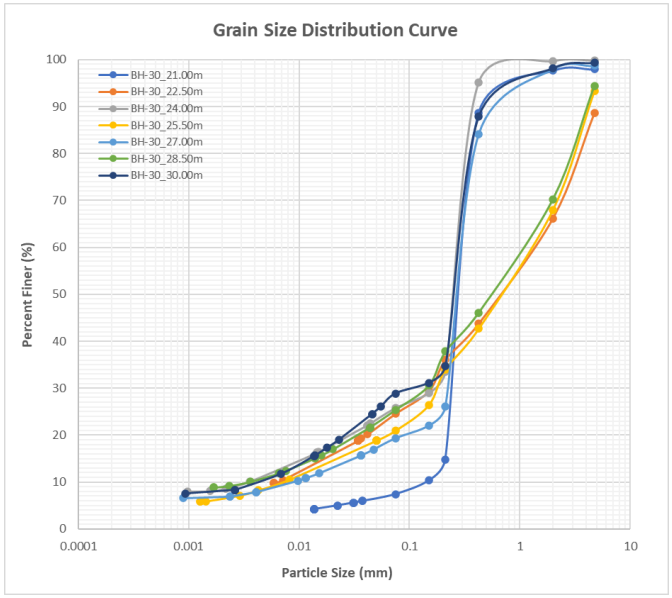
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-30	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	3+514	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	24-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	200.5	**End Date:**	25-01-2026
Project Code:	158_R4_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	14.55	**Location:**	Lat. 28.544025, Long. 77.340743

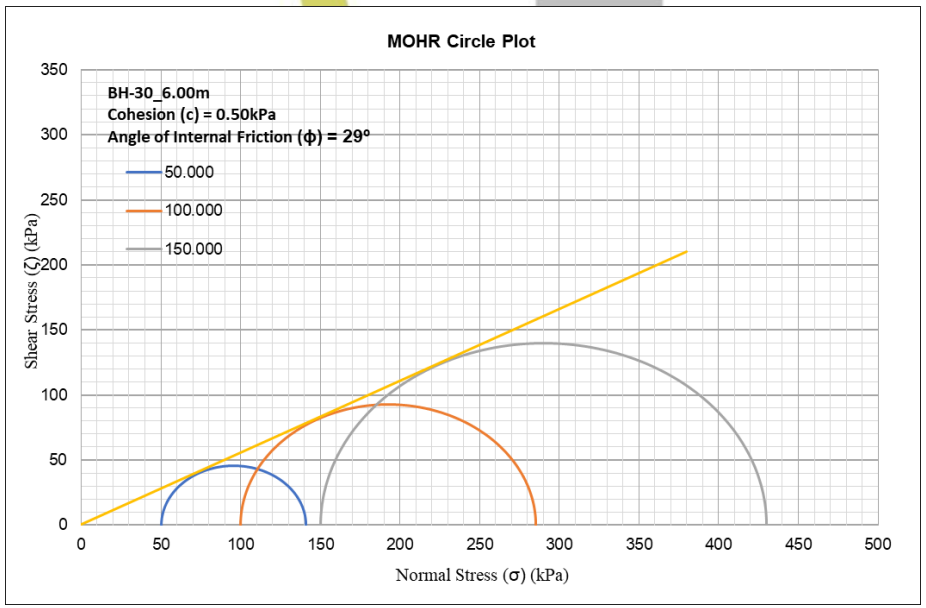
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						1.8	29.4	63.1	5.7	21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Stiff to Very Stiff, Brownish, fine-grained inorganic silt of low Plasticity with sand (ML)						0.9	31.5	46.2	21.4	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							0.9	24.1	51.9	23.1	23	NP	NP	12.0	1.8	1.64	2.7	F	0.04	24.0	UU	0.8	28.0	-	-	-
3.50	SPT/DS		4	6	6	12	13	-																			
4.50	SPT/DS		7	9	10	19	19	2.8	19.5	49.1	28.7	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							2.5	29.4	65.1	3.0	26	NP	NP	11.8	1.9	1.65	2.7	F	0.07	26.0	UU	0.5	29.0	-	-	-
6.50	SPT/DS		5	7	10	17	16	-																			
7.50	SPT/DS	Medium Dense, Brownish, fine-grained silty sand and Gravel (SM)	6	9	12	21	19	8.3	66.7	17.0	8.0	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	DS							0.9	69.1	21.2	8.8	26	NP	NP	13.88	-	-	2.61	F	0.02	27	-	-	-	-	-	-
9.50	SPT/DS		5	10	12	22	19	-																			
10.50	SPT/DS		5	11	14	25	21	11.1	65.0	16.9	7.0	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	DS							3.4	76.8	12.8	7.0	29	NP	NP	15.53	-	-	2.60	F	0.03	28	-	-	-	-	-	-
12.50	SPT/DS		7	8	12	20	15	-																			
13.50	SPT/DS		8	11	15	26	19	6.5	69.9	16.2	7.4	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS							0.4	61.6	31.3	6.6	27	NP	NP	14.83	-	-	2.64	F	0.02	29	-	-	-	-	-	-
15.50	SPT/DS	Dense Brownish to Whiteish, fine-grained silty sand (SM)	8	14	18	32	18	-																			
16.50	SPT/DS		10	16	20	36	19	9.3	66.1	16.6	7.9	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS							0.0	84.0	11.2	4.8	24	NP	NP	16.14	-	-	2.63	F	0.05	29	-	-	-	-	-	-
18.50	SPT/DS		8	16	21	37	19	-																			
19.50	SPT/DS		10	18	25	43	21	9.9	70.3	14.5	5.3	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS							2.0	90.6	7.4	0.0	23	NP	NP	13.88	-	-	2.65	F	0.01	31	-	-	-	-	-	-
21.50	SPT/DS		12	20	27	47	22	-																			
22.50	SPT/DS	Dense to Very Dense,Yellowish Brownish, fine-grained silty sand and Gravel(SM)	14	22	30	52	23	11.4	64.0	16.9	7.7	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							0.2	74.0	17.3	8.5	29	NP	NP	12.78	-	-	2.61	F	0.04	32	-	-	-	-	-	-
24.50	SPT/DS		16	25	35	60	25	-																			
25.50	SPT/DS		8	16	18	34	17	6.7	72.4	14.5	6.5	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							1.3	79.4	12.5	6.8	23	NP	NP	12.55	-	-	2.66	F	0.05	31	-	-	-	-	-	-
27.50	SPT/DS		12	18	20	38	18	-																			
28.50	SPT/DS		14	20	23	43	19	5.6	69.1	16.4	9.0	21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							0.7	70.5	20.8	8.1	29	NP	NP	14.31	-	-	2.68	F	0.02	33	-	-	-	-	-	-
30.50	SPT/DS		16	25	30	55	22	-																			

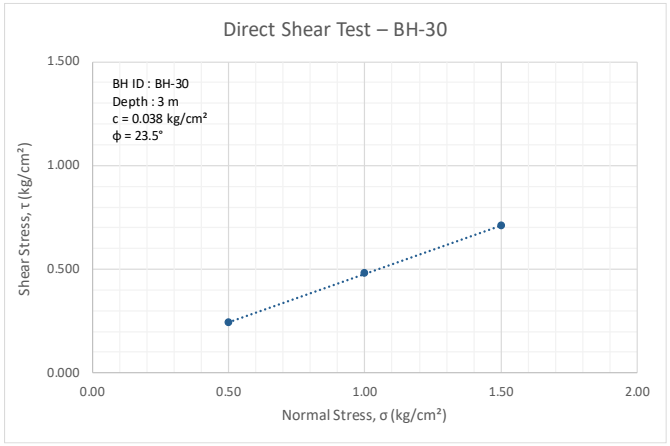
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

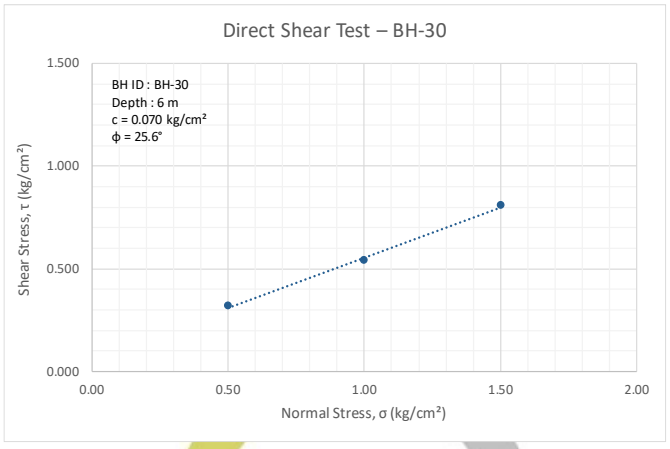

Grain Size Distribution Curve
Percent Finer (%)
Particle Size (mm)
BH-30_0.00m
BH-30_1.50m
BH-30_3.00m
BH-30_4.50m
BH-30_6.00m
BH-30_7.50m
BH-30_9.00m

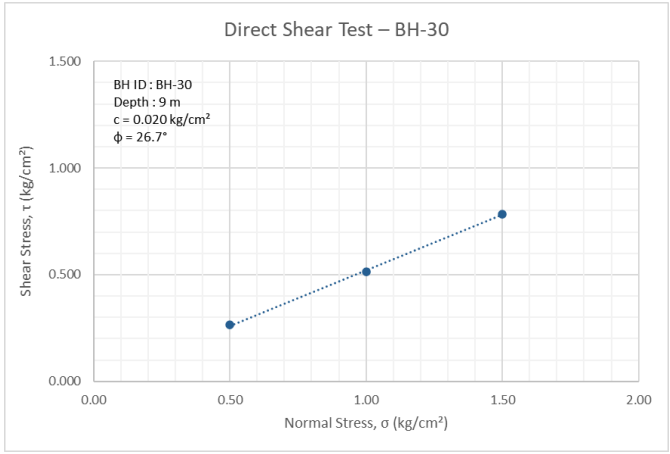

Grain Size Distribution Curve
Percent Finer (%)
Particle Size (mm)
BH-30_10.50m
BH-30_12.00m
BH-30_13.50m
BH-30_15.00m
BH-30_16.50m
BH-30_18.00m
BH-30_19.50m

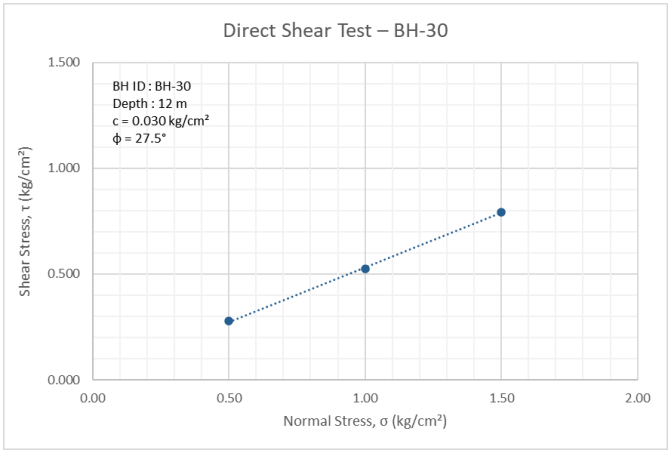

Grain Size Distribution Curve
Percent Finer (%)
Particle Size (mm)
BH-30_21.00m
BH-30_22.50m
BH-30_24.00m
BH-30_25.50m
BH-30_27.00m
BH-30_28.50m
BH-30_30.00m

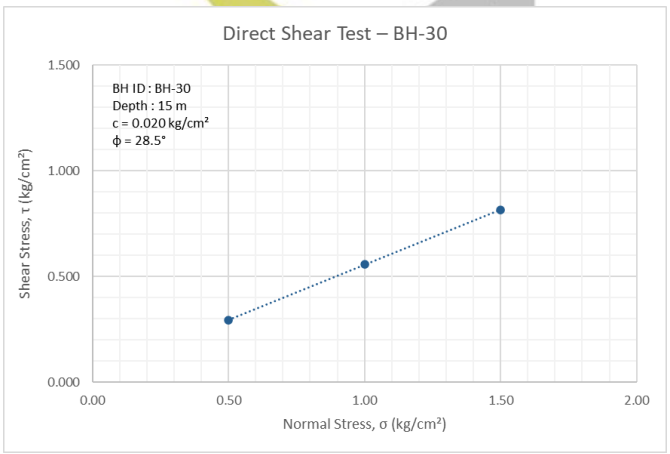

MOHR Circle Plot
BH-30_6.00m
Cohesion (c) = 0.50kPa
Angle of Internal Friction (ϕ) = 29°
50.000
100.000
150.000
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

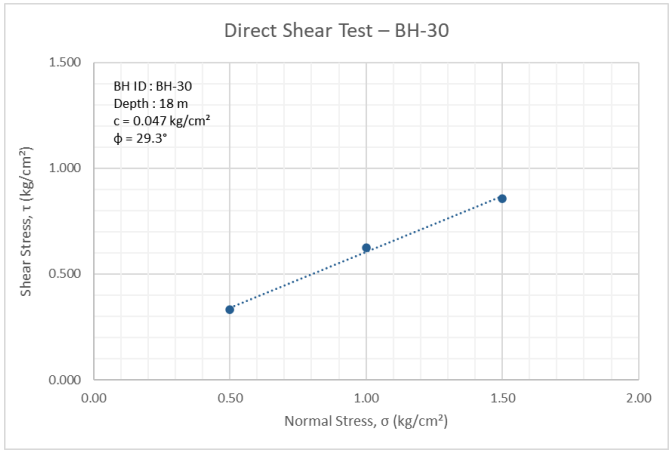

Direct Shear Test – BH-30
BH ID : BH-30
Depth : 3 m
c = 0.038 kg/cm²
ϕ = 23.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

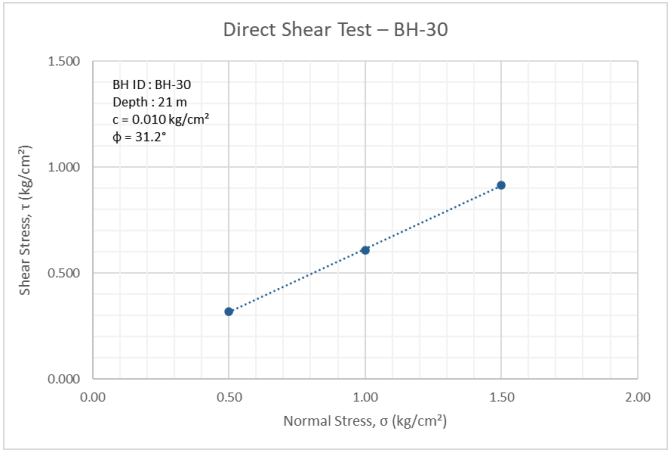

Direct Shear Test – BH-30
BH ID : BH-30
Depth : 6 m
c = 0.070 kg/cm²
ϕ = 25.6°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

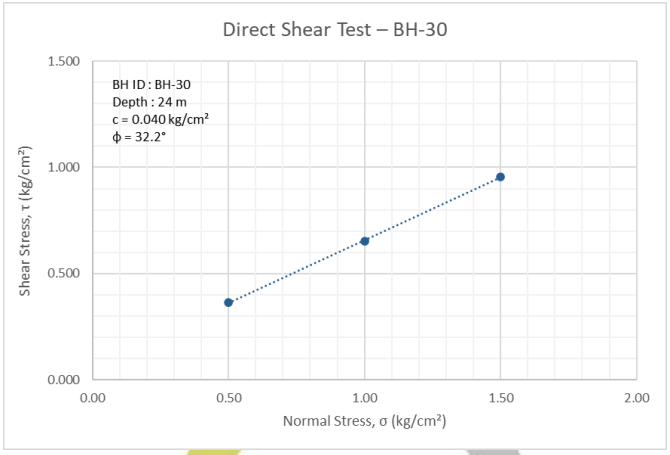

Direct Shear Test – BH-30
BH ID : BH-30
Depth : 9 m
c = 0.020 kg/cm²
ϕ = 26.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

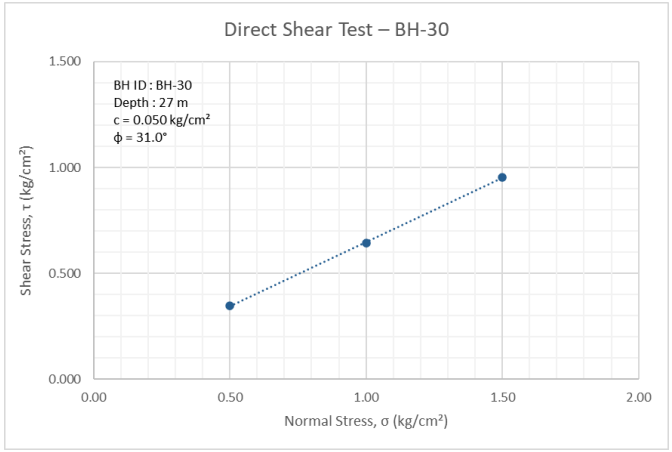

Direct Shear Test – BH-30
BH ID : BH-30
Depth : 12 m
c = 0.030 kg/cm²
ϕ = 27.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

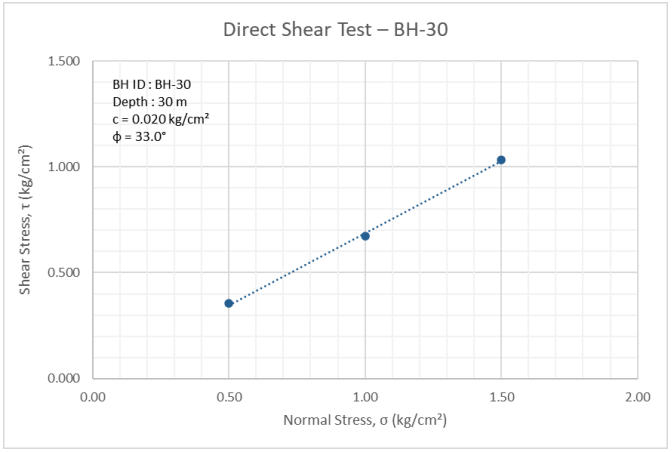

Direct Shear Test – BH-30
BH ID : BH-30
Depth : 15 m
c = 0.020 kg/cm²
ϕ = 28.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-30
BH ID : BH-30
Depth : 18 m
c = 0.047 kg/cm²
ϕ = 29.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

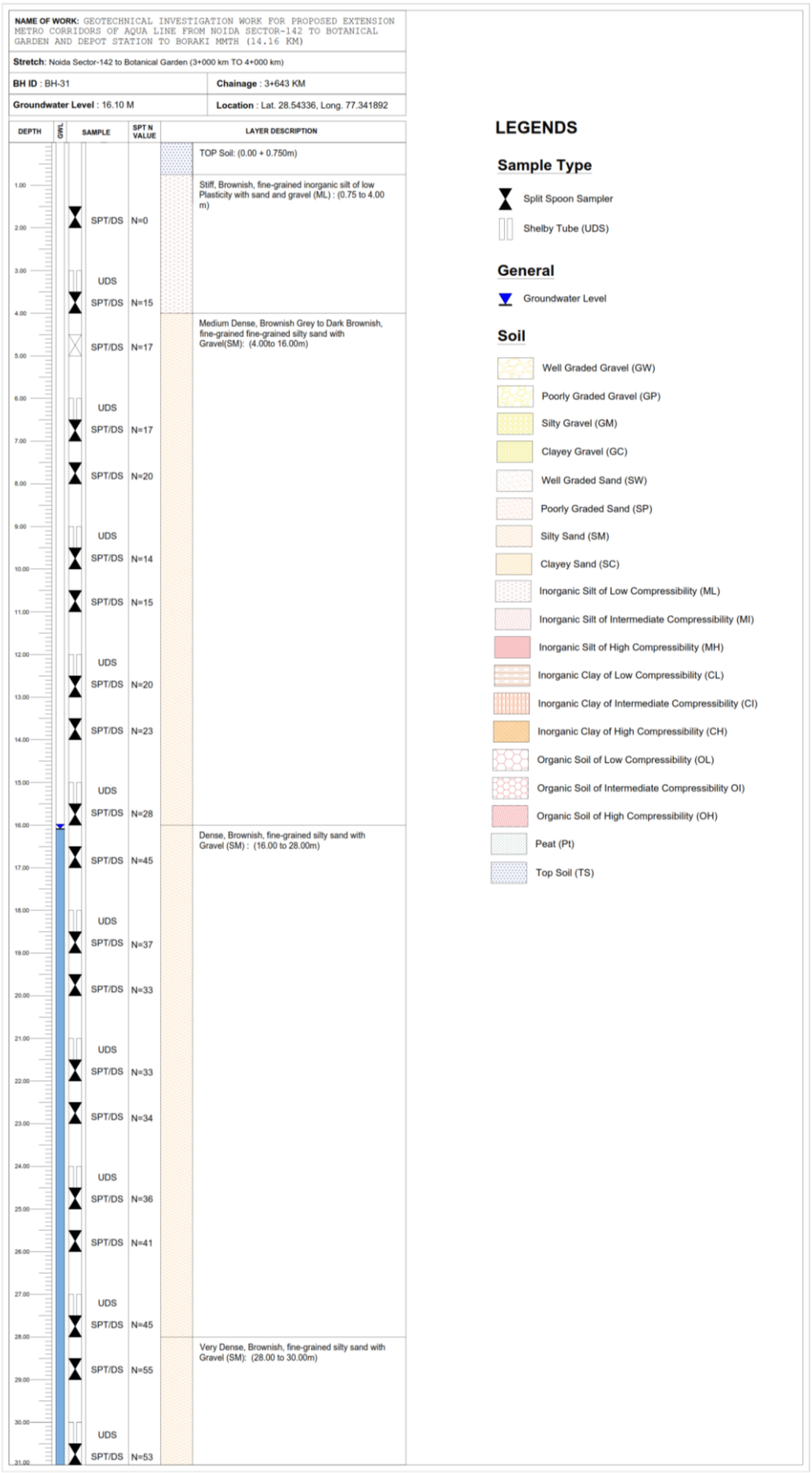

Direct Shear Test – BH-30
BH ID : BH-30
Depth : 21 m
c = 0.010 kg/cm²
ϕ = 31.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-30
BH ID : BH-30
Depth : 24 m
c = 0.040 kg/cm²
ϕ = 32.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-30
BH ID : BH-30
Depth : 27 m
c = 0.050 kg/cm²
ϕ = 31.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-30
BH ID : BH-30
Depth : 30 m
c = 0.020 kg/cm²
ϕ = 33.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

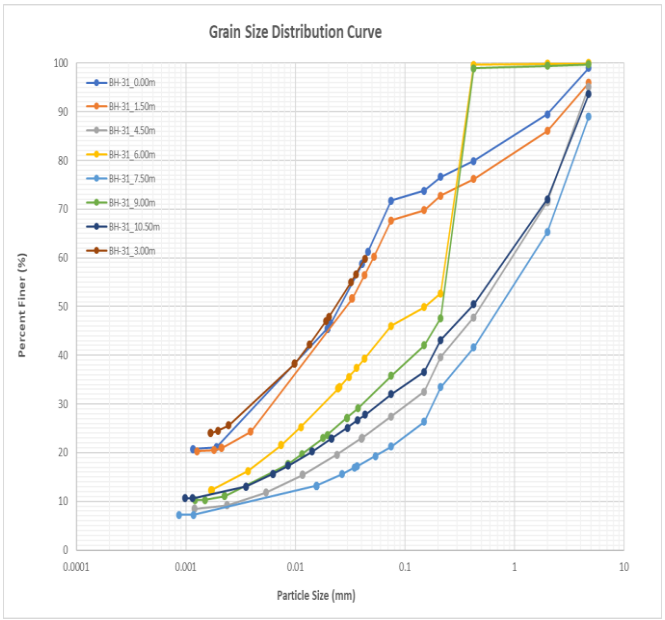
C.5. Zone 5: CH: 3+515 km to 4+520 km (BH-31 to BH-40)

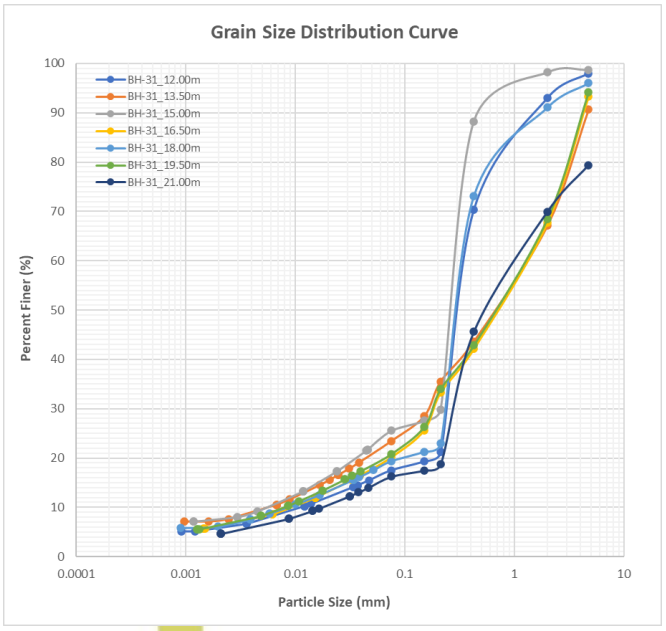


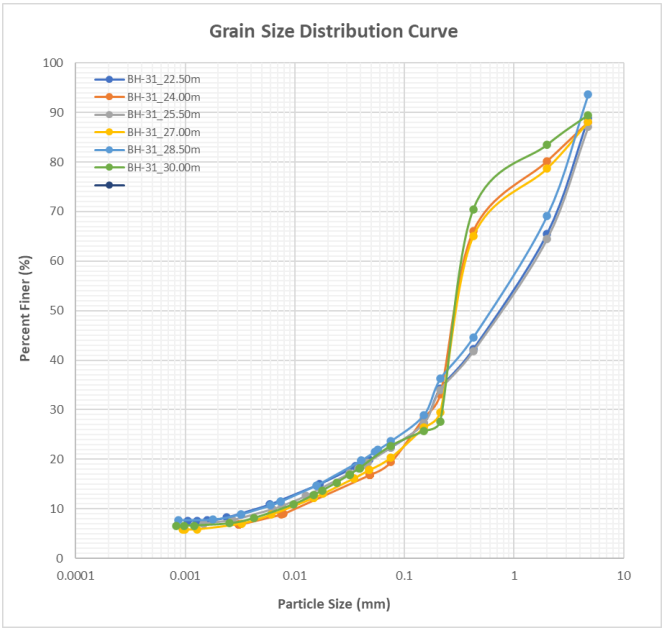
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-31	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	3+643	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	24-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	198.2	**End Date:**	25-01-2026
Project Code:	158_R5_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	16.10	**Location:**	Lat. 28.543360, Long. 77.341892

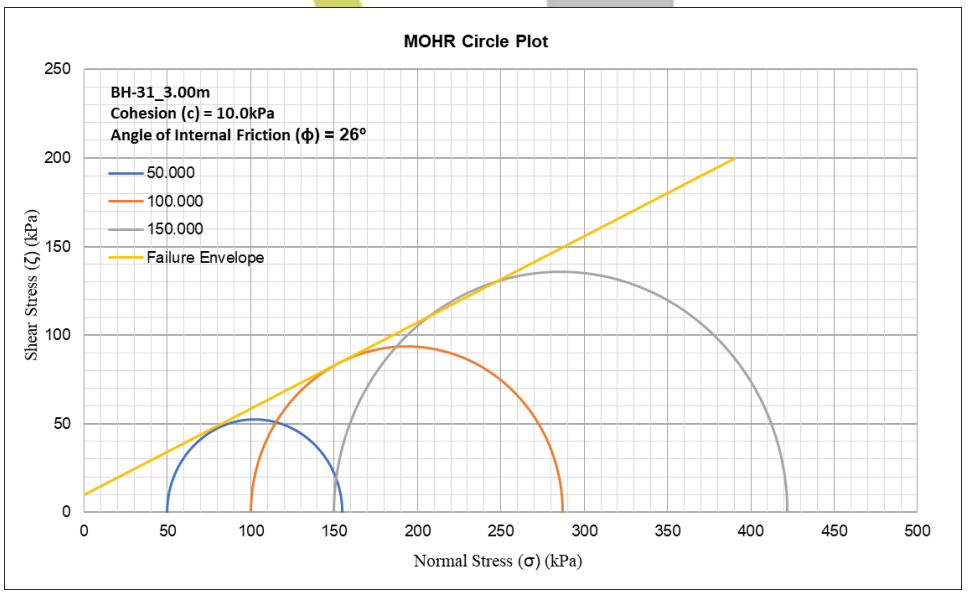
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						1.0	27.3	47.2	24.5	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Stiff, Brownish, fine-grained inorganic silt of low Plasticity with sand and gravel (ML)						4.0	28.3	46.7	21.0	21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							0.95	29.5	44.9	24.6	25	NP	NP	14.28	1.88	1.65	2.681	F	0.02	23	UU	10.0	26.0	-	-	-
3.50	SPT/DS		4	7	8	15	16	-																			
4.50	SPT/DS	Medium Dense, Brownish Grey to Dark Brownish, fine-grained fine-grained silty sand with Gravel(SM)	5	8	9	17	17	4.8	67.7	19.7	7.8	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	DS							0.0	54.0	29.9	16.1	24	NP	NP	8.22	-	-	2.61	F	0.05	25	-	-	-	-	-	-
6.50	SPT/DS		5	7	10	17	16	-																			
7.50	SPT/DS		6	9	11	20	18	11.0	67.7	14.0	7.3	21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	DS							0.3	63.9	25.8	10.1	23	NP	NP	9.87	-	-	2.64	F	0.02	26	-	-	-	-	-	-
9.50	SPT/DS		4	6	8	14	12	-																			
10.50	SPT/DS		5	6	9	15	12	6.4	61.6	20.8	11.2	22	NP	NP		-	-	-	-	-	-	-	-	-	-	-	-
12.00	DS							2.0	80.5	12.6	4.9	27	NP	NP	13.54	-	-	2.63	F	0.05	26	-	-	-	-	-	-
12.50	SPT/DS		6	9	10	20	14	-																			
13.50	SPT/DS		6	10	13	23	16	9.4	67.2	16.9	6.5	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS							1.3	73.2	16.2	9.4	23	NP	NP	12.81	-	-	2.65	F	0.07	28	-	-	-	-	-	-
15.50	SPT/DS		9	12	16	28	18	-																			
16.50	SPT/DS	Dense, Brownish, fine-grained silty sand with Gravel (SM)	12	19	26	45	22	6.7	73.1	13.8	6.3	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS							4.0	76.6	12.7	6.6	24	NP	NP	14.22	-	-	2.65	F	0.01	29	-	-	-	-	-	-
18.50	SPT/DS		9	13	24	37	20	-																			
19.50	SPT/DS		10	14	20	34	19	5.8	73.3	13.6	7.2	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS							20.6	63.2	10.5	5.7	23	NP	NP	15.11	-	-	2.68	F	0.02	30	-	-	-	-	-	-
21.50	SPT/DS		10	14	20	34	18	-																			
22.50	SPT/DS		9	16	17	33	17	11.2	66.4	14.6	7.8	21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							11.9	68.7	13.9	5.5	26	NP	NP	13.18	-	-	2.64	F	0.01	31	-	-	-	-	-	-
24.50	SPT/DS		10	17	19	36	18	-																			
25.50	SPT/DS		11	19	22	41	19	12.9	64.7	14.0	8.5	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							11.9	67.8	13.1	7.2	24	NP	NP	14.22	-	-	2.65	F	0.02	33	-	-	-	-	-	-
27.50	SPT/DS		10	21	24	45	19	-																			
28.50	SPT/DS	Very Dense, Brownish, fine-grained silty sand with Gravel (SM)	11	26	29	55	22	6.4	70.0	15.8	7.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							10.5	66.8	14.6	8.1	25	NP	NP	15.13	-	-	2.64	F	0.00	34	-	-	-	-	-	-
30.50	SPT/DS		12	23	30	53	20	-																			

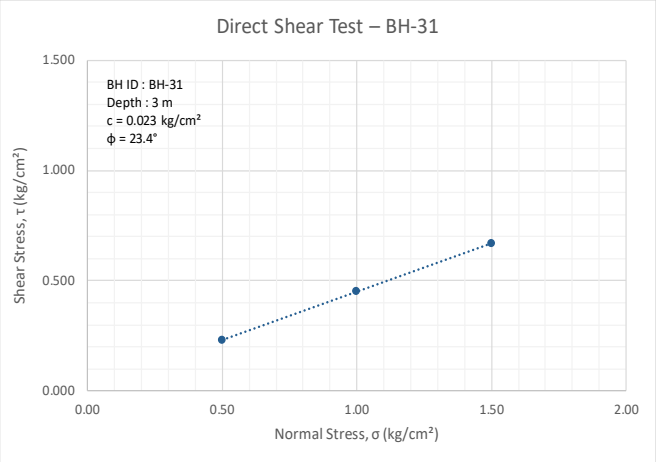
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

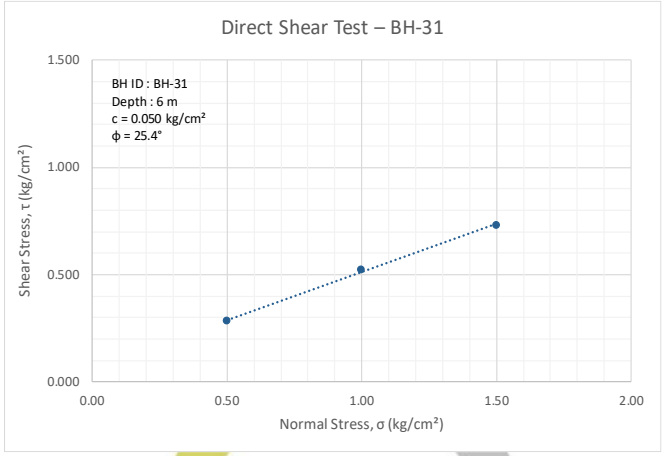

Grain Size Distribution Curve
Percent Finer (%)
Particle Size (mm)
BH-31_0.00m
BH-31_1.50m
BH-31_4.50m
BH-31_6.00m
BH-31_7.50m
BH-31_9.00m
BH-31_10.50m
BH-31_3.00m

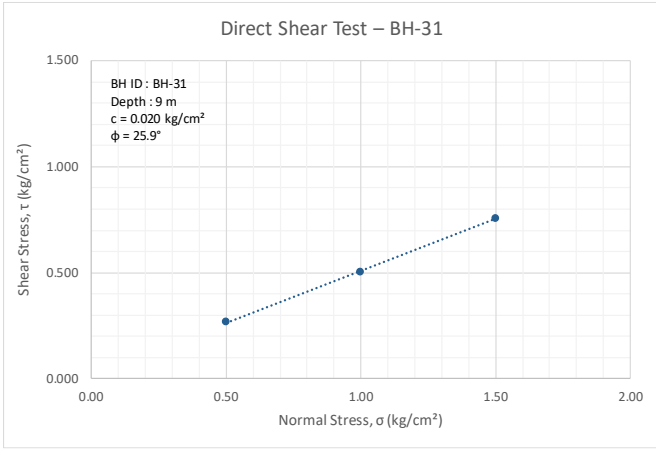

Grain Size Distribution Curve
Percent Finer (%)
Particle Size (mm)
BH-31_12.00m
BH-31_13.50m
BH-31_15.00m
BH-31_16.50m
BH-31_18.00m
BH-31_19.50m
BH-31_21.00m

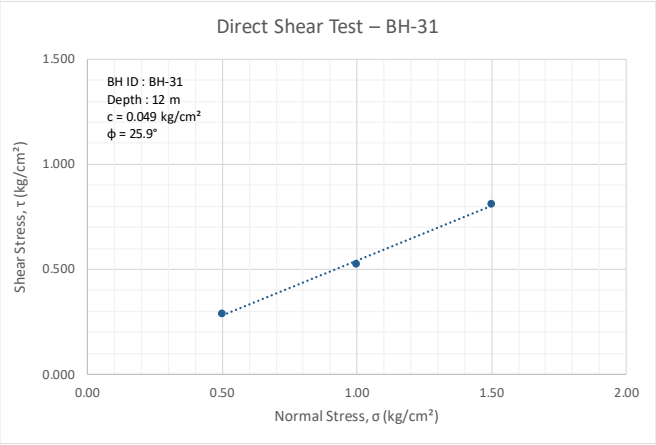

Grain Size Distribution Curve
Percent Finer (%)
Particle Size (mm)
BH-31_22.50m
BH-31_24.00m
BH-31_25.50m
BH-31_27.00m
BH-31_28.50m
BH-31_30.00m

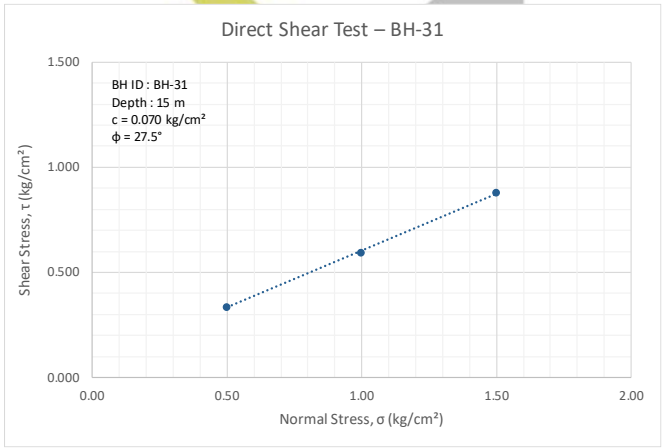

MOHR Circle Plot
BH-31_3.00m
Cohesion (c) = 10.0kPa
Angle of Internal Friction (ϕ) = 26°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

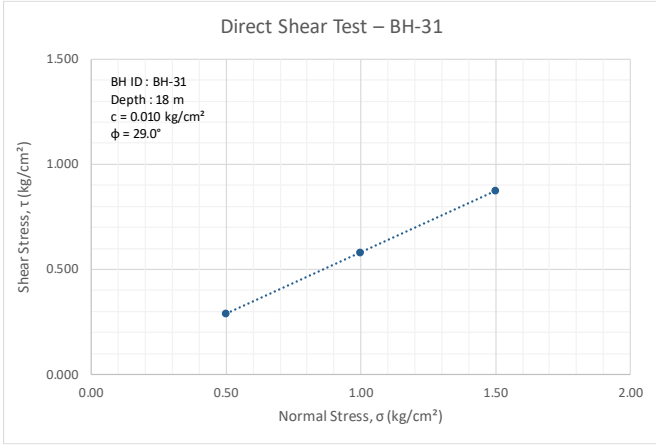

Direct Shear Test – BH-31
BH ID : BH-31
Depth : 3 m
c = 0.023 kg/cm²
ϕ = 23.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

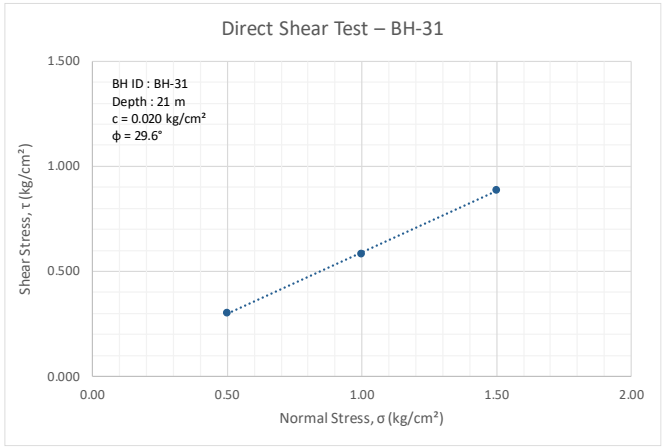

Direct Shear Test – BH-31
BH ID : BH-31
Depth : 6 m
c = 0.050 kg/cm²
ϕ = 25.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

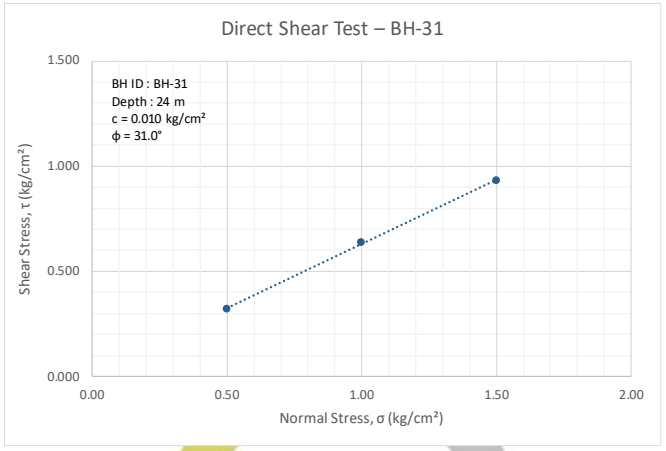

Direct Shear Test – BH-31
BH ID : BH-31
Depth : 9 m
c = 0.020 kg/cm²
ϕ = 25.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

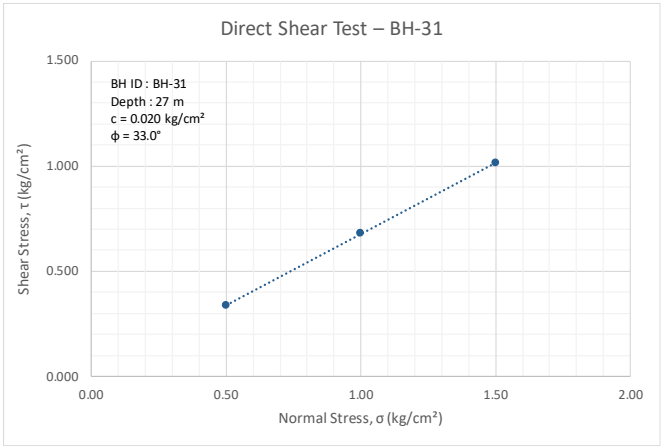

Direct Shear Test – BH-31
BH ID : BH-31
Depth : 12 m
c = 0.049 kg/cm²
ϕ = 25.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

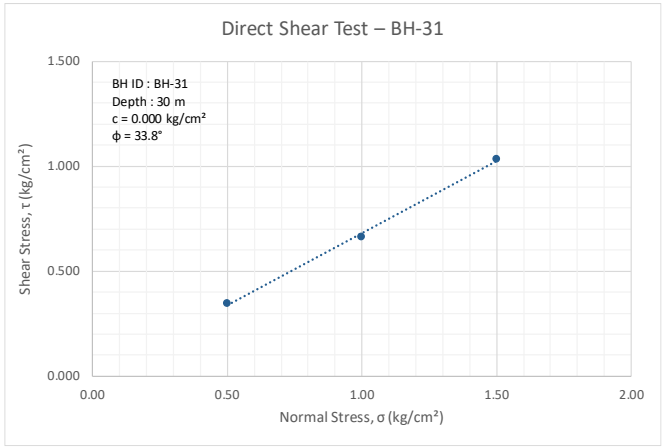

Direct Shear Test – BH-31
BH ID : BH-31
Depth : 15 m
c = 0.070 kg/cm²
ϕ = 27.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-31
BH ID : BH-31
Depth : 18 m
c = 0.010 kg/cm²
ϕ = 29.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-31
BH ID : BH-31
Depth : 21 m
c = 0.020 kg/cm²
ϕ = 29.6°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-31
BH ID : BH-31
Depth : 24 m
c = 0.010 kg/cm²
ϕ = 31.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-31
BH ID : BH-31
Depth : 27 m
c = 0.020 kg/cm²
ϕ = 33.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

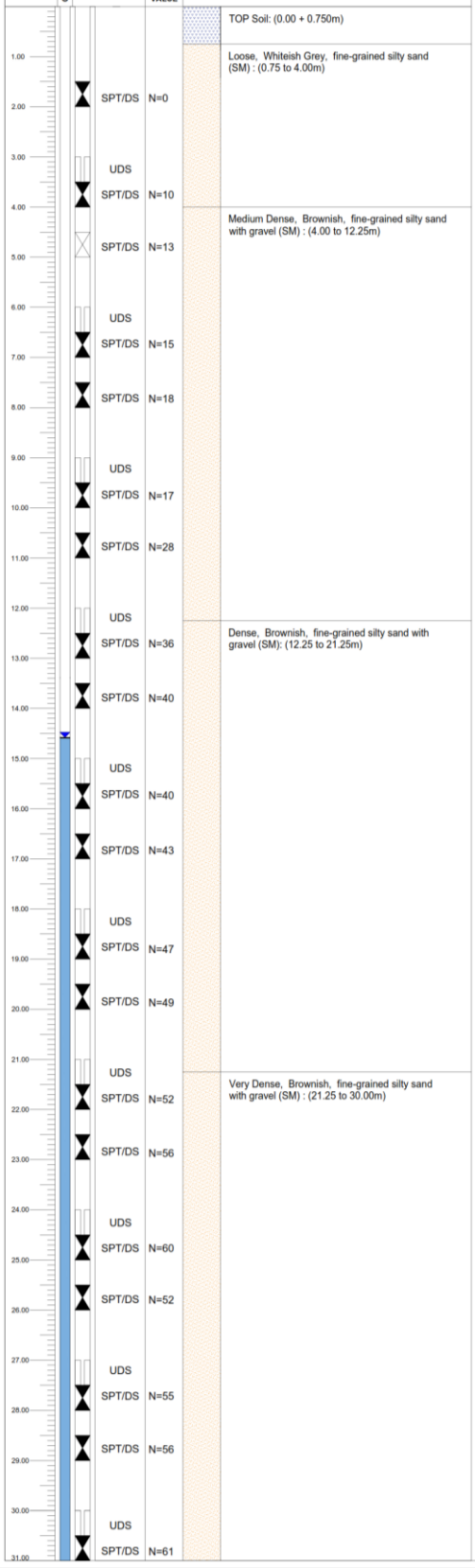

Direct Shear Test – BH-31
BH ID : BH-31
Depth : 30 m
c = 0.000 kg/cm²
ϕ = 33.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Noida Sector-142 to Botanical Garden (3+000 km TO 4+000 km)

BH ID : BH-32 | **Chainage** : 3+730 KM

Groundwater Level : 14.60 M | **Location** : Lat. 28.542894, Long. 77.342602



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

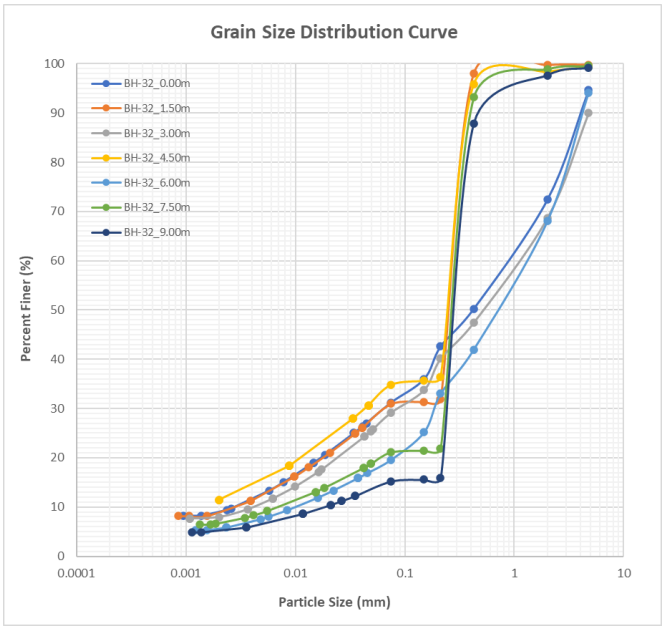
Soil

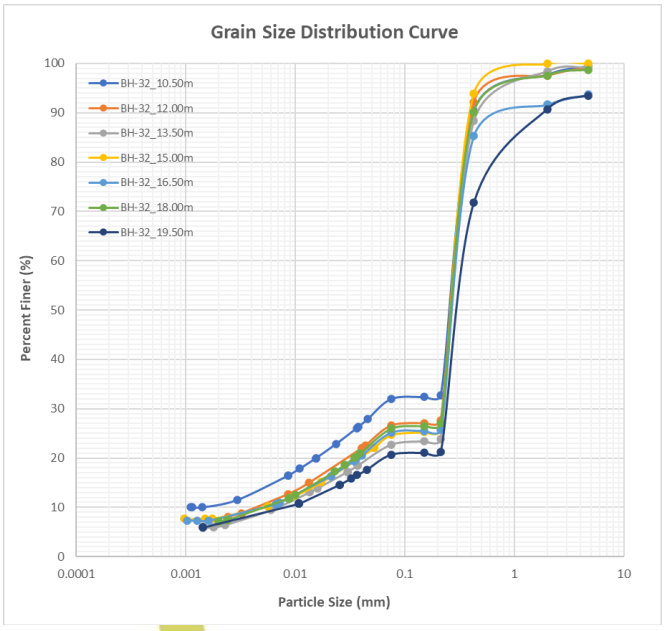
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

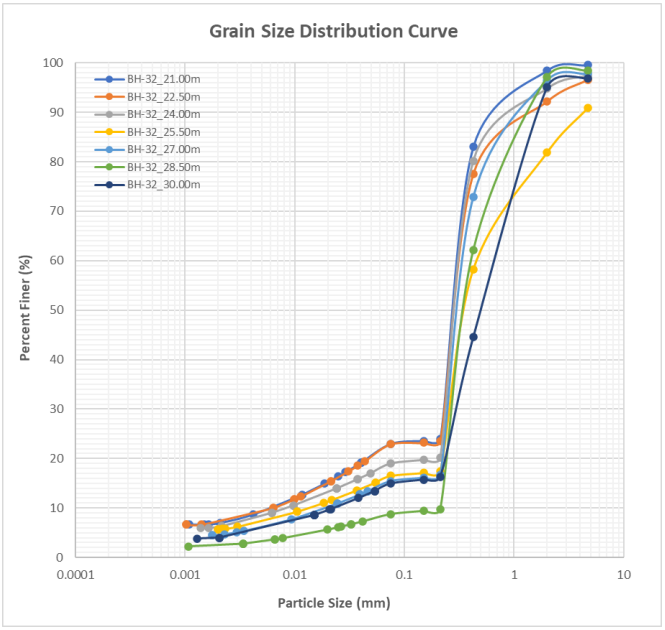
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-32	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	3+730	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	27-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	199.4	**End Date:**	29-01-2026
Project Code:	158_R5_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	14.60	**Location:**	Lat. 28.542894 Long. 77.342602

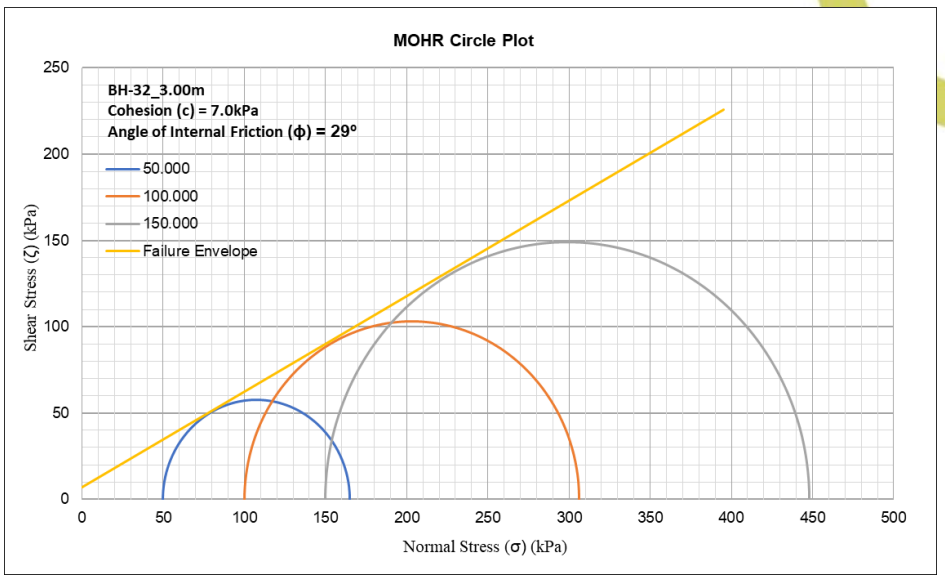
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						5.4	63.4	22.2	9.0	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Loose, Whiteish Grey, fine-grained silty sand(SM)						0.2	68.8	21.9	9.0	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							10.0	60.8	21.2	8.0	23	NP	NP	7.5	1.9	1.73	2.67	F	0.03	22.0	UU	7.0	29.0	-	-	-
3.50	SPT/DS		3	4	6	10	11	-																			
4.50	SPT/DS	Medium Dense, Brownish, fine-grained silty sand with gravel (SM)	4	6	7	13	13	0.7	64.5	27.5	7.3	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							5.9	74.5	14.0	5.6	27	NP	NP	11.8	1.9	1.67	2.69	F	0.04	24.0	UU	9.0	28.0	-	-	-
6.50	SPT/DS		4	6	9	15	14	-																			
7.50	SPT/DS		5	6	12	18	16	0.5	78.4	14.4	6.7	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	DS							0.9	83.9	9.9	5.3	21	NP	NP	9.4	-	-	2.73	F	0.05	25	-	-	-	-	-	-
9.50	SPT/DS		5	6	11	17	15	-																			
10.50	SPT/DS		7	12	16	28	23	0.6	67.5	21.3	10.7	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	DS							0.8	72.7	17.8	8.8	24	NP	NP	22.4	-	-	2.60	F	0.07	27	-	-	-	-	-	-
12.50	SPT/DS	Dense, Brownish, fine-grained silty sand with gravel (SM)	8	16	20	36	27	-																			
13.50	SPT/DS		10	18	22	40	29	0.8	76.5	16.6	6.2	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS							0.0	75.3	16.7	8.0	23	NP	NP	22.0	-	-	2.62	F	0.03	29	-	-	-	-	-	-
15.50	SPT/DS		9	17	23	40	21	-																			
16.50	SPT/DS		10	18	25	43	22	6.3	68.6	17.4	7.8	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS							1.3	72.8	18.8	7.1	25	NP	NP	19.7	-	-	2.80	F	0.02	30	-	-	-	-	-	-
18.50	SPT/DS		12	20	27	47	22	-																			
19.50	SPT/DS		13	21	28	49	23	6.5	72.8	14.0	6.7	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS							0.5	76.6	16.0	6.9	26	NP	NP	18.2	-	-	2.68	F	0.04	31	-	-	-	-	-	-
21.50	SPT/DS	Very Dense, Brownish, fine-grained silty sand with gravel (SM)	16	23	29	52	23	-																			
22.50	SPT/DS		18	25	31	56	24	3.4	73.7	15.5	7.4	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							2.5	78.5	12.8	6.2	24	NP	NP	6.7	-	-	2.62	F	0.04	31	-	-	-	-	-	-
24.50	SPT/DS		20	27	33	60	25	-																			
25.50	SPT/DS		17	23	29	52	22	9.0	74.4	10.8	5.7	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							2.2	82.3	10.9	4.6	29	NP	NP	11.7	-	-	2.77	F	0.01	32	-	-	-	-	-	-
27.50	SPT/DS		15	22	33	55	23	-																			
28.50	SPT/DS		16	25	31	56	23	1.6	89.6	6.2	2.5	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							3.1	81.9	11.0	4.0	21	NP	NP	10.6	-	-	2.68	F	0.03	35	-	-	-	-	-	-
30.50	SPT/DS		19	26	35	61	23	-																			

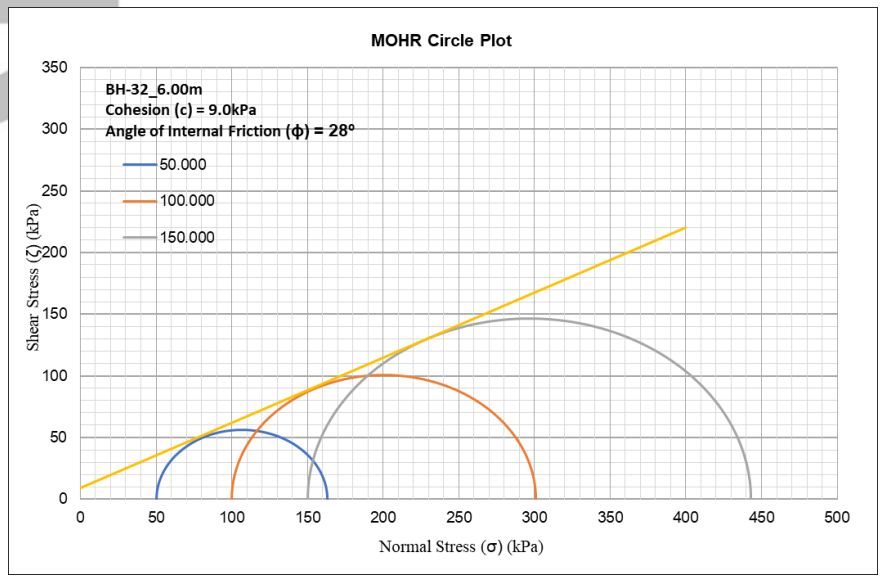
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

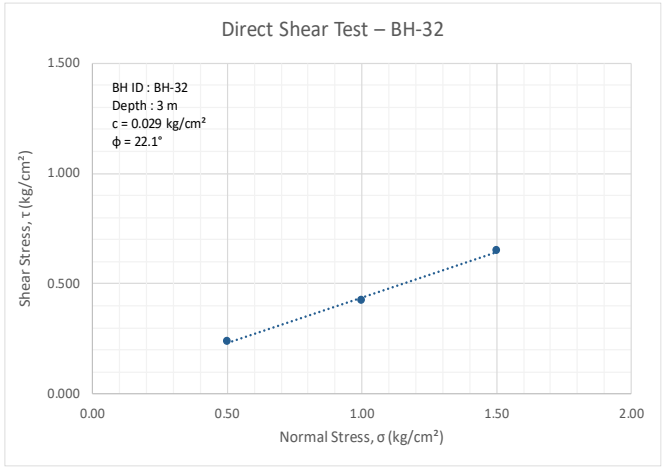

Grain Size Distribution Curve
BH-32_0.00m
BH-32_1.50m
BH-32_3.00m
BH-32_4.50m
BH-32_6.00m
BH-32_7.50m
BH-32_9.00m
Percent Finer (%)
Particle Size (mm)

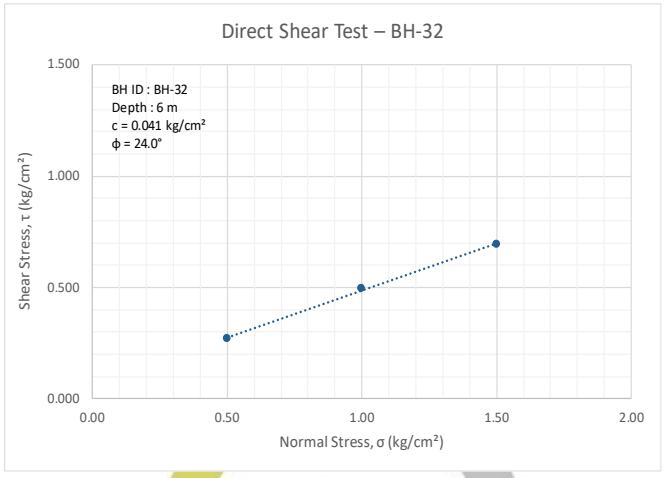

Grain Size Distribution Curve
BH-32_10.50m
BH-32_12.00m
BH-32_13.50m
BH-32_15.00m
BH-32_16.50m
BH-32_18.00m
BH-32_19.50m
Percent Finer (%)
Particle Size (mm)

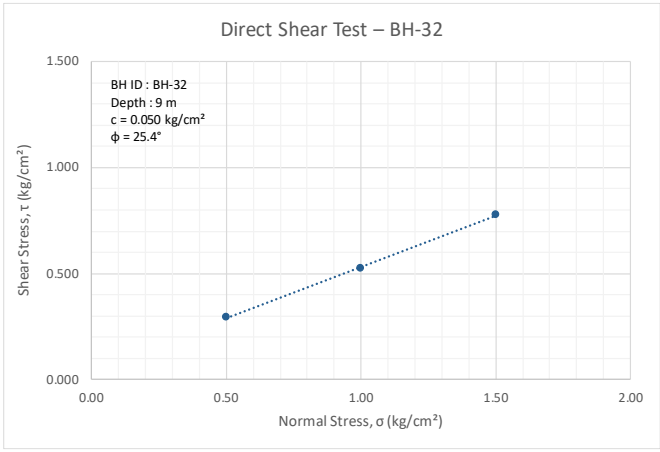

Grain Size Distribution Curve
BH-32_21.00m
BH-32_22.50m
BH-32_24.00m
BH-32_25.50m
BH-32_27.00m
BH-32_28.50m
BH-32_30.00m
Percent Finer (%)
Particle Size (mm)

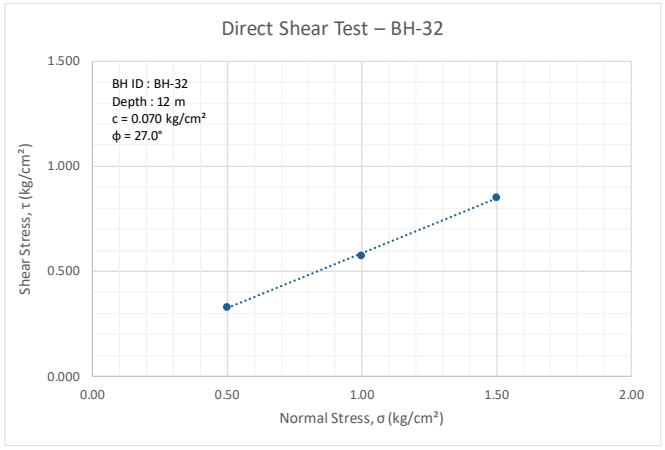

MOHR Circle Plot
BH-32_3.00m
Cohesion (c) = 7.0kPa
Angle of Internal Friction (ϕ) = 29°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

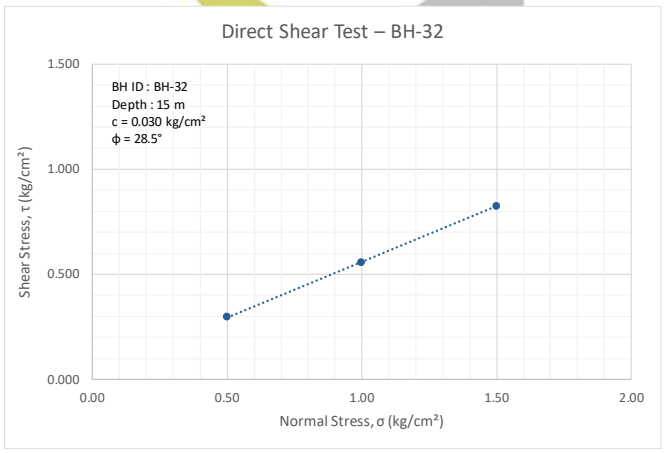

MOHR Circle Plot
BH-32_6.00m
Cohesion (c) = 9.0kPa
Angle of Internal Friction (ϕ) = 28°
50.000
100.000
150.000
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

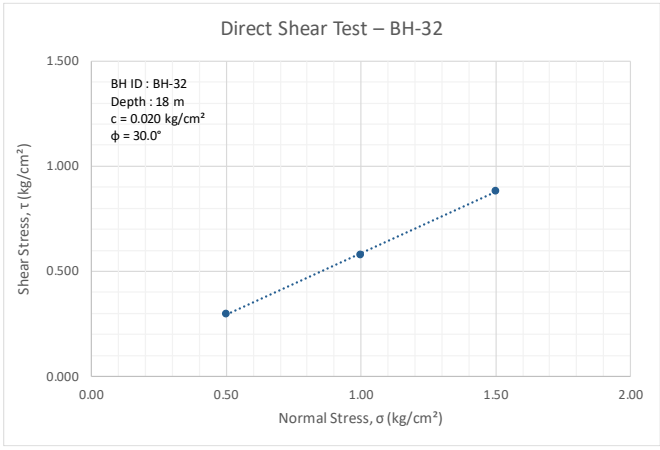

Direct Shear Test – BH-32
BH ID : BH-32
Depth : 3 m
c = 0.029 kg/cm²
ϕ = 22.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

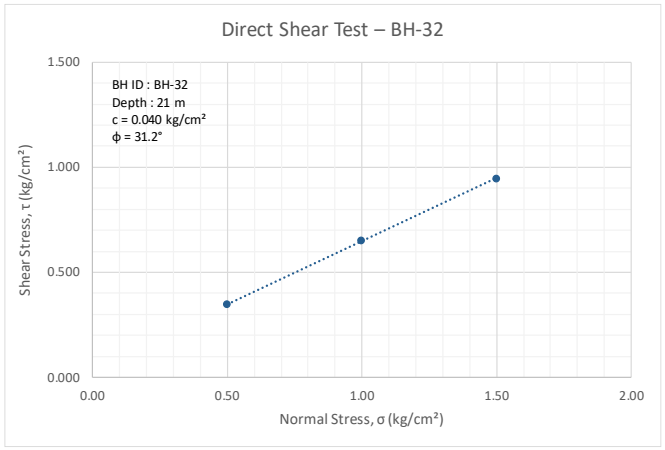

Direct Shear Test – BH-32
BH ID : BH-32
Depth : 6 m
c = 0.041 kg/cm²
ϕ = 24.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

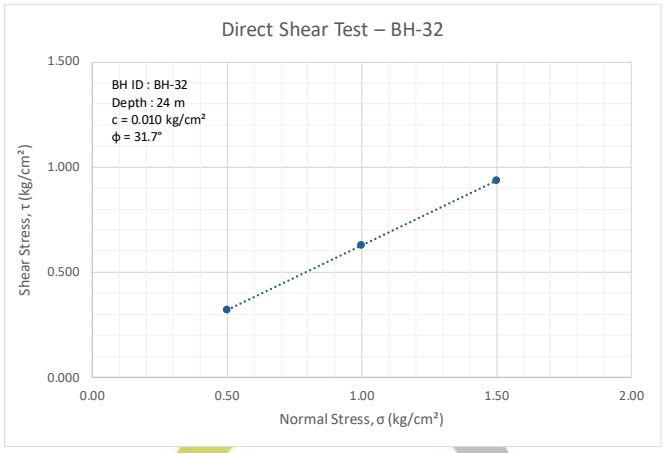

Direct Shear Test – BH-32
BH ID : BH-32
Depth : 9 m
c = 0.050 kg/cm²
ϕ = 25.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

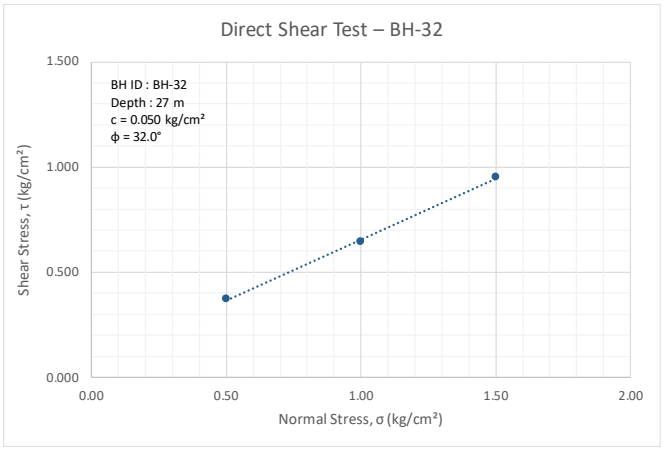

Direct Shear Test – BH-32
BH ID : BH-32
Depth : 12 m
c = 0.070 kg/cm²
ϕ = 27.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

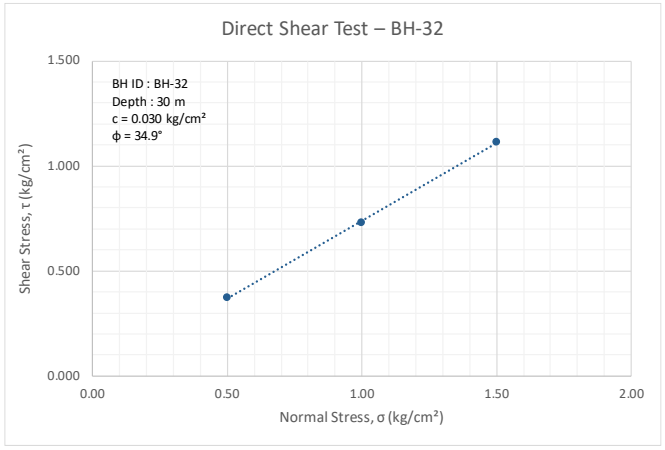

Direct Shear Test – BH-32
BH ID : BH-32
Depth : 15 m
c = 0.030 kg/cm²
ϕ = 28.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-32
BH ID : BH-32
Depth : 18 m
c = 0.020 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-32
BH ID : BH-32
Depth : 21 m
c = 0.040 kg/cm²
ϕ = 31.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-32
BH ID : BH-32
Depth : 24 m
c = 0.010 kg/cm²
ϕ = 31.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

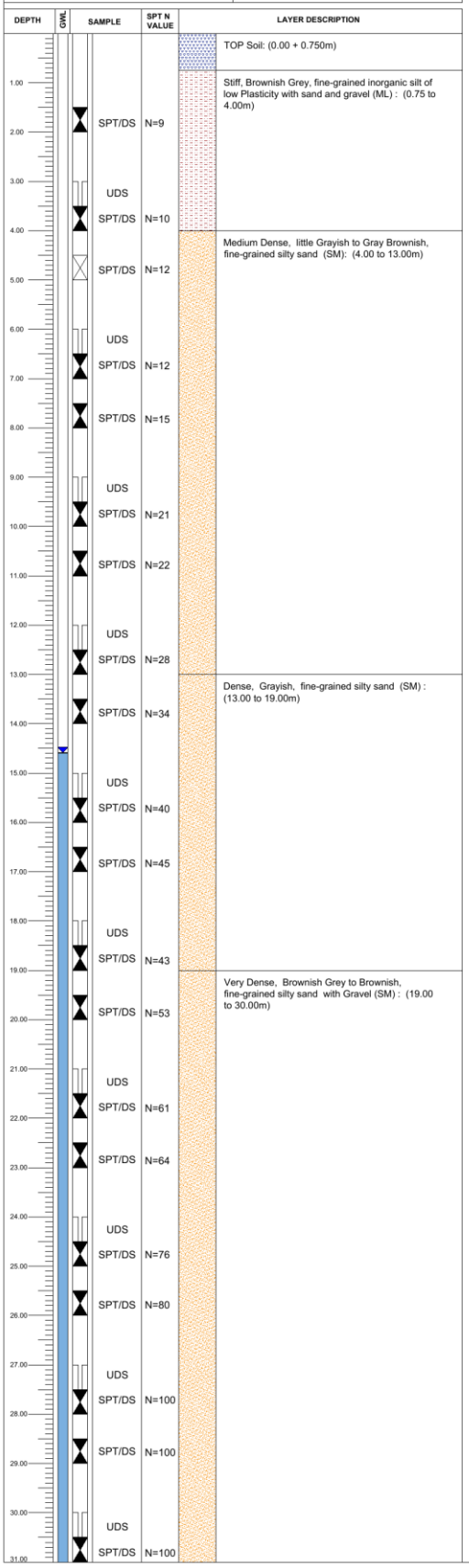

Direct Shear Test – BH-32
BH ID : BH-32
Depth : 27 m
c = 0.050 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-32
BH ID : BH-32
Depth : 30 m
c = 0.030 kg/cm²
ϕ = 34.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Noida Sector-142 to Botanical Garden (3+000 km TO 4+000 km)

BH ID : BH-33	**Chainage** : 3+792 KM
Groundwater Level : 14.60 M	**Location** : Lat. 28.543081, Long. 77.343537



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

Soil

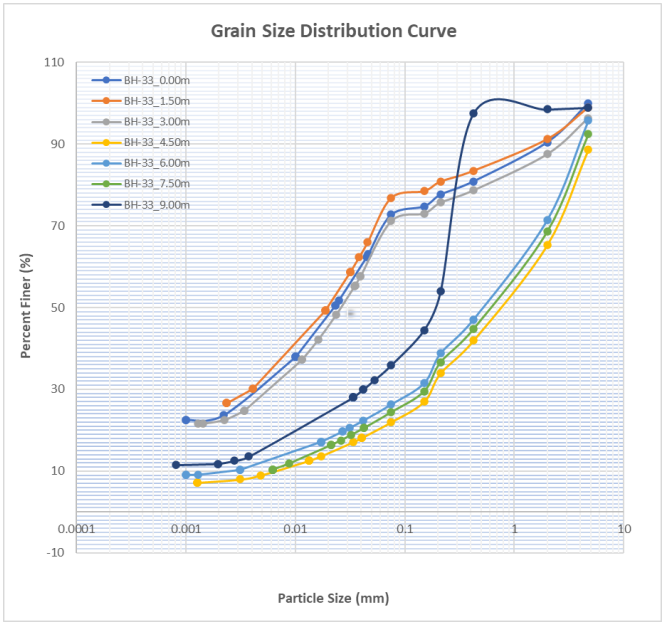
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

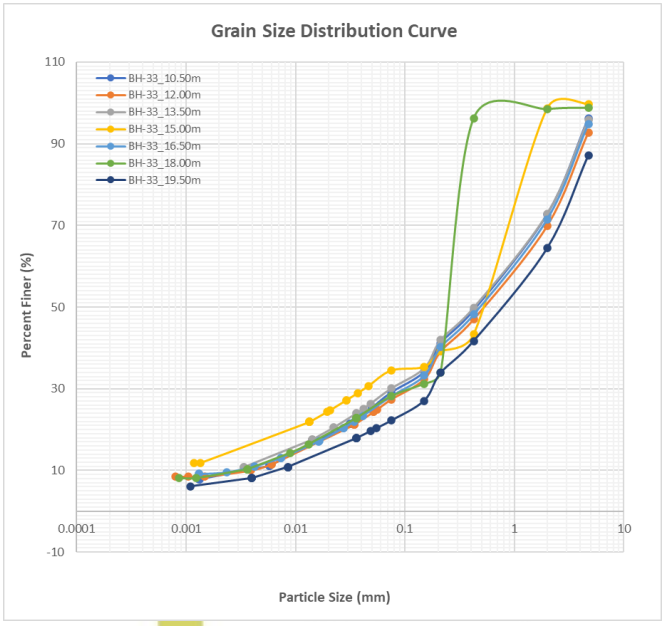
GOMA ENGINEERING AND CONSULTANCY
Quality we put forward

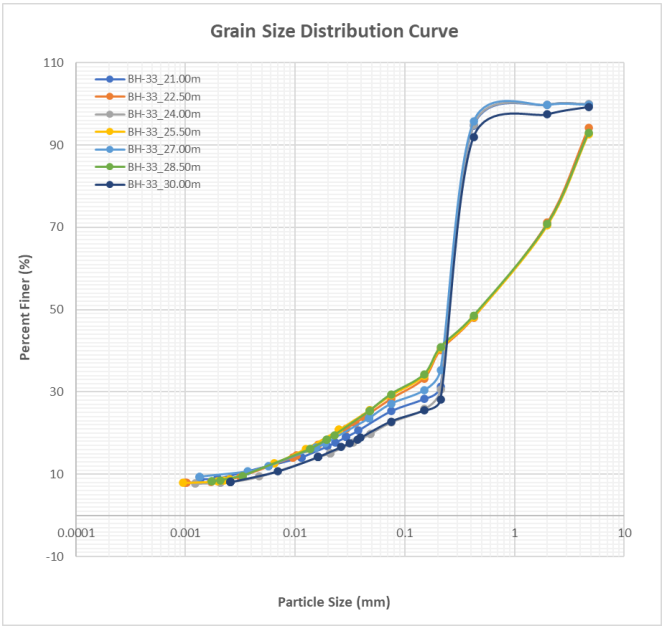
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-33	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	3+792	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	19-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	201.6	**End Date:**	22-01-2026
Project Code:	158_R5_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	13.20	**Location:**	Lat. 28.543081, Long. 77.343537

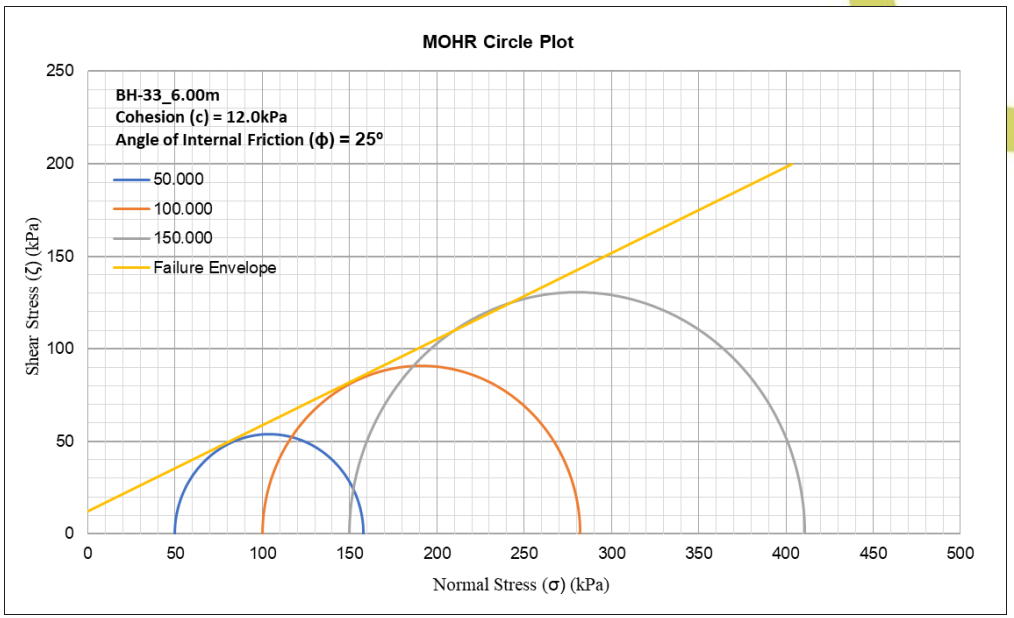
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						0.0	27.3	49.2	23.5	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Stiff, Brownish Grey, fine-grained inorganic silt of low Plasticity with sand and gravel (ML)	3	4	5	9	13	1.1	22.1	57.9	18.9	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							3.6	25.2	48.8	22.3	26	NP	NP	10.3	1.9	1.71	2.70	F	0.0	22.0	UU	11.0	26.0	-	-	-
3.50	SPT/DS		3	5	5	10	11	-																			
4.50	SPT/DS	Medium Dense, little Grayish to Gray Brownish, fine-grained silty sand (SM)	3	5	7	12	12	11.4	66.7	14.4	7.6	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							4.24	69.5	16.6	9.7	29.0	NP	NP	8.5	1.9	1.72	2.67	F	0.0	24.0	UU	12.0	25.0	-	-	-
6.50	SPT/DS		4	5	7	12	11	-																			
7.50	SPT/DS		5	7	8	15	14	7.6	68.1	13.9	10.5	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	DS							1.1	63.0	24.1	11.8	21	NP	NP	7.9	-	-	2.63	F	0.04	25	-	-	-	-	-	-
9.50	SPT/DS		7	9	12	21	18	-																			
10.50	SPT/DS		7	10	12	22	18	3.7	67.2	20.4	8.7	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	DS							10.5	67.2	16.1	6.3	25	NP	NP	12.2	-	-	2.65	F	0.03	27	-	-	-	-	-	-
12.50	SPT/DS		10	13	15	28	21	-																			
13.50	SPT/DS	Dense, Grayish, fine-grained silty sand (SM)	11	15	19	34	24	4.1	65.9	13.9	12.7	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS							0.3	65.2	20.9	13.6	24	NP	NP	13.1	-	-	2.60	F	0.05	28	-	-	-	-	-	-
15.50	SPT/DS		13	18	22	40	21	-																			
16.50	SPT/DS		15	20	25	45	22	5.1	66.7	18.7	9.5	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS							1.1	70.7	19.1	9.1	26	NP	NP	11.6	-	-	2.61	F	0.02	30	-	-	-	-	-	-
18.50	SPT/DS		14	19	24	43	21	-																			
19.50	SPT/DS	Very Dense, Brownish Grey to Brownish, fine-grained silty sand with Gravel (SM)	19	24	29	53	24	12.8	65.0	15.2	7.0	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS							0.0	74.7	16.4	9.0	24	NP	NP	12.7	-	-	2.67	F	0.01	31	-	-	-	-	-	-
21.50	SPT/DS		23	28	33	61	26	-																			
22.50	SPT/DS		25	30	34	64	27	5.8	65.8	19.9	8.4	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							0.0	77.4	14.7	7.9	28	NP	NP	13.2	-	-	2.60	F	0.00	32	-	-	-	-	-	-
24.50	SPT/DS		30	35	41	76	30	-																			
25.50	SPT/DS		32	37	43	80	30	7.3	63.5	20.9	8.3	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							0.1	72.7	17.2	9.9	29	NP	NP	14.1	-	-	2.64	F	0.02	34	-	-	-	-	-	-
27.50	SPT/DS		50	(50/5cm)	-	100	35	-																			
28.50	SPT/DS		(50/12cm)	-	-	100	35	7.0	63.6	21.0	8.5	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							0.8	76.4	15.6	7.8	23	NP	NP	11.0	-	-	2.69	F	0.01	35	-	-	-	-	-	-
30.50	SPT/DS		(50/8cm)	-	-	100	33	-																			

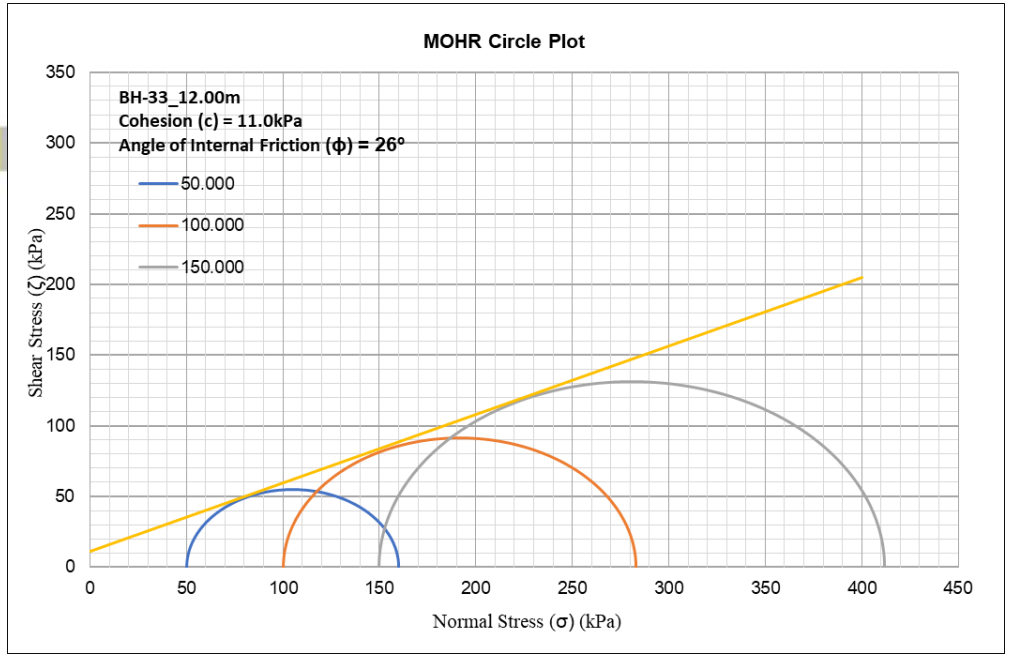
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

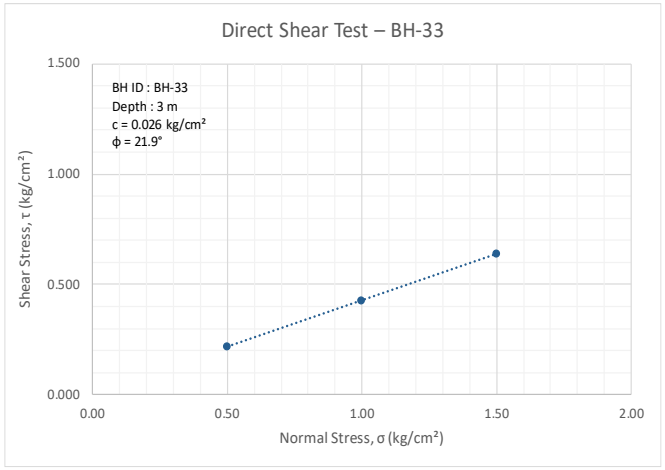

Grain Size Distribution Curve
BH-33_0.00m
BH-33_1.50m
BH-33_3.00m
BH-33_4.50m
BH-33_6.00m
BH-33_7.50m
BH-33_9.00m
Percent Finer (%)
Particle Size (mm)

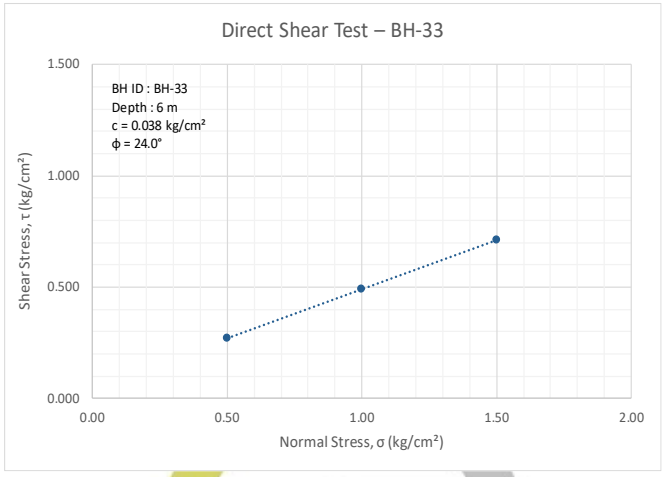

Grain Size Distribution Curve
BH-33_10.50m
BH-33_12.00m
BH-33_13.50m
BH-33_15.00m
BH-33_16.50m
BH-33_18.00m
BH-33_19.50m
Percent Finer (%)
Particle Size (mm)

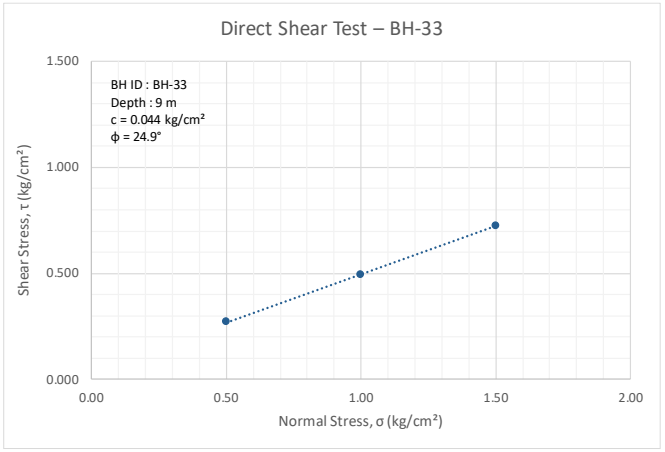

Grain Size Distribution Curve
BH-33_21.00m
BH-33_22.50m
BH-33_24.00m
BH-33_25.50m
BH-33_27.00m
BH-33_28.50m
BH-33_30.00m
Percent Finer (%)
Particle Size (mm)

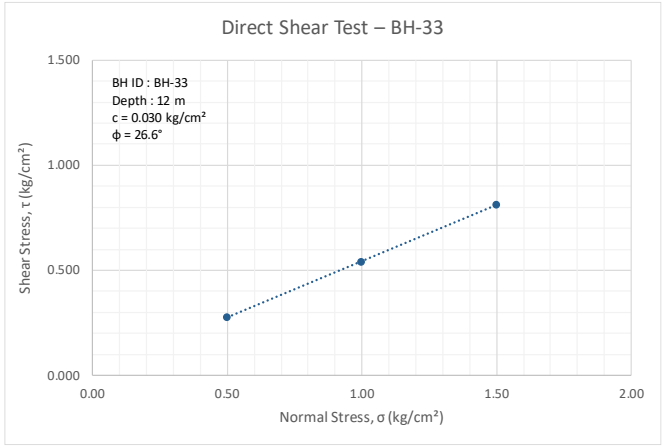

MOHR Circle Plot
BH-33_6.00m
Cohesion (c) = 12.0kPa
Angle of Internal Friction (ϕ) = 25°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

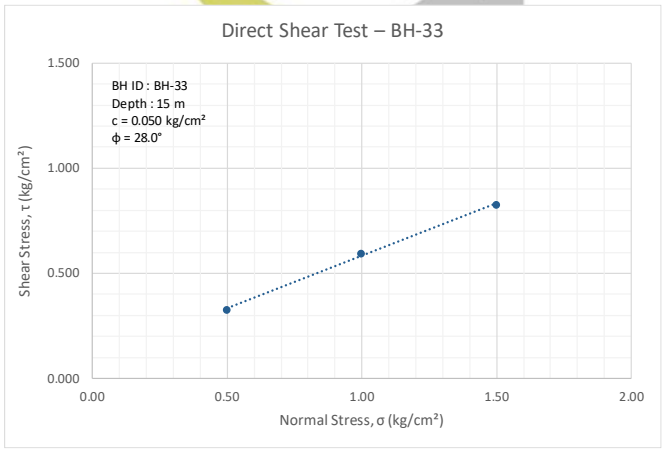

MOHR Circle Plot
BH-33_12.00m
Cohesion (c) = 11.0kPa
Angle of Internal Friction (ϕ) = 26°
50.000
100.000
150.000
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

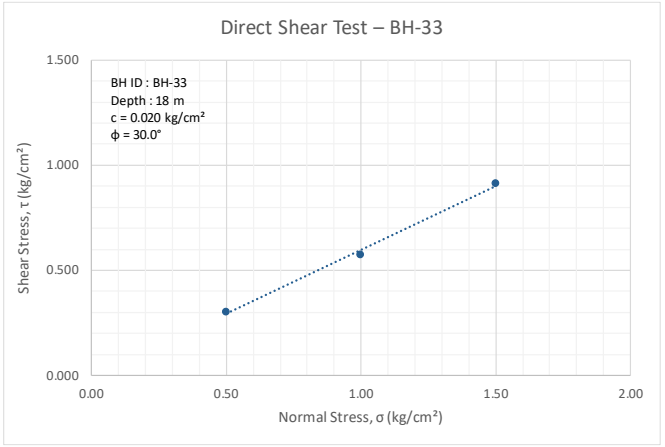

Direct Shear Test – BH-33
BH ID : BH-33
Depth : 3 m
c = 0.026 kg/cm²
ϕ = 21.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

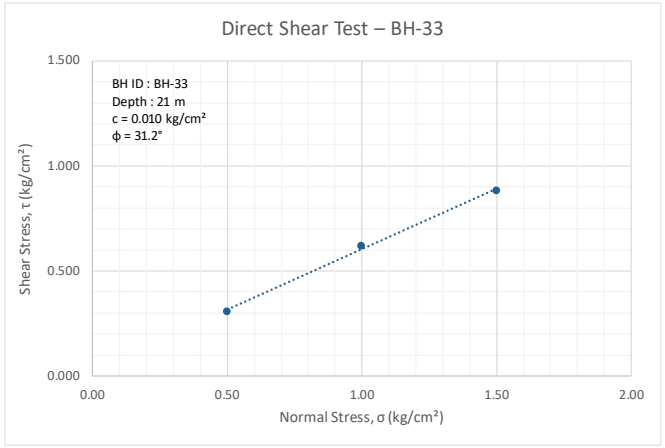

Direct Shear Test – BH-33
BH ID : BH-33
Depth : 6 m
c = 0.038 kg/cm²
ϕ = 24.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

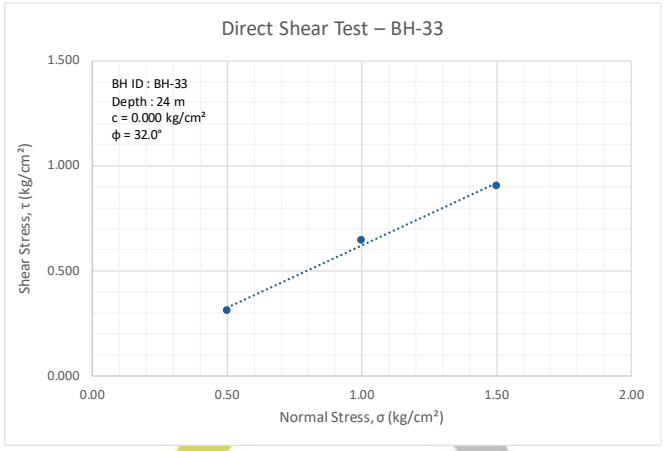

Direct Shear Test – BH-33
BH ID : BH-33
Depth : 9 m
c = 0.044 kg/cm²
ϕ = 24.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

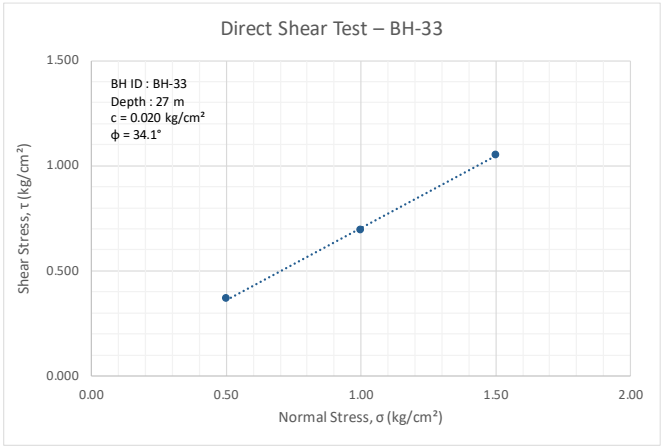

Direct Shear Test – BH-33
BH ID : BH-33
Depth : 12 m
c = 0.030 kg/cm²
ϕ = 26.6°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

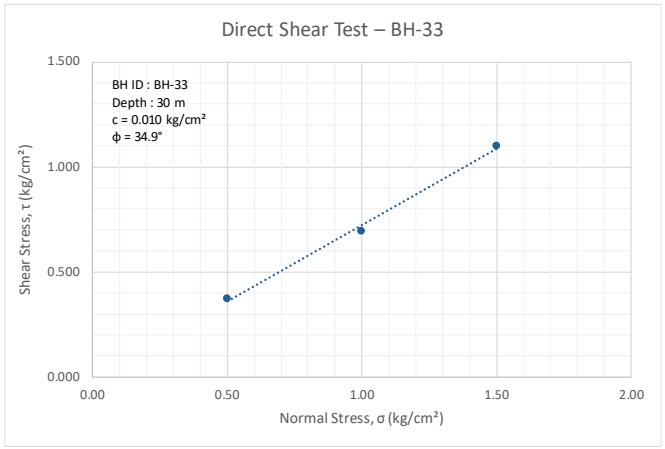

Direct Shear Test – BH-33
BH ID : BH-33
Depth : 15 m
c = 0.050 kg/cm²
ϕ = 28.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-33
BH ID : BH-33
Depth : 18 m
c = 0.020 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-33
BH ID : BH-33
Depth : 21 m
c = 0.010 kg/cm²
ϕ = 31.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-33
BH ID : BH-33
Depth : 24 m
c = 0.000 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-33
BH ID : BH-33
Depth : 27 m
c = 0.020 kg/cm²
ϕ = 34.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

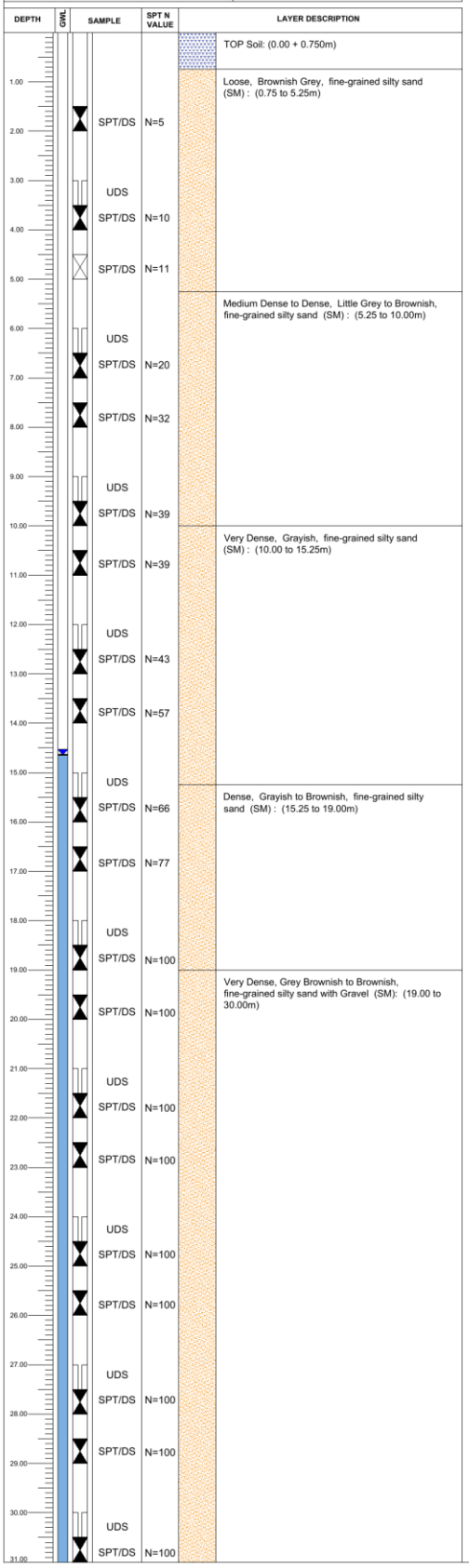

Direct Shear Test – BH-33
BH ID : BH-33
Depth : 30 m
c = 0.010 kg/cm²
ϕ = 34.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Noida Sector-142 to Botanical Garden (3+000 km TO 4+000 km)

BH ID : BH-34 | **Chainage** : 3+883 KM

Groundwater Level : 14.65 M | **Location** : Lat. 28.542715, Long. 77.344385



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

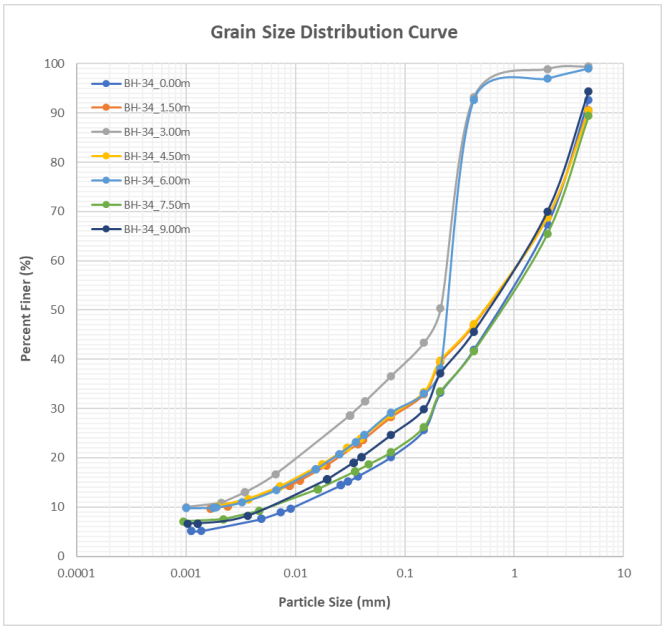
Soil

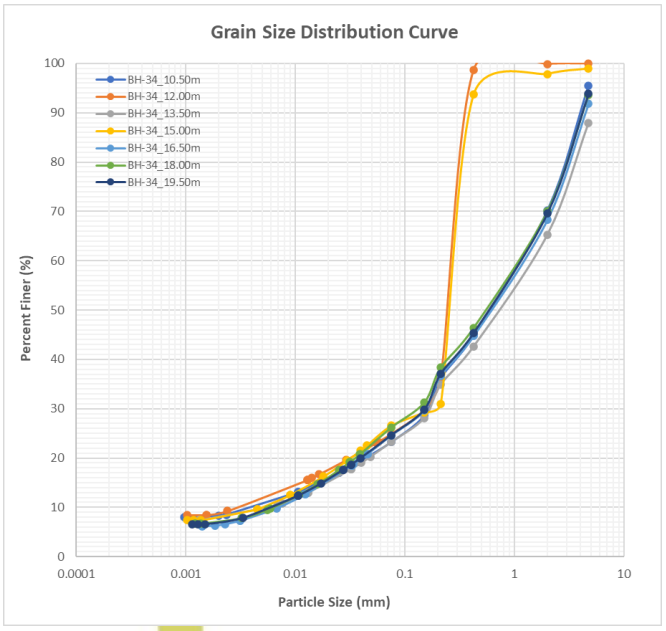
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

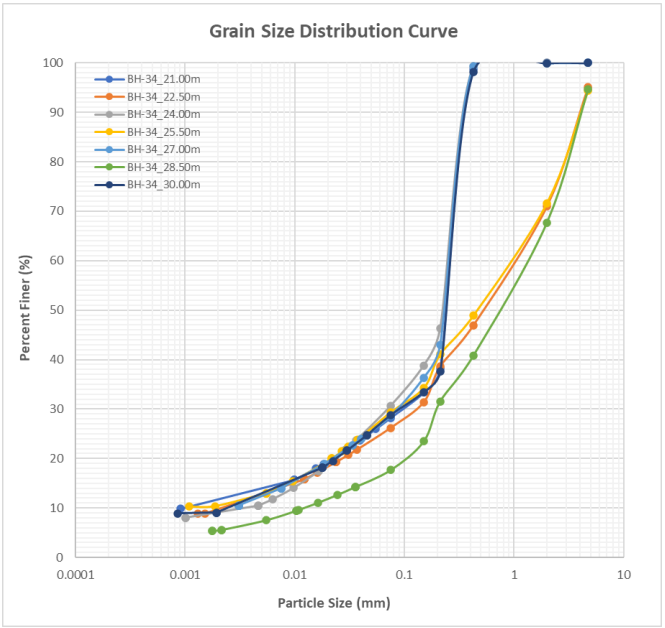
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-34	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	3+883	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	20-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	203.5	**End Date:**	24-01-2026
Project Code:	158_R5_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	14.65	**Location:**	Lat. 28.542715, Long. 77.344385

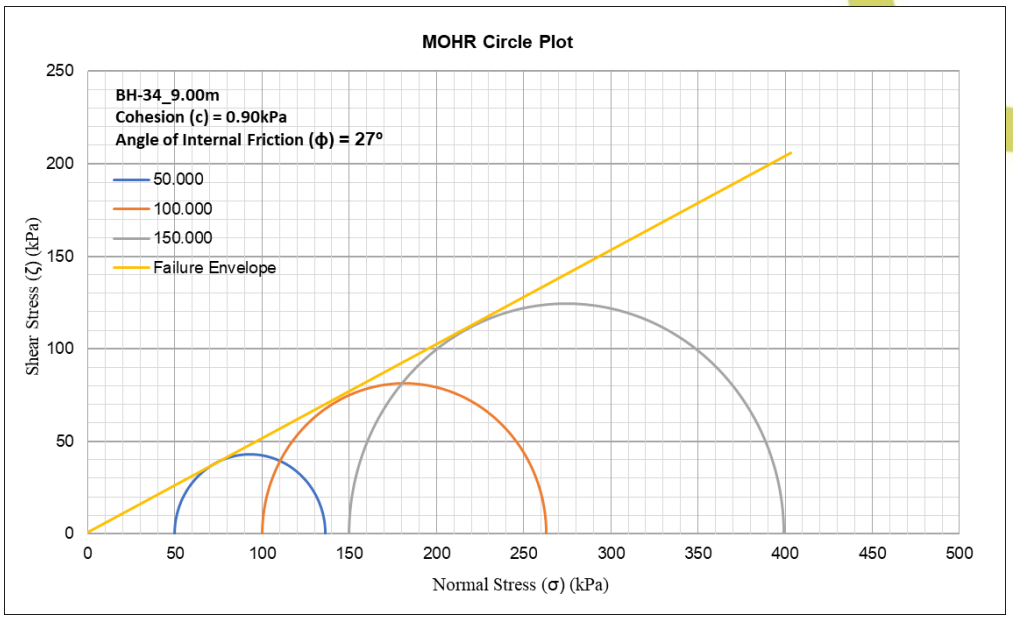
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						7.3	72.5	14.3	5.9	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Loose, Brownish Grey, fine-grained silty sand (SM)	2	2	3	5	7	9.4	62.4	18.3	9.9	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	DS							0.6	62.8	25.8	10.8	24	NP	NP	11.30	-	-	2.60	F	0.02	22	-	-	-	-	-	-
3.50	SPT/DS		3	3	5	10	11	-																			
4.50	SPT/DS		3	4	6	11	11	9.6	61.7	18.5	10.2	21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	DS	Medium Dense to Dense, Little Grey to Brownish, fine-grained silty sand (SM)						1.0	69.8	19.2	10.0	28	NP	NP	12.71	-	-	2.69	F	0.04	24	-	-	-	-	-	-
6.50	SPT/DS		6	8	12	20	19	-																			
7.50	SPT/DS		9	13	15	32	29	10.6	68.3	13.7	7.5	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS							5.6	69.8	17.3	7.3	23	NP	NP	10.78	1.92	1.73	2.66	F	0.03	26	UU	0.9	27	-	-	-
9.50	SPT/DS		14	16	18	39	33	-																			
10.50	SPT/DS	Very Dense, Grayish, fine-grained silty sand (SM)	20	24	32	39	32	4.5	72.3	14.9	8.3	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							0.0	75.1	16.0	8.9	22	NP	NP	12.10	1.90	1.69	2.67	F	0.07	28	UU	0.7	29	-	-	-
12.50	SPT/DS		21	26	27	43	32	-																			
13.50	SPT/DS		22	24	32	57	41	12.1	64.7	15.1	8.1	21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS							1.1	72.4	18.5	8.1	29	NP	NP	13.13	-	-	2.68	F	0.03	30	-	-	-	-	-	-
15.50	SPT/DS	Dense, Grayish to Brownish, fine-grained silty sand (SM)	17	19	25	68	31	-																			
16.50	SPT/DS		8	11	16	77	33	8.2	67.2	18.2	6.4	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS							9.2	63.9	19.7	7.2	26	NP	NP	14.22	-	-	2.65	F	0.05	30	-	-	-	-	-	-
18.50	SPT/DS		18	21	25	100	40	-																			
19.50	SPT/DS	Very Dense, Grey Brownish to Brownish, fine-grained silty sand with Gravel (SM)	25	32	37	100	39	6.2	69.2	17.6	7.0	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS							0.0	71.8	16.4	11.8	24	NP	NP	12.98	-	-	2.61	F	0.02	32	-	-	-	-	-	-
21.50	SPT/DS		18	27	35	100	38	-																			
22.50	SPT/DS		23	28	39	100	38	4.9	68.9	16.4	9.8	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							0.0	69.4	21.5	9.1	26	NP	NP	11.42	-	-	2.66	F	0.00	33	-	-	-	-	-	-
24.50	SPT/DS		26	35	40	100	37	-																			
25.50	SPT/DS		33	37	42	100	36	5.6	65.1	18.8	10.5	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							0.0	71.4	20.4	8.2	24	NP	NP	12.66	-	-	2.61	F	0.02	35	-	-	-	-	-	-
27.50	SPT/DS		36	42	45	100	36	-																			
28.50	SPT/DS		36	(50/6cm)	-	100	35	5.3	77.0	12.2	5.5	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							0.0	71.2	19.6	9.2	27	NP	NP	13.81	-	-	2.62	F	0.02	34	-	-	-	-	-	-
30.50	SPT/DS		46	(50/8cm)	-	100	34	-																			

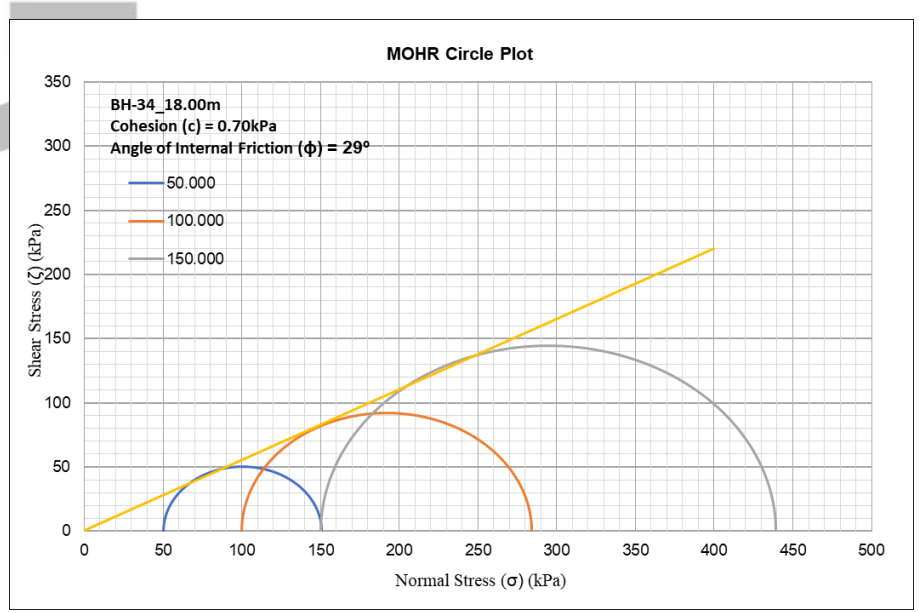
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

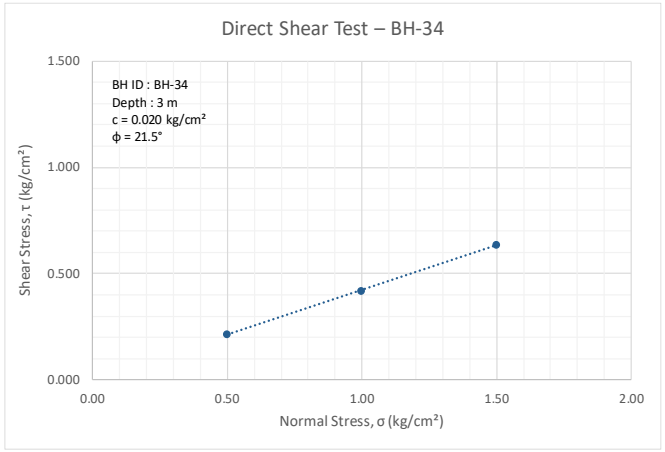

Grain Size Distribution Curve
BH-34_0.00m
BH-34_1.50m
BH-34_3.00m
BH-34_4.50m
BH-34_6.00m
BH-34_7.50m
BH-34_9.00m
Percent Finer (%)
Particle Size (mm)

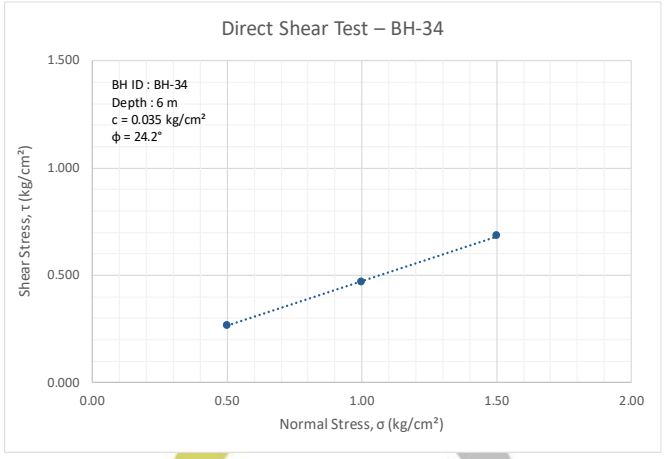

Grain Size Distribution Curve
BH-34_10.50m
BH-34_12.00m
BH-34_13.50m
BH-34_15.00m
BH-34_16.50m
BH-34_18.00m
BH-34_19.50m
Percent Finer (%)
Particle Size (mm)

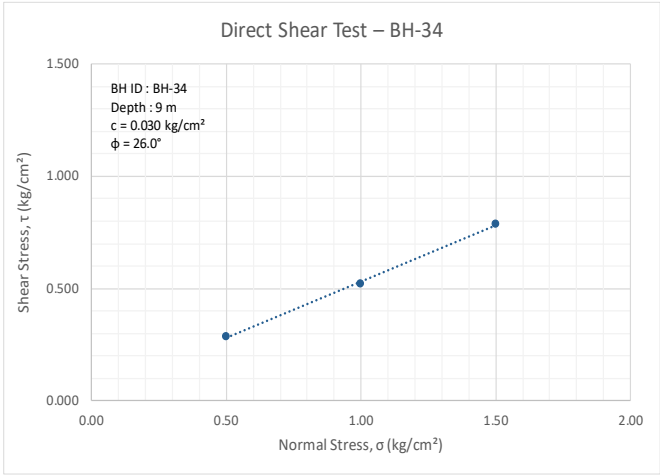

Grain Size Distribution Curve
BH-34_21.00m
BH-34_22.50m
BH-34_24.00m
BH-34_25.50m
BH-34_27.00m
BH-34_28.50m
BH-34_30.00m
Percent Finer (%)
Particle Size (mm)

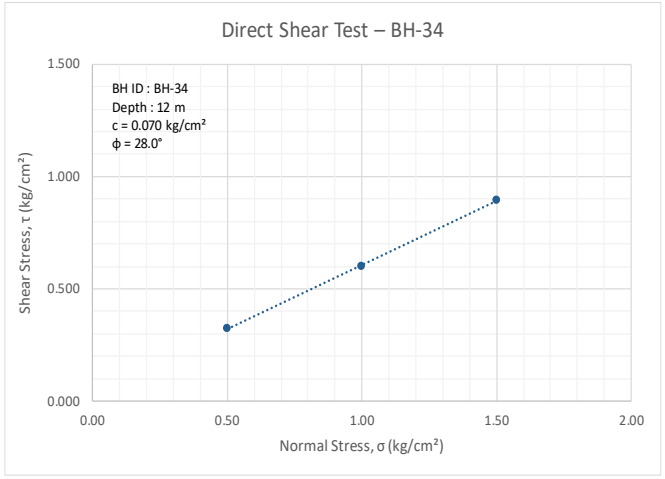

MOHR Circle Plot
BH-34_9.00m
Cohesion (c) = 0.90kPa
Angle of Internal Friction (ϕ) = 27°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

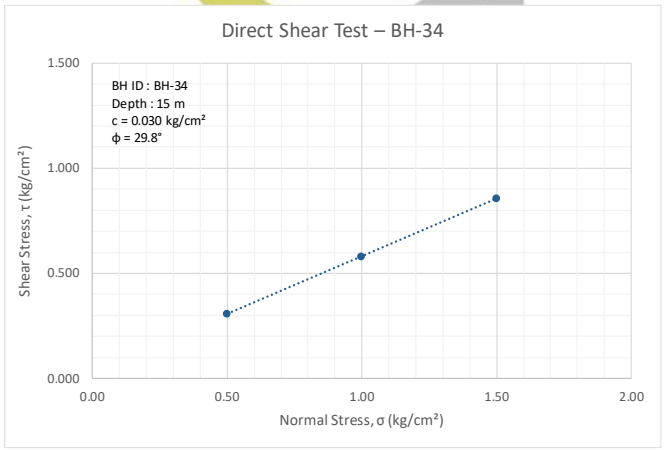

MOHR Circle Plot
BH-34_18.00m
Cohesion (c) = 0.70kPa
Angle of Internal Friction (ϕ) = 29°
50.000
100.000
150.000
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

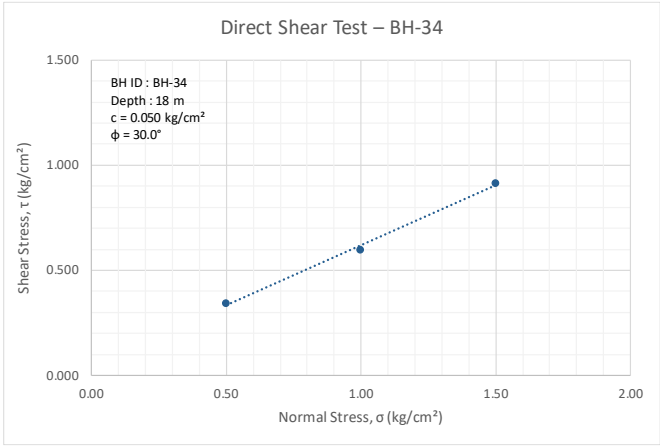

Direct Shear Test – BH-34
BH ID : BH-34
Depth : 3 m
c = 0.020 kg/cm²
ϕ = 21.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

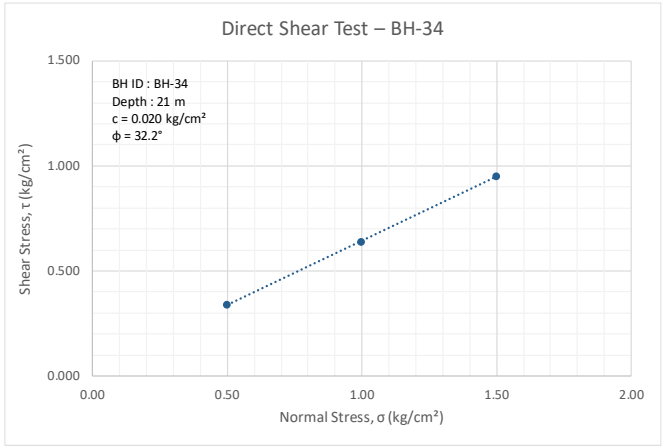

Direct Shear Test – BH-34
BH ID : BH-34
Depth : 6 m
c = 0.035 kg/cm²
ϕ = 24.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

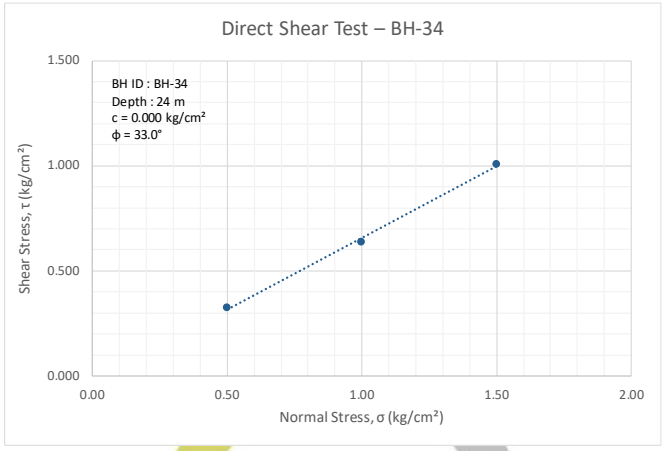

Direct Shear Test – BH-34
BH ID : BH-34
Depth : 9 m
c = 0.030 kg/cm²
ϕ = 26.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

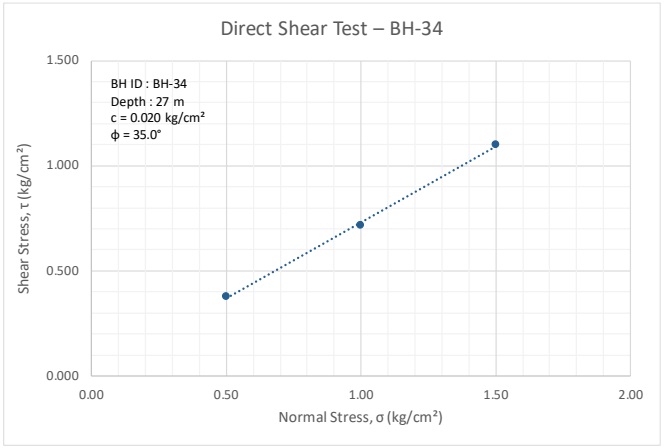

Direct Shear Test – BH-34
BH ID : BH-34
Depth : 12 m
c = 0.070 kg/cm²
ϕ = 28.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

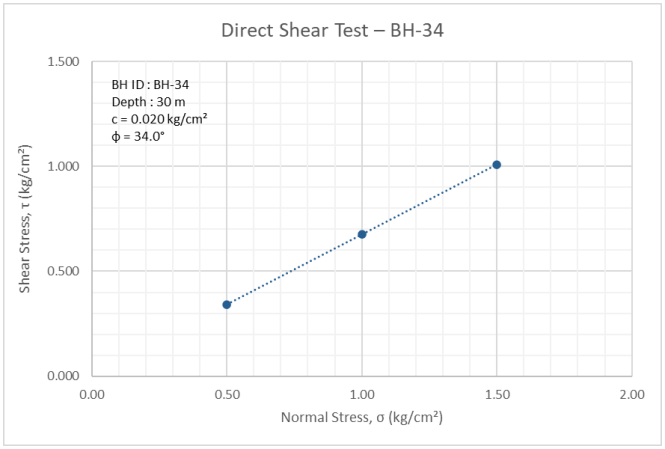

Direct Shear Test – BH-34
BH ID : BH-34
Depth : 15 m
c = 0.030 kg/cm²
ϕ = 29.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-34
BH ID : BH-34
Depth : 18 m
c = 0.050 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-34
BH ID : BH-34
Depth : 21 m
c = 0.020 kg/cm²
ϕ = 32.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-34
BH ID : BH-34
Depth : 24 m
c = 0.000 kg/cm²
ϕ = 33.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-34
BH ID : BH-34
Depth : 27 m
c = 0.020 kg/cm²
ϕ = 35.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

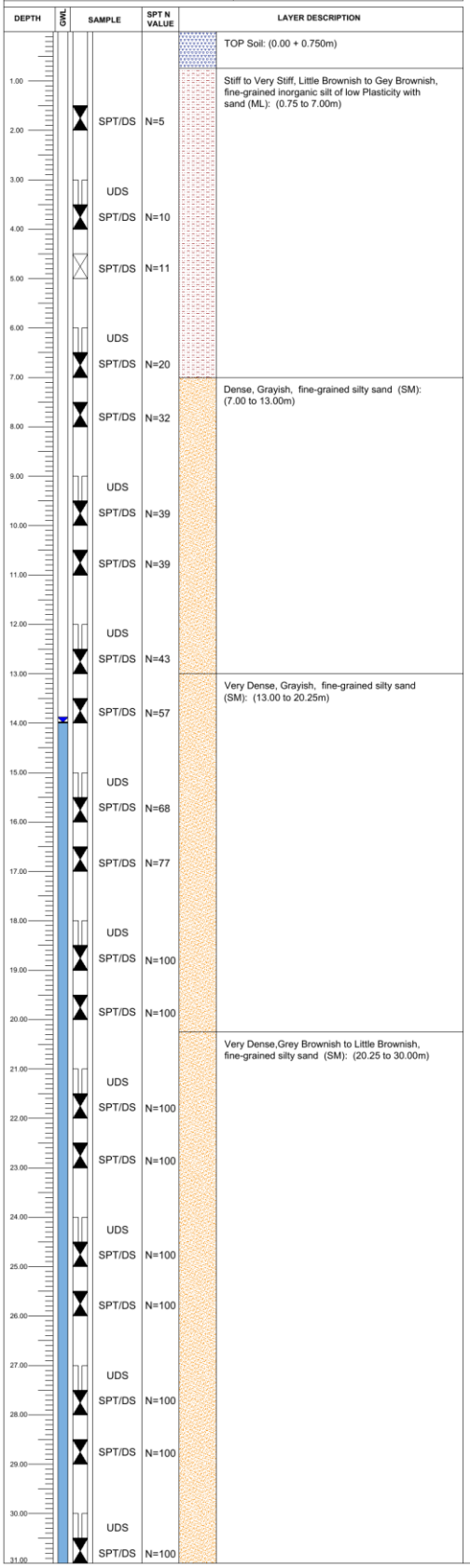

Direct Shear Test – BH-34
BH ID : BH-34
Depth : 30 m
c = 0.020 kg/cm²
ϕ = 34.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Noida Sector-142 to Botanical Garden (3+000 km TO 4+000 km)

BH ID : BH-35 | **Chainage** : 4+014 KM

Groundwater Level : 14.00 M | **Location** : Lat. 28.542085, Long. 77.345346



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

Soil

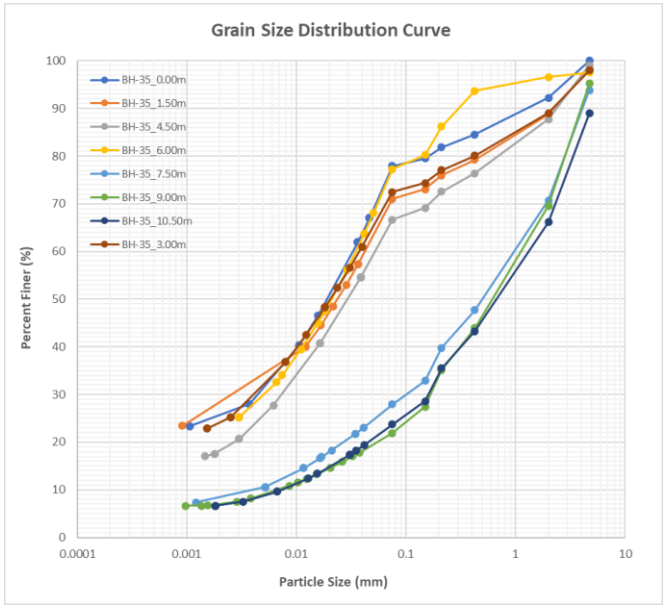
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

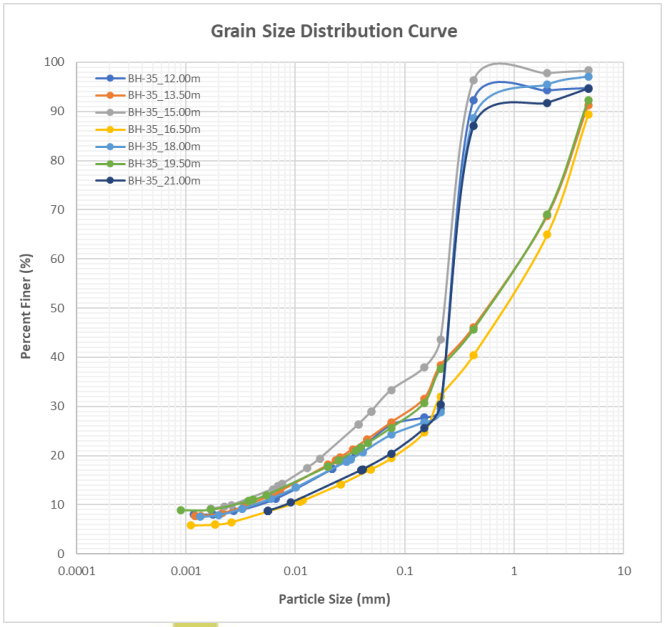
GOMA ENGINEERING AND CONSULTANCY
Quality we put forward

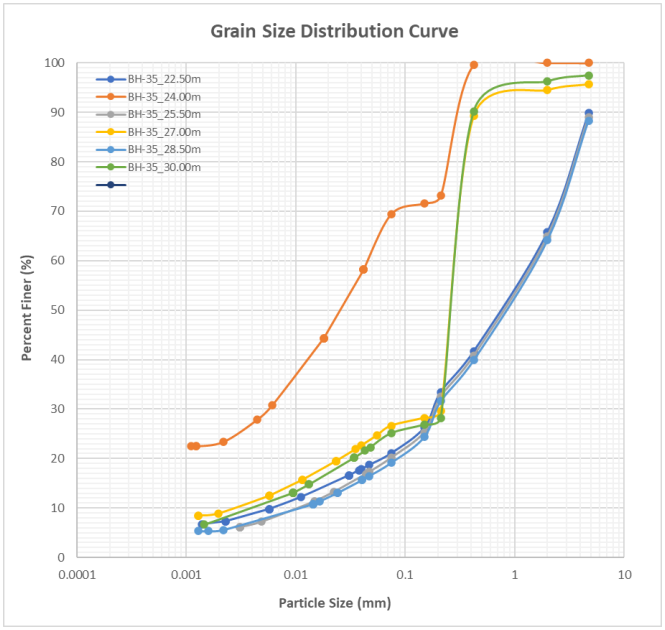
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-35	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	4+014	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	17-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	201.6	**End Date:**	18-01-2026
Project Code:	158_R5_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	14.00	**Location:**	Lat. 28.542085, Long. 77.345346

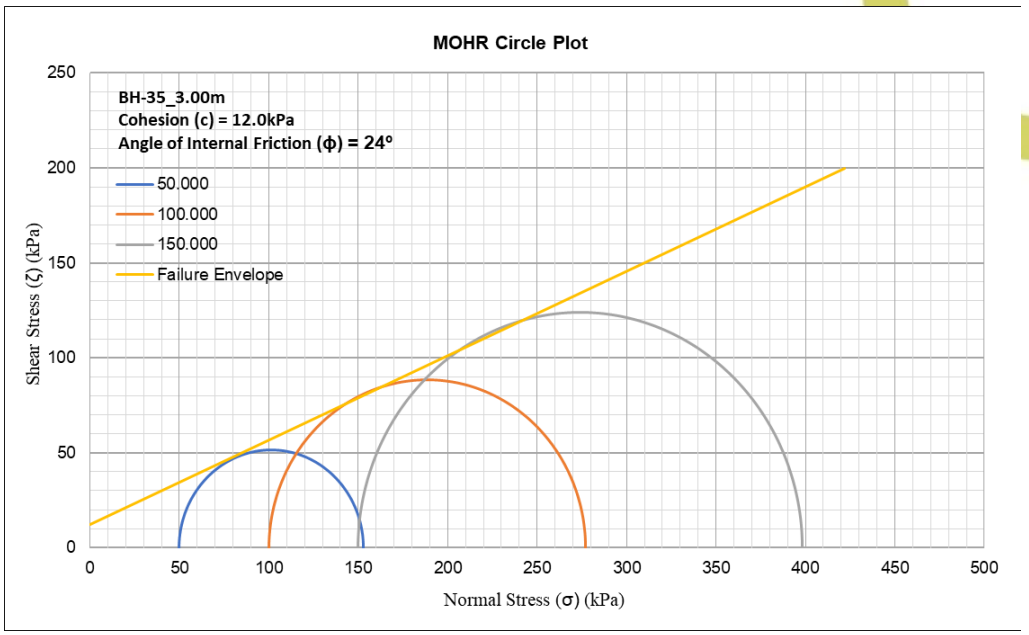
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						0.0	22.1	52.2	25.7	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Stiff to Very Stiff, Little Brownish to Gey Brownish, fine-grained inorganic silt of low Plasticity with sand (ML)	2	2	3	5	7	1.8	27.2	42.6	28.5	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							2.04	25.5	48.29	24.16	22.0	NP	NP	8.0	1.9	1.78	2.7	F	0.0	23.0	UU	12.0	24.0	-	-	-
3.50	SPT/DS		2	5	5	10	11	-																			
4.50	SPT/DS		3	4	7	11	11	1.0	32.4	48.5	18.2	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							2.5	20.3	54.6	22.6	26	NP	NP	12.70	1.85	1.64	2.65	F	0.04	26	-	-	-	-	-	-
6.50	SPT/DS		6	7	13	20	19	-																			
7.50	SPT/DS	Dense, Grayish, fine-grained silty sand (SM)	12	15	17	32	29	6.2	65.9	19.5	8.5	21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS							4.76	73.3	14.87	7.03	29.0	NP	NP	8.5	1.9	1.78	2.65	F	0.05	27	UU	13.0	23.0	-	-	-
9.50	SPT/DS		13	18	21	39	33	-																			
10.50	SPT/DS		14	16	23	39	32	11.0	65.3	16.9	6.8	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	DS							5.2	68.5	18.1	8.2	26	NP	NP	11.64	-	-	2.65	F	0.01	30	-	-	-	-	-	-
12.50	SPT/DS		15	18	25	43	32	-																			
13.50	SPT/DS	Very Dense, Grayish, fine-grained silty sand (SM)	22	27	30	57	41	8.7	64.6	18.5	8.2	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS							1.7	65.0	23.9	9.4	29	NP	NP	13.88	-	-	2.62	F	0.09	29	-	-	-	-	-	-
15.50	SPT/DS		25	33	35	68	30	-																			
16.50	SPT/DS		25	36	41	77	33	10.6	69.9	13.4	6.1	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS							2.9	72.9	16.3	7.9	27	NP	NP	14.44	-	-	2.63	F	0.02	30	-	-	-	-	-	-
18.50	SPT/DS		39	40	50/13cm	100	39	-																			
19.50	SPT/DS		45	50/12cm	-	100	39	7.7	66.7	16.3	9.3	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS	Very Dense,Grey Brownish to Little Brownish, fine-grained silty sand (SM)						5.3	74.2	14.5	5.9	23	NP	NP	12.81	-	-	2.65	F	0.03	32	-	-	-	-	-	-
21.50	SPT/DS		47	50/7cm	-	100	38	-																			
22.50	SPT/DS		45	50/6cm	-	100	37	10.2	68.7	13.9	7.1	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							0.0	30.6	46.2	23.2	29	NP	NP	15.02	-	-	2.64	F	0.07	32	-	-	-	-	-	-
24.50	SPT/DS		45	50/8cm	-	100	36	-																			
25.50	SPT/DS		47	50/9cm	-	100	36	10.9	68.9	13.1	7.1	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							4.4	69.0	17.7	8.9	26	NP	NP	14.12	-	-	2.65	F	0.04	34	-	-	-	-	-	-
27.50	SPT/DS		44	50/6cm	-	100	35	-																			
28.50	SPT/DS		50/8cm	-		100	35	11.7	69.2	13.6	5.5	21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							2.5	72.3	17.5	7.7	29	NP	NP	11.89	-	-	2.68	F	0.01	37	-	-	-	-	-	-
30.50	SPT/DS		50/11cm)			100	33	-																			

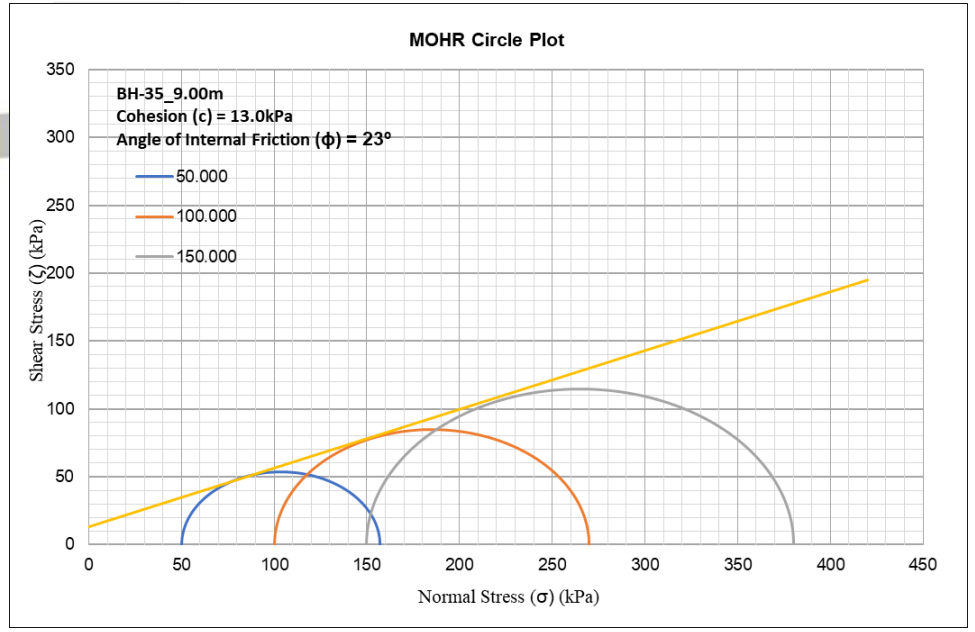
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

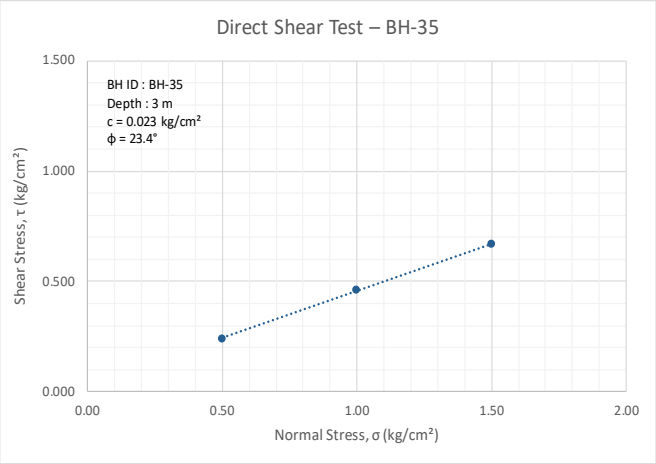

Grain Size Distribution Curve
BH-35_0.00m
BH-35_1.50m
BH-35_4.50m
BH-35_6.00m
BH-35_7.50m
BH-35_9.00m
BH-35_10.50m
BH-35_3.00m
Percent Finer (%)
Particle Size (mm)

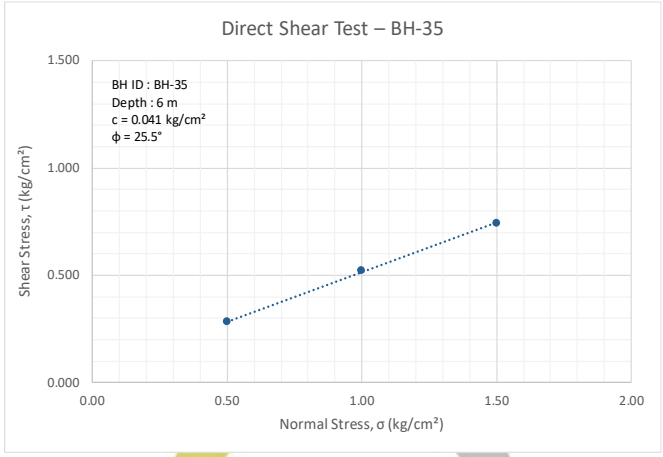

Grain Size Distribution Curve
BH-35_12.00m
BH-35_13.50m
BH-35_15.00m
BH-35_16.50m
BH-35_18.00m
BH-35_19.50m
BH-35_21.00m
Percent Finer (%)
Particle Size (mm)

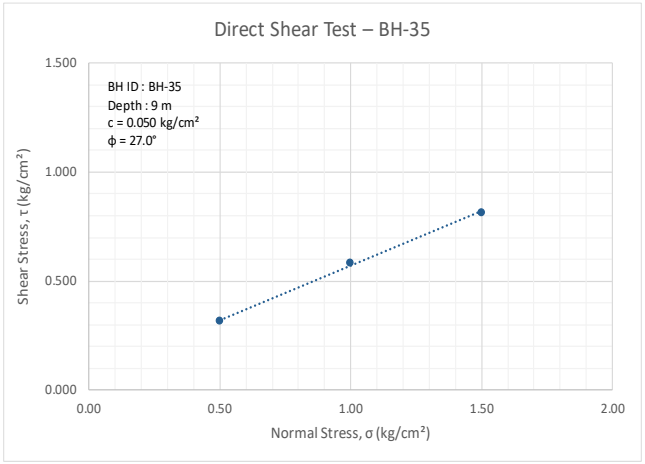

Grain Size Distribution Curve
BH-35_22.50m
BH-35_24.00m
BH-35_25.50m
BH-35_27.00m
BH-35_28.50m
BH-35_30.00m
Percent Finer (%)
Particle Size (mm)

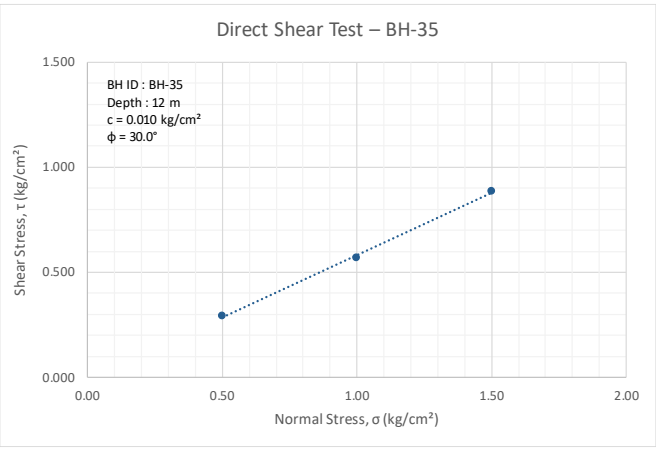

MOHR Circle Plot
BH-35_3.00m
Cohesion (c) = 12.0kPa
Angle of Internal Friction (ϕ) = 24°
50.000
100.000
150.000
Failure Envelope
Shear Stress (Ζ) (kPa)
Normal Stress (σ) (kPa)

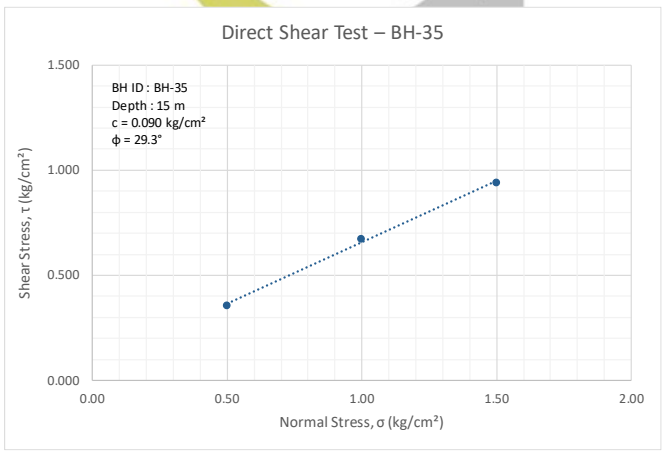

MOHR Circle Plot
BH-35_9.00m
Cohesion (c) = 13.0kPa
Angle of Internal Friction (ϕ) = 23°
50.000
100.000
150.000
Shear Stress (Ζ) (kPa)
Normal Stress (σ) (kPa)

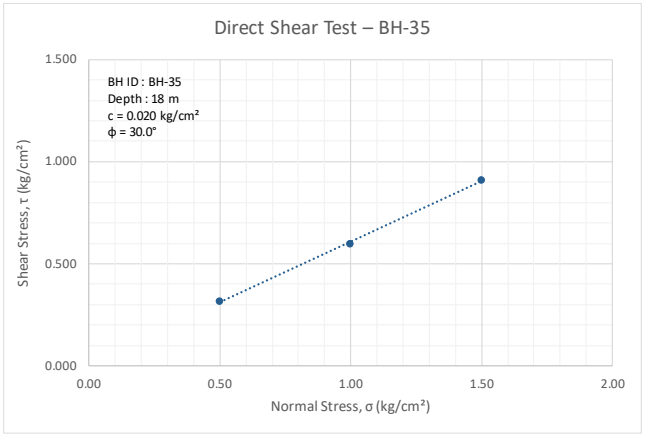

Direct Shear Test – BH-35
BH ID : BH-35
Depth : 3 m
c = 0.023 kg/cm²
ϕ = 23.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

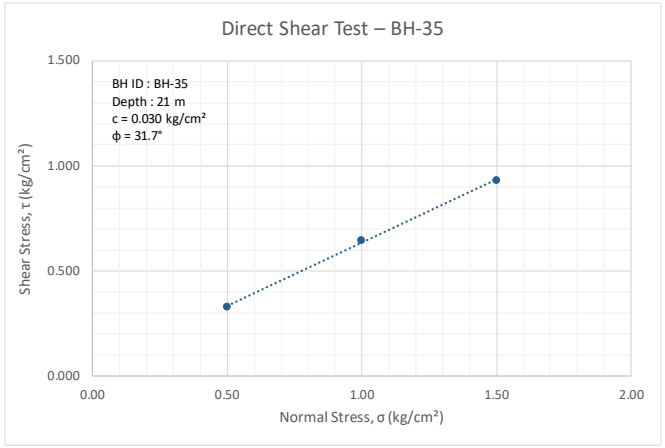

Direct Shear Test – BH-35
BH ID : BH-35
Depth : 6 m
c = 0.041 kg/cm²
ϕ = 25.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

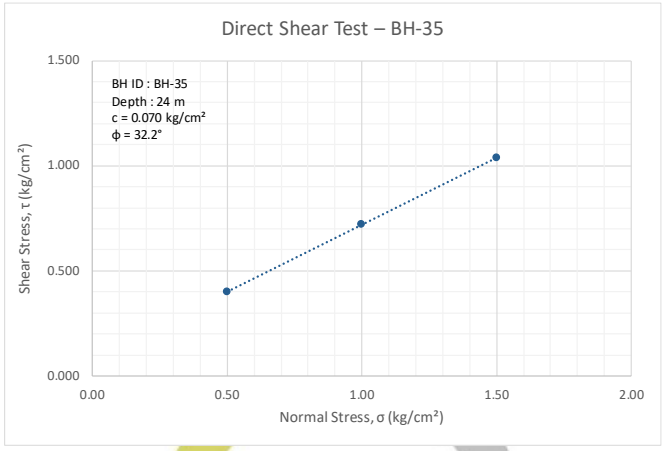

Direct Shear Test – BH-35
BH ID : BH-35
Depth : 9 m
c = 0.050 kg/cm²
ϕ = 27.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

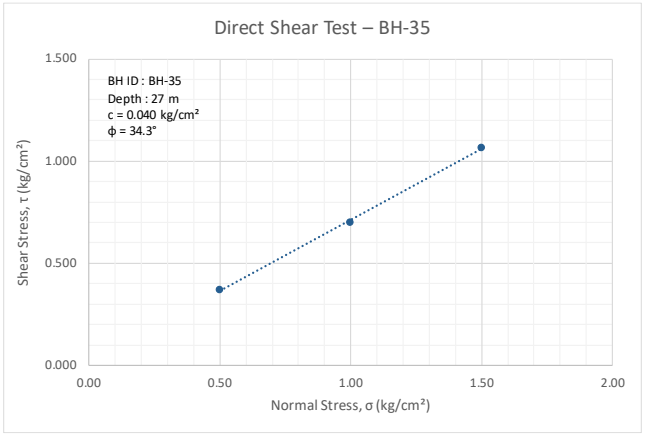

Direct Shear Test – BH-35
BH ID : BH-35
Depth : 12 m
c = 0.010 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

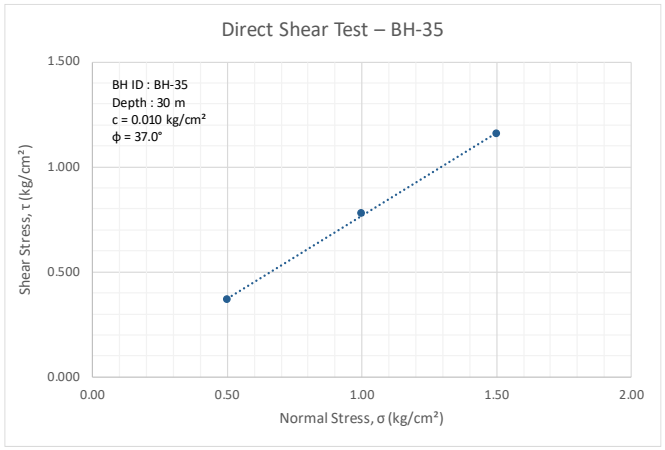

Direct Shear Test – BH-35
BH ID : BH-35
Depth : 15 m
c = 0.090 kg/cm²
ϕ = 29.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-35
BH ID : BH-35
Depth : 18 m
c = 0.020 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-35
BH ID : BH-35
Depth : 21 m
c = 0.030 kg/cm²
ϕ = 31.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-35
BH ID : BH-35
Depth : 24 m
c = 0.070 kg/cm²
ϕ = 32.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-35
BH ID : BH-35
Depth : 27 m
c = 0.040 kg/cm²
ϕ = 34.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-35
BH ID : BH-35
Depth : 30 m
c = 0.010 kg/cm²
ϕ = 37.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Noida Sector-142 to Botanical Garden (3+000 km TO 4+000 km)

BH ID : BH-36 | **Chainage** : 4+093 KM

Groundwater Level : 14.20 M | **Location** : Lat. 28.541566, Long. 77.346066

DEPTH	GWL	SAMPLE	SPT N VALUE	LAYER DESCRIPTION
				TOP Soil: (0.00 + 0.750m)
1.00				Stiff, Yellowish to Little Grayish, fine-grained inorganic silt of low Plasticity with sand and Little Gravel (ML): (0.75 to 4.00m)
2.00		SPT/DS	N=13	
3.00		UDS		
4.00		SPT/DS	N=17	
5.00		SPT/DS	N=22	Medium Dense to Dense, Little Brownish, fine-grained silty sand with Gravel (SM) : (4.00to 8.25m)
6.00		UDS		
7.00		SPT/DS	N=31	
8.00		SPT/DS	N=30	
9.00		UDS		Very Stiff to Hard , Brownish, fine-grained inorganic silt of low Plasticity with sand (ML) : (8.25 to 13.00m)
10.00		SPT/DS	N=30	
11.00		SPT/DS	N=33	
12.00		UDS		
13.00		SPT/DS	N=32	
14.00		SPT/DS	N=38	Dense, Greyish, fine-grained silty sand with Little Gravel (SM) : (13.00 to19.00m)
15.00		UDS		
16.00		SPT/DS	N=43	
17.00		SPT/DS	N=48	
18.00		UDS		
19.00		SPT/DS	N=48	
20.00		SPT/DS	N=55	Very Dense, Gray Brownish, fine-grained silty sand (SM) : (19.00 to 35.00m)
21.00		UDS		
22.00		SPT/DS	N=61	
23.00		SPT/DS	N=68	
24.00		UDS		
25.00		SPT/DS	N=77	
26.00		SPT/DS	N=100	
27.00		UDS		
28.00		SPT/DS	N=100	
29.00		SPT/DS	N=100	
30.00		UDS		
31.00		SPT/DS	N=100	
32.00		SPT/DS	N=100	
33.00		UDS		
34.00		SPT/DS	N=100	
35.00		SPT/DS	N=100	

LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

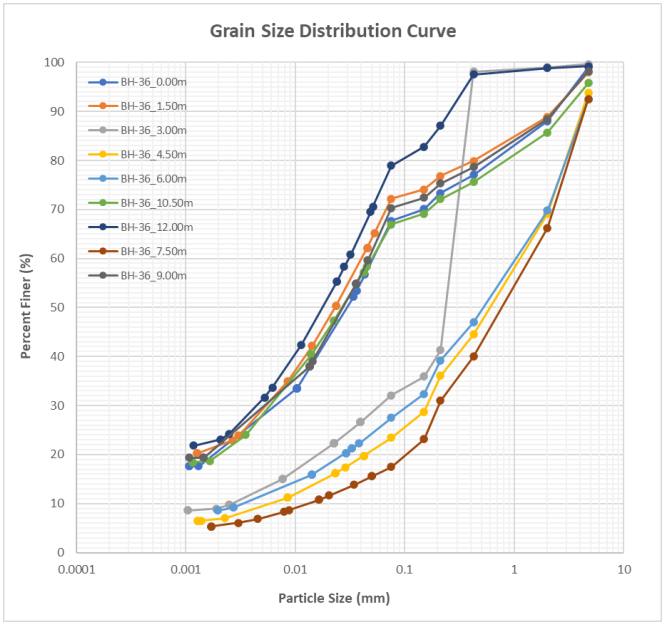
Soil

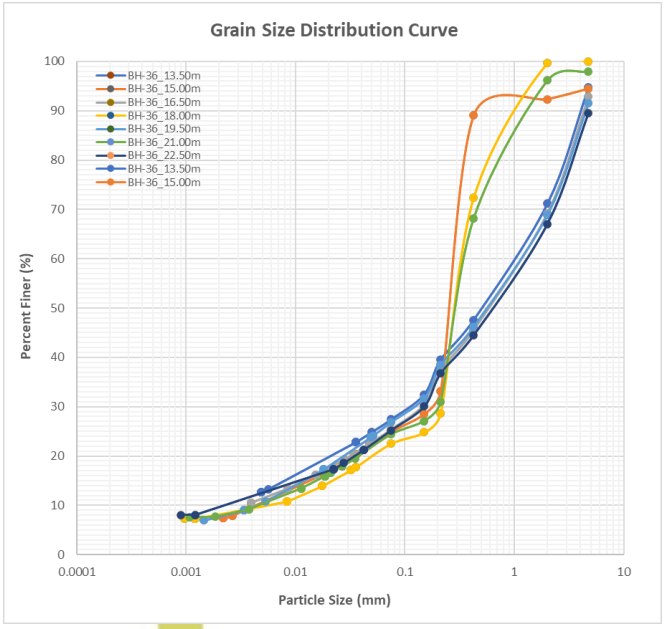
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

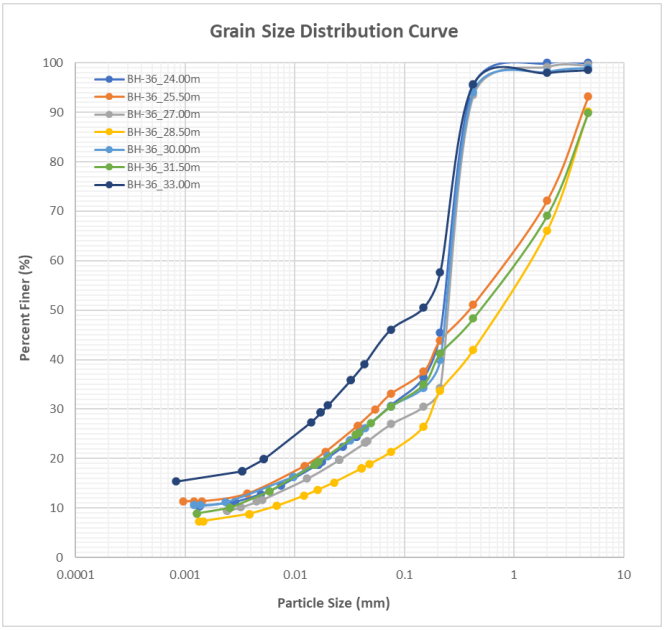
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-36	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	4+093	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	35.00	**Start Date:**	14-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	203	**End Date:**	15-01-2026
Project Code:	158_R5_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	14.20	**Location:**	Lat. 28.541566, Long. 77.346066

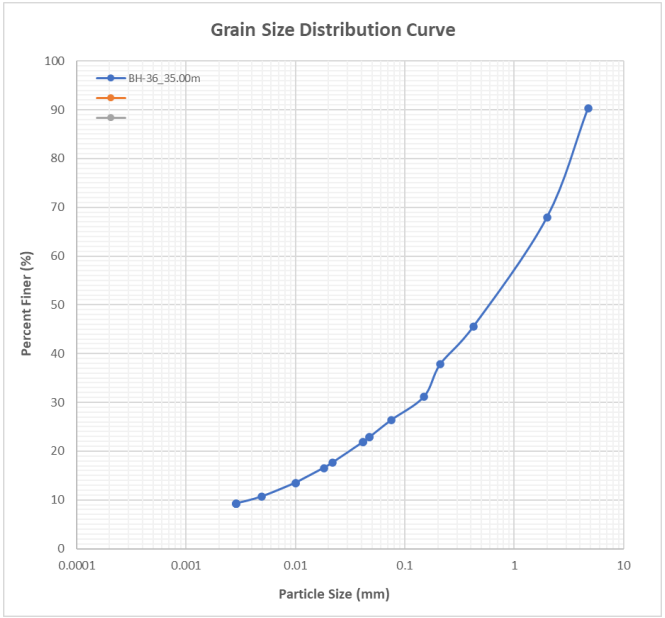
			SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
Depth [m]	Sample Type	Descriptions	N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						1.0	31.3	46.9	20.8	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Stiff, Yellowish to Little Grayish, fine-grained inorganic silt of low Plasticity with sand and Little Gravel (ML)	5	6	7	13	18	2.1	25.8	50.3	21.9	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							0.4	67.5	23.0	9.1	28	NP	NP	12.22	1.73	1.54	2.67	F	0.04	24	-	-	-	-	-	-
3.50	SPT/DS		6	8	9	17	19	-																			
4.50	SPT/DS	Medium Dense to Dense, Little Brownish, fine-grained silty sand with Gravel (SM)	8	10	12	22	22	6.3	70.3	16.6	6.9	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							7.50	65.0	18.82	8.68	22	NP	NP	12.36	1.93	1.72	2.60	F	0.07	27	UU	15.0	22.0	-	-	-
6.50	SPT/DS		10	12	19	31	29	-																			
7.50	SPT/DS		12	14	16	30	27	7.5	75.0	12.0	5.6	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS	Very Stiff to Hard , Brownish, fine-grained inorganic silt of low Plasticity with sand (ML)						1.80	27.9	48.23	22.05	29	NP	NP	13.29	1.94	1.71	2.61	F	0.09	26	UU	14.0	25.0	-	-	-
9.50	SPT/DS		7	12	18	30	26	-																			
10.50	SPT/DS		9	15	18	33	27	4.2	28.8	46.9	20.0	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							0.8	20.3	55.9	23.0	24	NP	NP	16.22	1.93	1.66	2.67	F	0.08	28	-	-	-	-	-	-
12.50	SPT/DS		8	12	20	32	24	-																			
13.50	SPT/DS	Dense, Greyish, fine-grained silty sand with Little Gravel (SM)	11	15	23	38	27	5.3	67.3	19.3	8.1	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS							5.6	69.5	13.3	11.6	28	NP	NP	13.17	1.99	1.76	2.68	F	0.02	29	-	-	-	-	-	-
15.50	SPT/DS		12	18	25	43	22	-																			
16.50	SPT/DS		13	20	28	48	23	7.1	67.5	17.6	7.8	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS		p					0.0	77.5	14.3	8.2	29	NP	NP	13.82	-	-	2.62	F	0.00	30	-	-	-	-	-	-
18.50	SPT/DS		10	16	32	48	23	-																			
19.50	SPT/DS	Very Dense, Gray Brownish, fine-grained silty sand (SM)	12	19	36	55	25	8.5	64.6	19.2	7.7	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS							2.0	73.6	16.5	7.9	26	NP	NP	15.16	-	-	2.61	F	0.01	30	-	-	-	-	-	-
21.50	SPT/DS		15	22	39	61	26	-																			
22.50	SPT/DS		17	26	42	68	28	10.4	64.3	15.6	9.7	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							0.0	69.3	19.9	10.8	26	NP	NP	14.13	-	-	2.61	F	0.00	31	-	-	-	-	-	-
24.50	SPT/DS		20	31	46	77	30	-																			
25.50	SPT/DS		22	36	(50/12cm)	100	36	6.8	60.2	21.2	11.9	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							0.4	72.6	15.9	11.1	23	NP	NP	12.66	-	-	2.61	F	0.02	33	-	-	-	-	-	-
27.50	SPT/DS		25	40	(50/8cm)	100	35	-																			
28.50	SPT/DS		29	(50/11cm)	-	100	35	9.8	68.9	13.5	7.8	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							0.9	68.6	19.5	11.0	24	NP	NP	11.31	-	-	2.63	F	0.03	32	-	-	-	-	-	-
30.50	SPT/DS		32	(50/10cm)	-	100	34	-																			
31.50	SPT/DS		36	(50/9cm)	-	100	33	10.2	59.3	20.9	9.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33.00	DS							1.4	52.5	29.4	16.7	-	-	-	12.3	-	-	2.65	-	-	-	-	-	-	-	-	-
33.50	SPT/DS		39	(50/10cm)	-	100	32	-																			
35.00	SPT/DS		42	(50/8cm)	-	100	30	9.7	64.0	14.1	12.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

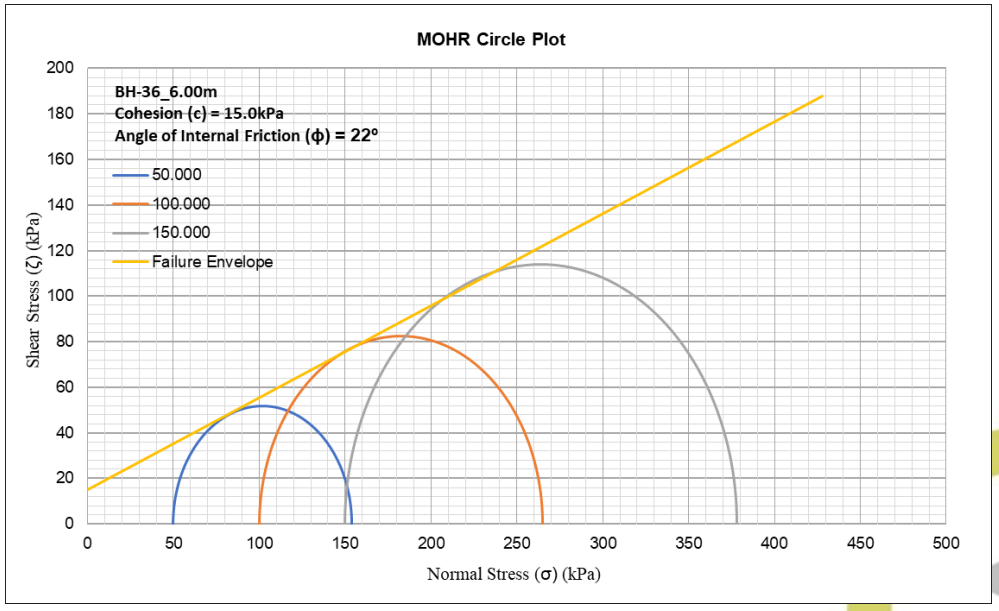
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

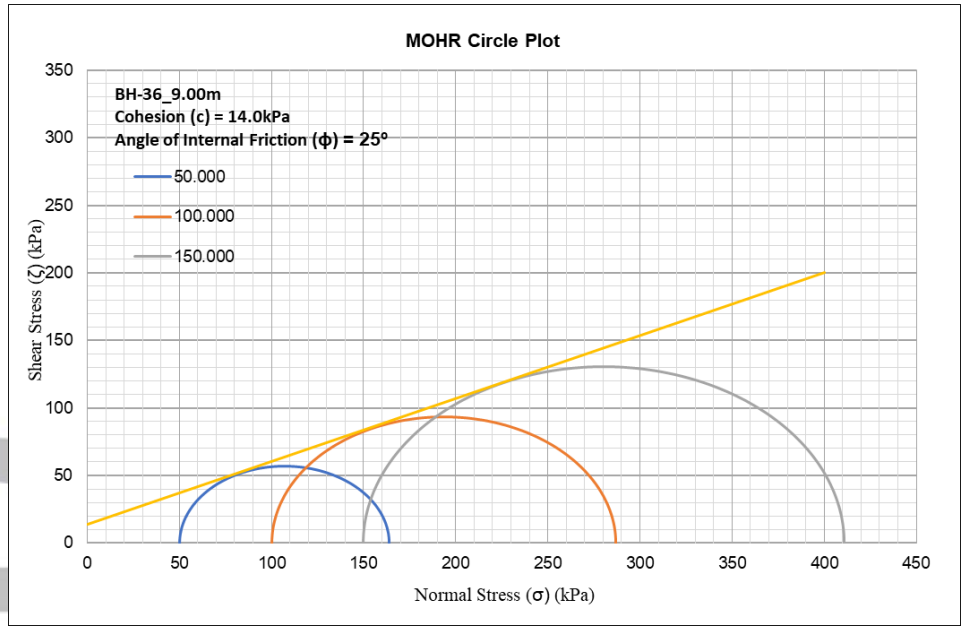

Grain Size Distribution Curve
BH-36_0.00m
BH-36_1.50m
BH-36_3.00m
BH-36_4.50m
BH-36_6.00m
BH-36_10.50m
BH-36_12.00m
BH-36_7.50m
BH-36_9.00m
Percent Finer (%)
Particle Size (mm)

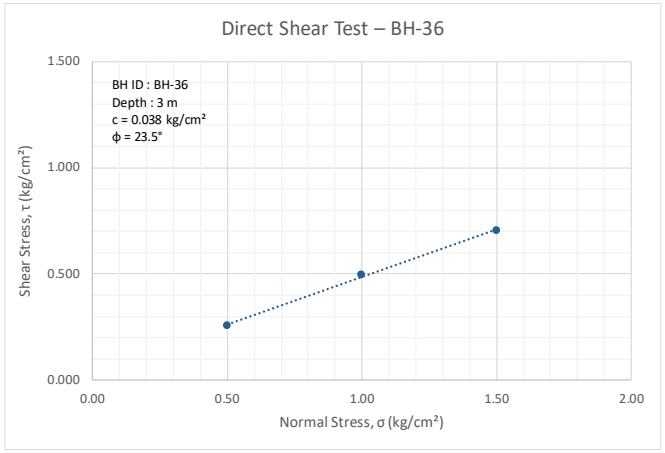

Grain Size Distribution Curve
BH-36_13.50m
BH-36_15.00m
BH-36_16.50m
BH-36_18.00m
BH-36_19.50m
BH-36_21.00m
BH-36_22.50m
BH-36_13.50m
BH-36_15.00m
Percent Finer (%)
Particle Size (mm)

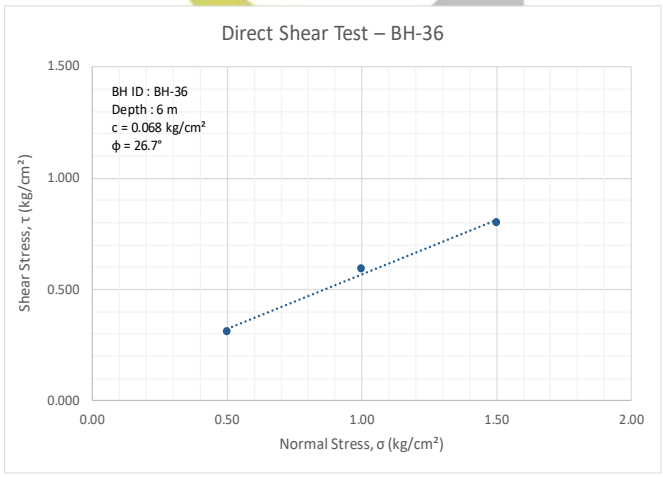

Grain Size Distribution Curve
BH-36_24.00m
BH-36_25.50m
BH-36_27.00m
BH-36_28.50m
BH-36_30.00m
BH-36_31.50m
BH-36_33.00m
Percent Finer (%)
Particle Size (mm)

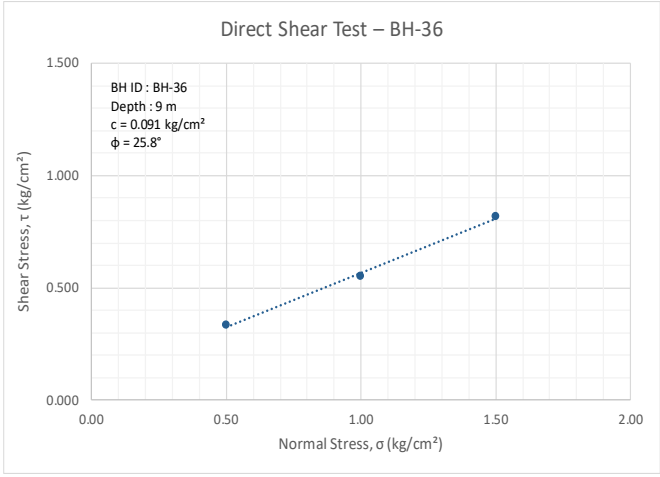

Grain Size Distribution Curve
BH-36_35.00m
Percent Finer (%)
Particle Size (mm)

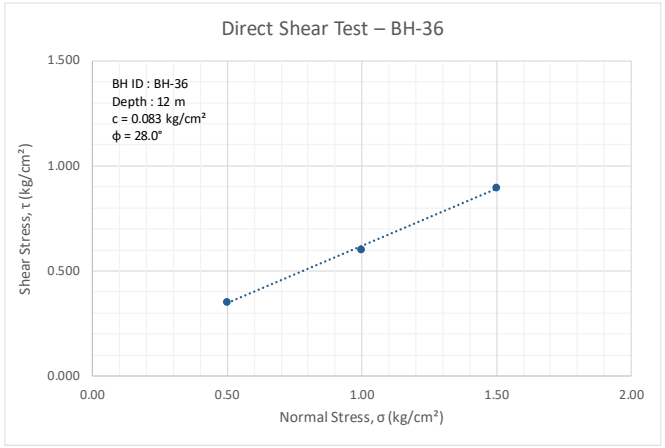

MOHR Circle Plot
BH-36_6.00m
Cohesion (c) = 15.0kPa
Angle of Internal Friction (ϕ) = 22°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

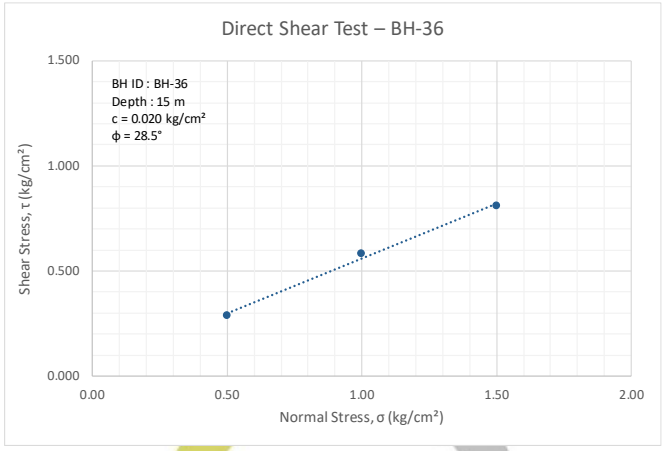

MOHR Circle Plot
BH-36_9.00m
Cohesion (c) = 14.0kPa
Angle of Internal Friction (ϕ) = 25°
50.000
100.000
150.000
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

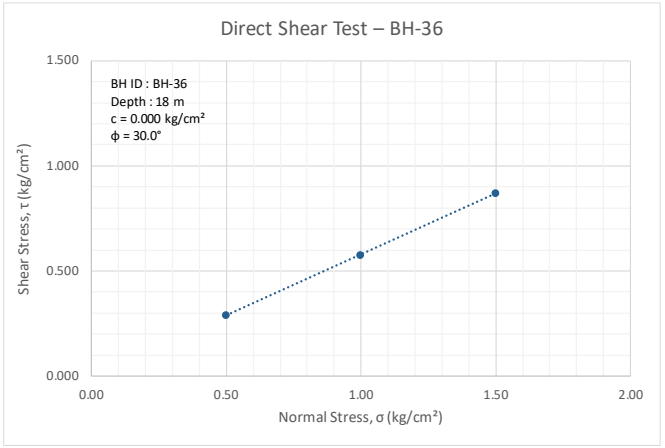

Direct Shear Test – BH-36
BH ID : BH-36
Depth : 3 m
c = 0.038 kg/cm²
ϕ = 23.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

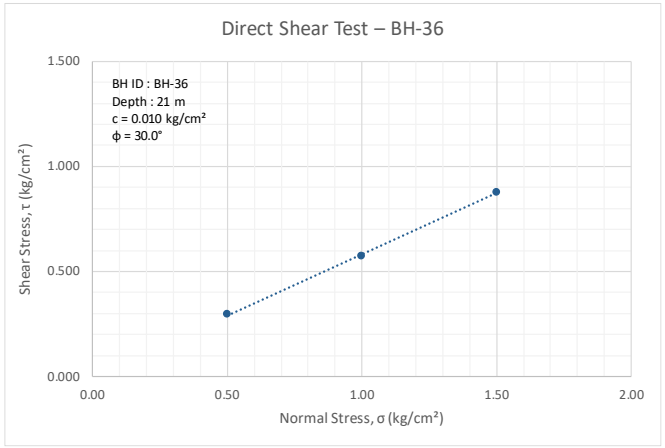

Direct Shear Test – BH-36
BH ID : BH-36
Depth : 6 m
c = 0.068 kg/cm²
ϕ = 26.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

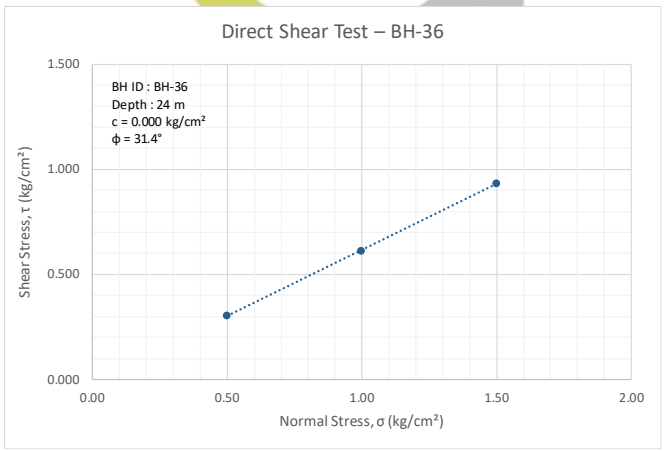

Direct Shear Test – BH-36
BH ID : BH-36
Depth : 9 m
c = 0.091 kg/cm²
ϕ = 25.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

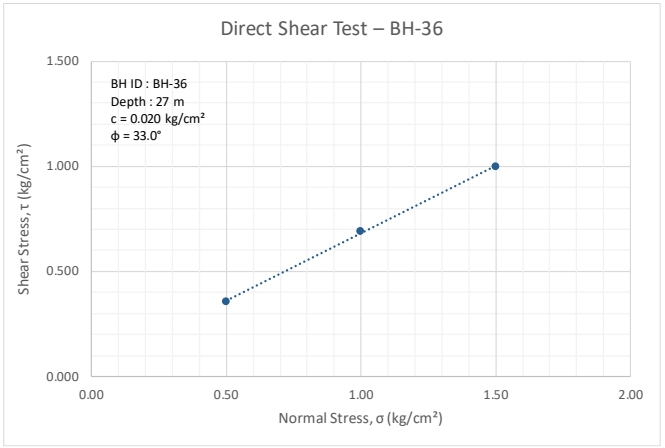

Direct Shear Test – BH-36
BH ID : BH-36
Depth : 12 m
c = 0.083 kg/cm²
ϕ = 28.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

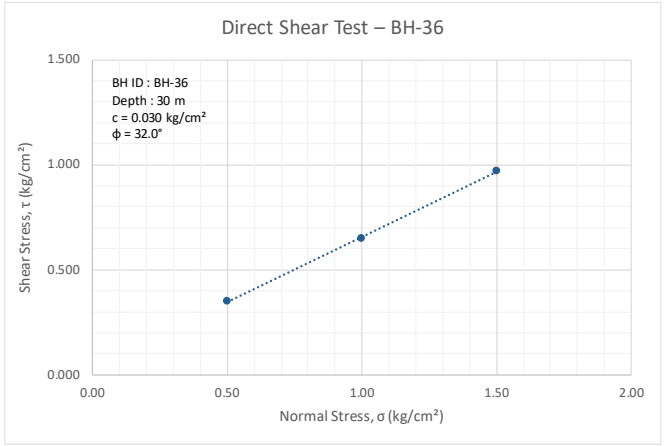

Direct Shear Test – BH-36
BH ID : BH-36
Depth : 15 m
c = 0.020 kg/cm²
ϕ = 28.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-36
BH ID : BH-36
Depth : 18 m
c = 0.000 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-36
BH ID : BH-36
Depth : 21 m
c = 0.010 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-36
BH ID : BH-36
Depth : 24 m
c = 0.000 kg/cm²
ϕ = 31.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-36
BH ID : BH-36
Depth : 27 m
c = 0.020 kg/cm²
ϕ = 33.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-36
BH ID : BH-36
Depth : 30 m
c = 0.030 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Noida Sector-142 to Botanical Garden (3+000 km TO 4+000 km)

BH ID : BH-37 | **Chainage** : 4+210 KM

Groundwater Level : 14.30 M | **Location** : Lat. 28.541026, Long. 77.347098

DEPTH	GWL	SAMPLE	SPT N VALUE	LAYER DESCRIPTION
				TOP Soil: (0.00 + 0.750m)
1.00				Stiff, Brownish to Whiteish, fine-grained inorganic silt of low Plasticity with sand (ML): (0.75 to 4.00m)
2.00		SPT/DS	N=8	
3.00		UDS		
		SPT/DS	N=15	
4.00				Medium Dense,Whiteish to Brownish, fine-grained silty sand (SM) : (4.00 to 8.25m)
5.00		SPT/DS	N=23	
6.00		UDS		
7.00		SPT/DS	N=18	
8.00		SPT/DS	N=28	
9.00				Very Stiff to Hard, Yellowish, fine-grained inorganic silt of low Plasticity with sand and Gravel (ML) : (8.25 to 14.25m)
		UDS		
10.00		SPT/DS	N=30	
11.00		SPT/DS	N=34	
12.00		UDS		
13.00		SPT/DS	N=35	
14.00		SPT/DS	N=30	
15.00				Medium Dense, Whiteish Brown to Brownish, fine-grained silty sand with Little Gravel (SM): (14.25 to 20.25m)
		UDS		
16.00		SPT/DS	N=22	
17.00		SPT/DS	N=19	
18.00		UDS		
19.00		SPT/DS	N=31	
20.00		SPT/DS	N=28	
21.00				Dense, Brownish, fine-grained silty sand with Little Gravel (SM): (20.25 to 29.25m)
		UDS		
22.00		SPT/DS	N=34	
23.00		SPT/DS	N=40	
24.00		UDS		
25.00		SPT/DS	N=32	
26.00		SPT/DS	N=40	
27.00		UDS		
28.00		SPT/DS	N=49	
29.00		SPT/DS	N=46	
30.00				Very Dense, Brownish, fine-grained silty sand with Little Gravel (SM) : (29.25 to 35.00m)
		UDS		
31.00		SPT/DS	N=56	
32.00		SPT/DS	N=63	
33.00		UDS		
34.00		SPT/DS	N=62	
35.00		SPT/DS	N=57	

LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

Soil

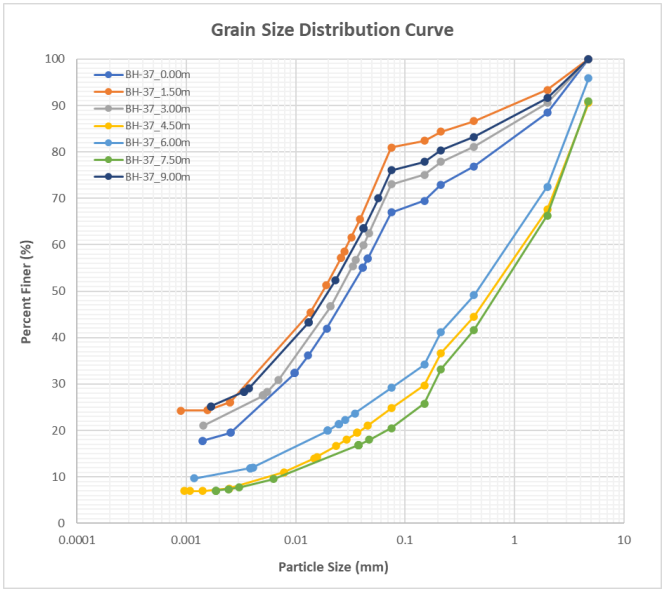
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

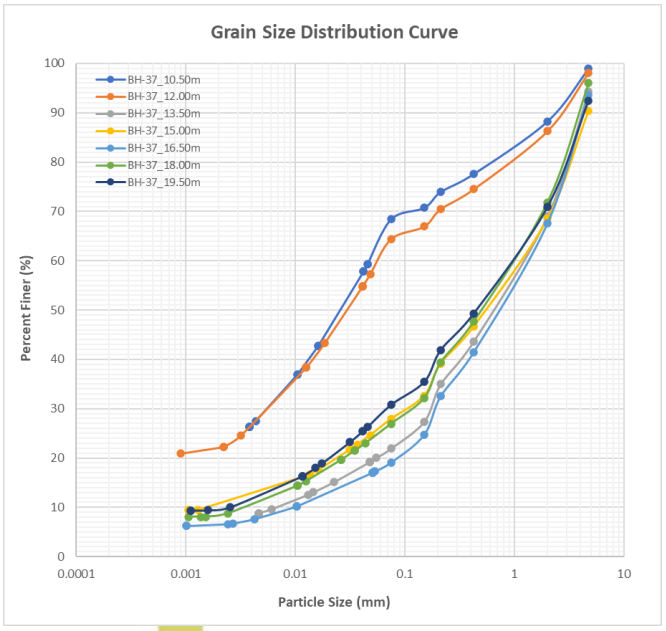
GOMA ENGINEERING AND CONSULTANCY
Quality we put forward

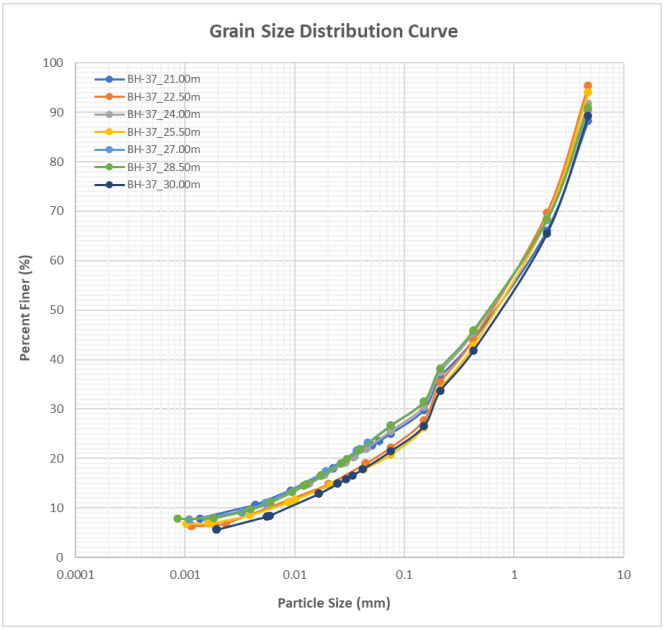
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-37	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	3+600	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	35.00	**Start Date:**	12-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	196.9	**End Date:**	13-01-2026
Project Code:	158_R5_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	14.30	**Location:**	Lat. 28.541026, Long. 77.347098

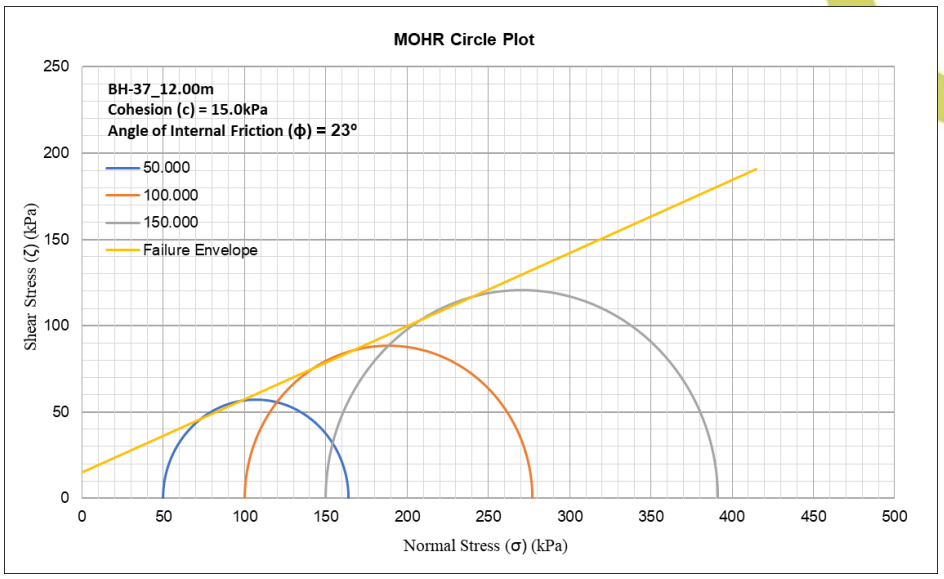
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						0.0	33.0	48.2	18.8	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Stiff, Brownish to Whiteish, fine-grained inorganic silt of low Plasticity with sand (ML)	3	4	4	8	11	0.0	19.1	55.7	25.2	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							0.0	27.0	50.3	22.8	28	NP	NP	15.11	1.77	1.54	2.70	F	0.02	23	-	-	-	-	-	-
3.50	SPT/DS		6	7	8	15	16	-																			
4.50	SPT/DS	Medium Dense,Whiteish to Brownish, fine-grained silty sand (SM)	4	10	13	23	23	9.4	65.8	17.5	7.3	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	DS							4.2	66.7	18.5	10.6	27	NP	NP	10.70	-	-	2.66	F	0.03	27	-	-	-	-	-	-
6.50	SPT/DS		6	8	10	18	17	-																			
7.50	SPT/DS		4	12	16	28	26	9.0	70.5	13.4	7.1	21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS	Very Stiff to Hard, Yellowish, fine-grained inorganic silt of low Plasticity with sand and Gravel (ML)						0.0	23.9	50.1	26.0	26	NP	NP	16.37	1.96	1.68	2.65	F	0.08	25	-	-	-	-	-	-
9.50	SPT/DS		12	14	16	30	26	-																			
10.50	SPT/DS		14	16	18	34	28	1.1	30.5	45.8	22.6	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							1.92	33.7	42.35	22.08	23	NP	NP	8.34	1.91	1.76	2.65	F	0.09	26	UU	15.0	23.0	-	-	-
12.50	SPT/DS		8	14	21	35	26	-																			
13.50	SPT/DS		6	12	18	30	21	5.7	72.4	14.2	7.7	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS	Medium Dense, Whiteish Brown to Brownish, fine-grained silty sand with Little Gravel (SM)						9.6	62.5	17.1	10.8	24	NP	NP	13.18	-	-	2.66	F	0.03	28	-	-	-	-	-	-
15.50	SPT/DS		6	8	14	22	15	-																			
16.50	SPT/DS		7	7	12	19	13	6.4	74.5	12.6	6.5	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS							3.97	69.1	18.47	8.50	28	NP	NP	8.97	1.92	1.76	2.66	F	0.04	29	UU	21.0	21.0	-	-	-
18.50	SPT/DS		10	13	18	31	17	-																			
19.50	SPT/DS		7	12	16	28	16	7.5	61.7	21.1	9.7	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS	Dense, Brownish, fine-grained silty sand with Little Gravel (SM)						11.7	63.3	16.2	8.8	24	NP	NP	14.15	-	-	2.61	F	0.05	30	-	-	-	-	-	-
21.50	SPT/DS		6	14	20	34	18	-																			
22.50	SPT/DS		10	16	24	40	20	4.6	73.1	15.6	6.6	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							8.3	66.2	17.3	8.2	26	NP	NP	12.67	-	-	2.68	F	0.02	31	-	-	-	-	-	-
24.50	SPT/DS		8	14	18	32	17	-																			
25.50	SPT/DS		10	17	23	40	19	5.9	73.3	13.6	7.2	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							9.5	63.8	18.2	8.5	29	NP	NP	13.24	-	-	2.69	F	0.04	31	-	-	-	-	-	-
27.50	SPT/DS		14	21	28	49	21	-																			
28.50	SPT/DS		11	20	26	46	20	9.2	64.2	18.5	8.2	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS	Very Dense, Brownish, fine-grained silty sand with Little Gravel (SM)						10.7	67.8	15.8	5.7	21	NP	NP	12.28	-	-	2.69	F	0.02	32	-	-	-	-	-	-
30.50	SPT/DS		16	24	32	56	22	-																			
31.50	SPT/DS		17	26	37	63	24	11.7	66.7	15.9	5.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33.00	DS							9.5	68.5	16.0	6.1	-	-	-	12.43	-	-	-	-	-	-	-	-	-	-	-	-
33.50	SPT/DS		10	24	38	62	22	-																			
35.00	SPT/DS		13	21	36	57	20	8.5	64.6	21.1	5.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

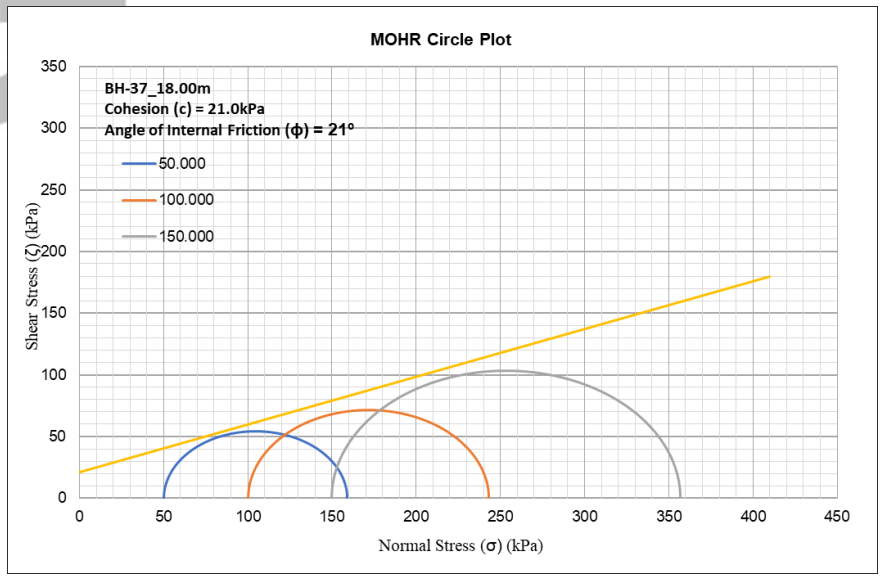
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

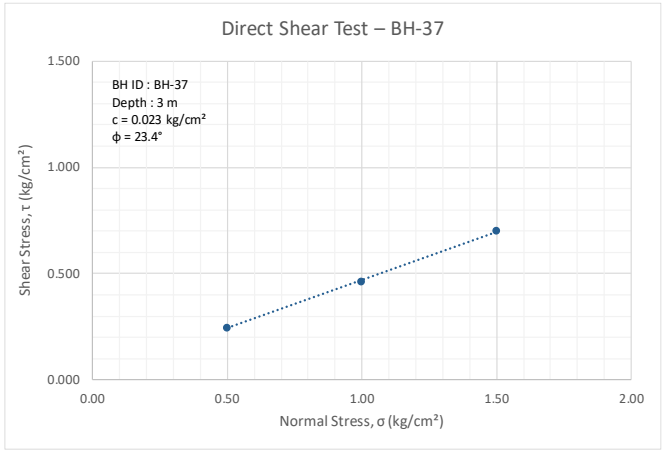

Grain Size Distribution Curve
BH-37_0.00m
BH-37_1.50m
BH-37_3.00m
BH-37_4.50m
BH-37_6.00m
BH-37_7.50m
BH-37_9.00m
Percent Finer (%)
Particle Size (mm)

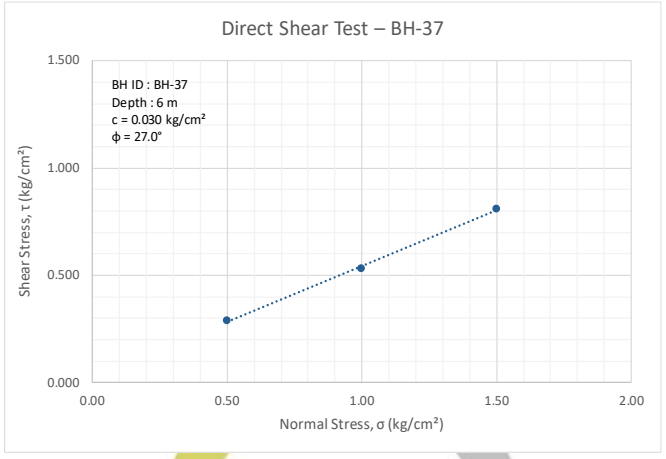

Grain Size Distribution Curve
BH-37_10.50m
BH-37_12.00m
BH-37_13.50m
BH-37_15.00m
BH-37_16.50m
BH-37_18.00m
BH-37_19.50m
Percent Finer (%)
Particle Size (mm)

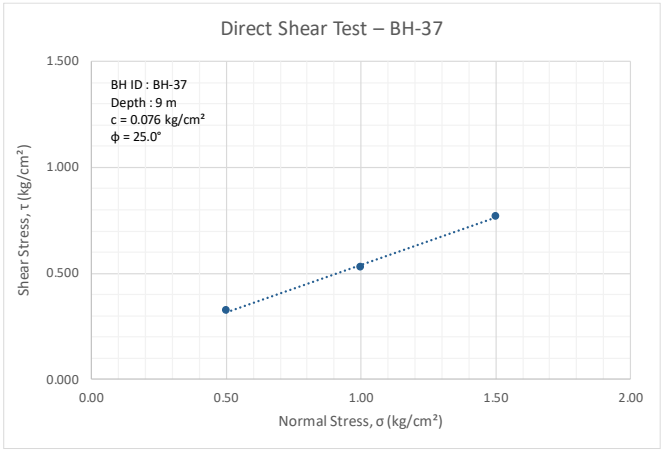

Grain Size Distribution Curve
BH-37_21.00m
BH-37_22.50m
BH-37_24.00m
BH-37_25.50m
BH-37_27.00m
BH-37_28.50m
BH-37_30.00m
Percent Finer (%)
Particle Size (mm)

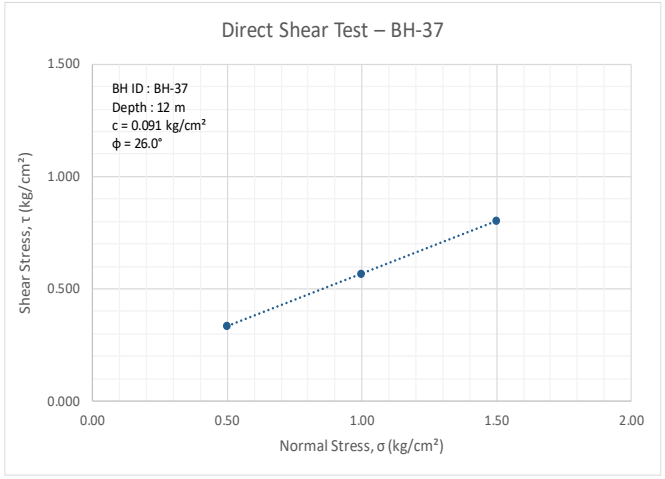

MOHR Circle Plot
BH-37_12.00m
Cohesion (c) = 15.0kPa
Angle of Internal Friction (ϕ) = 23°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

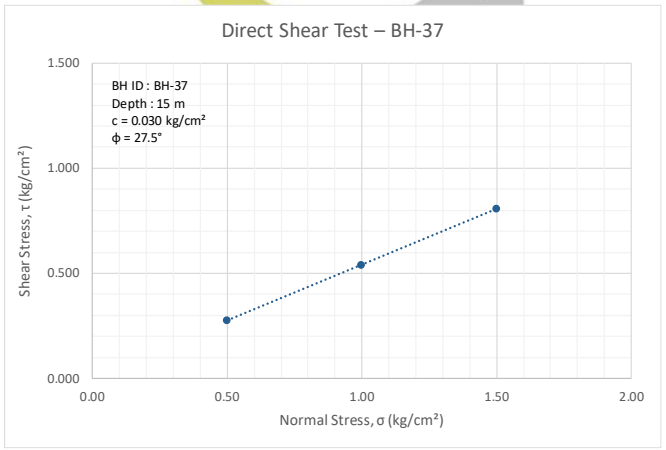

MOHR Circle Plot
BH-37_18.00m
Cohesion (c) = 21.0kPa
Angle of Internal Friction (ϕ) = 21°
50.000
100.000
150.000
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

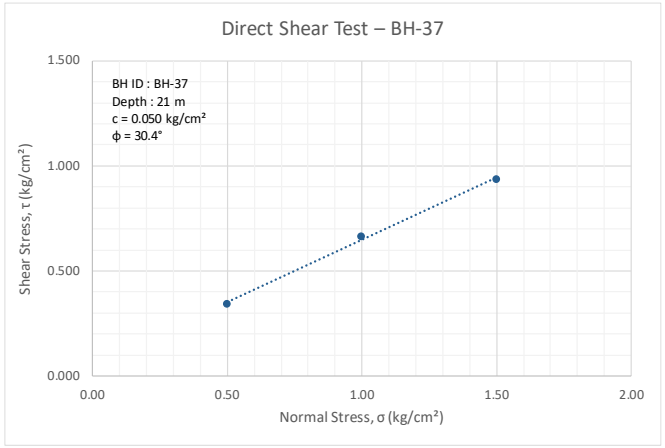

Direct Shear Test – BH-37
BH ID : BH-37
Depth : 3 m
c = 0.023 kg/cm²
ϕ = 23.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

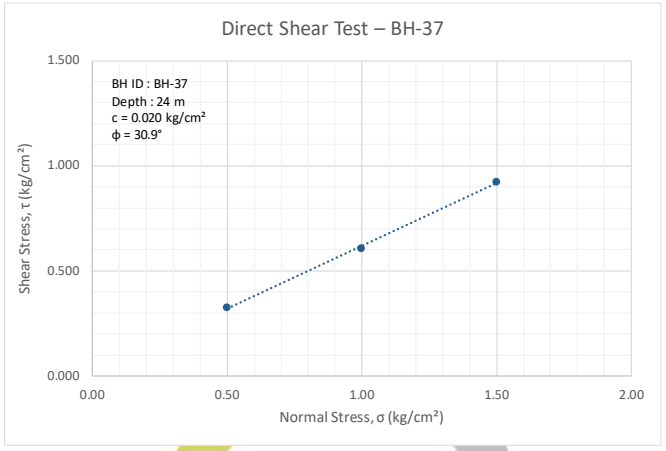

Direct Shear Test – BH-37
BH ID : BH-37
Depth : 6 m
c = 0.030 kg/cm²
ϕ = 27.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

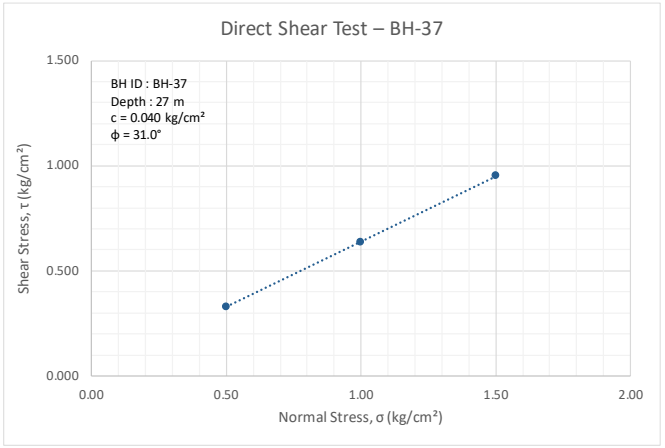

Direct Shear Test – BH-37
BH ID : BH-37
Depth : 9 m
c = 0.076 kg/cm²
ϕ = 25.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

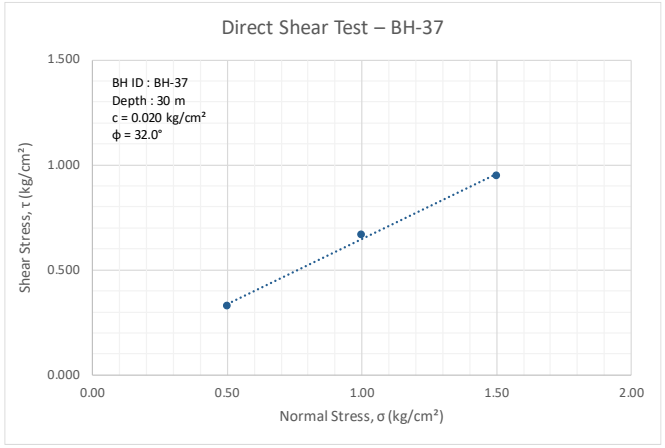

Direct Shear Test – BH-37
BH ID : BH-37
Depth : 12 m
c = 0.091 kg/cm²
ϕ = 26.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-37
BH ID : BH-37
Depth : 15 m
c = 0.030 kg/cm²
ϕ = 27.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-37
BH ID : BH-37
Depth : 21 m
c = 0.050 kg/cm²
ϕ = 30.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-37
BH ID : BH-37
Depth : 24 m
c = 0.020 kg/cm²
ϕ = 30.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-37
BH ID : BH-37
Depth : 27 m
c = 0.040 kg/cm²
ϕ = 31.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-37
BH ID : BH-37
Depth : 30 m
c = 0.020 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Noida Sector-142 to Botanical Garden (3+000 km TO 4+000 km)

BH ID : BH-38 | **Chainage** : 4+334 KM

Groundwater Level : 13.75 M | **Location** : Lat. 28.540361, Long. 77.348116

DEPTH	GWL	SAMPLE	SPT N VALUE	LAYER DESCRIPTION
0.00				TOP Soil: (0.00 + 0.750m)
1.00		SPT/DS	N=7	Medium Stiff to Stiff, Yellowish to Whiteish Brown, fine-grained inorganic silt of low Plasticity with sand with Gravel (ML) : (0.75 to 4.00m)
2.00				
3.00		UDS		
4.00		SPT/DS	N=18	
5.00		SPT/DS	N=18	Medium Dense, Brownish, fine-grained silty sand with Gravel (SM) : (4.00 to 8.25m)
6.00		UDS		
7.00		SPT/DS	N=16	
8.00		SPT/DS	N=17	
9.00		UDS		Very Stiff, Yellowish, fine-grained inorganic silt of low Plasticity with sand and Gravel (ML): (8.25 to 14.25m)
10.00		SPT/DS	N=19	
11.00		SPT/DS	N=23	
12.00		UDS		
13.00		SPT/DS	N=28	
14.00		SPT/DS	N=0	
15.00		UDS		Medium Dense to Dense, Brownish to Whiteish Grey, fine-grained silty sand (SM): (14.25 to 32.25m)
16.00		SPT/DS	N=29	
17.00		SPT/DS	N=33	
18.00		UDS		
19.00		SPT/DS	N=28	
20.00		SPT/DS	N=34	
21.00		UDS		
22.00		SPT/DS	N=39	
23.00		SPT/DS	N=43	
24.00		UDS		
25.00		SPT/DS	N=26	
26.00		SPT/DS	N=29	
27.00		UDS		
28.00		SPT/DS	N=34	
29.00		SPT/DS	N=38	
30.00		UDS		
31.00		SPT/DS	N=43	
32.00		SPT/DS	N=47	
33.00		UDS		Very Dense, Whiteish Grey, fine-grained silty sand (SM): (32.25 to 35m)
34.00		SPT/DS	N=57	
35.00		SPT/DS	N=57	

LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

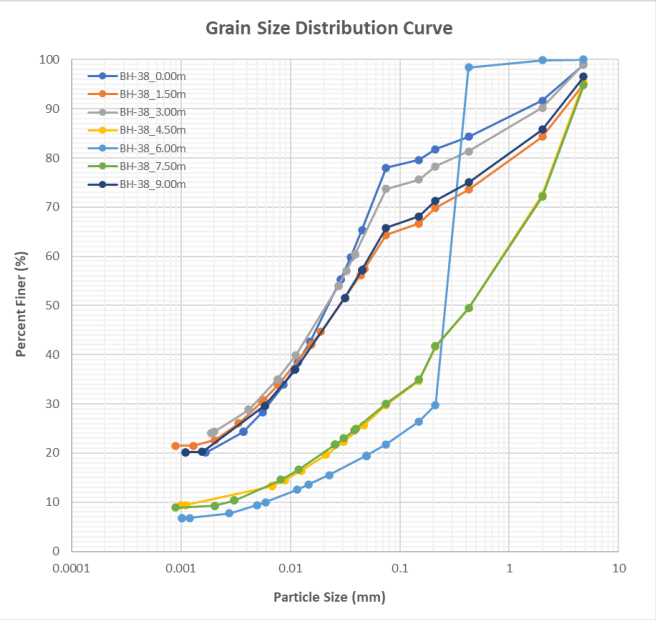
Soil

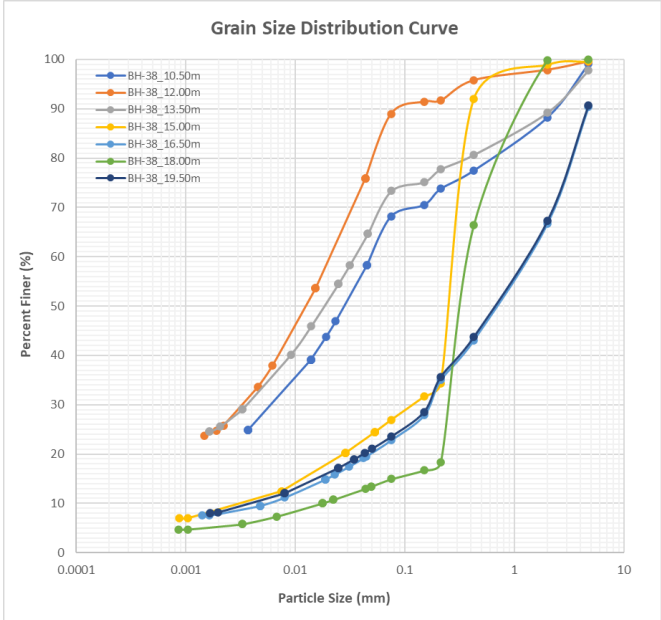
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

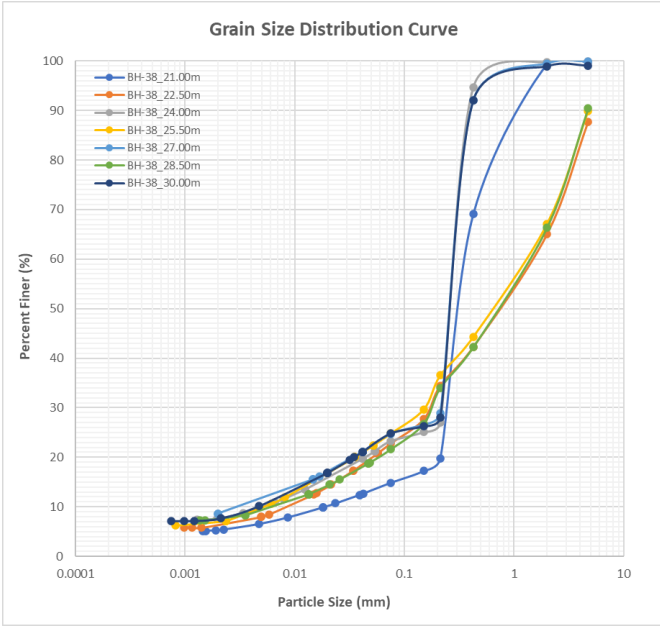
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-38	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	4+334	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	35.00	**Start Date:**	08-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	195.2	**End Date:**	09-01-2026
Project Code:	158_R5_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	13.75	**Location:**	Lat. 28.540361, Long. 77.348116

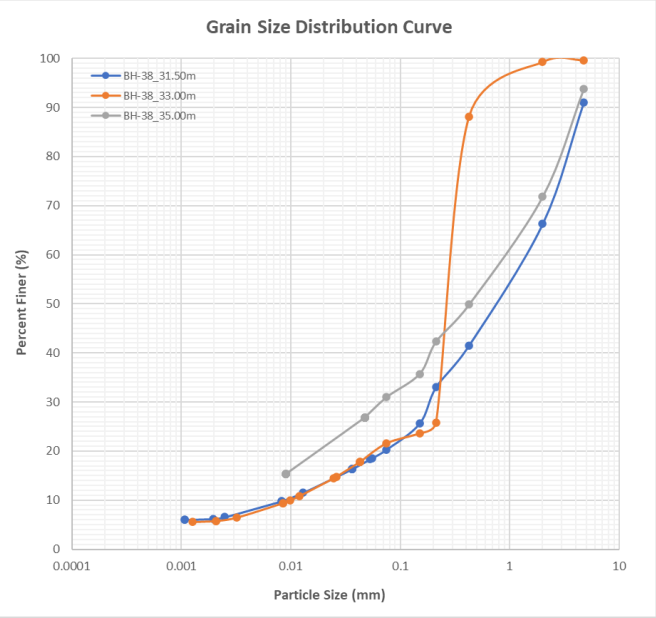
			SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
Depth [m]	**Sample Type**	**Descriptions**	**N1 (Seating Drive)**	**N2 (First Drive)**	**N3 (Second Drive)**	**Observed SPT**	**N (Correct N)**	**Gravel [%]**	**Sand [%]**	**Silt [%]**	**Clay [%]**	**Liquid Limit [%]**	**Plastic Limit [%]**	**Plasticity Index [%]**	**Moisture Content [%]**	**Bulk Density [gm/cm^3]**	**Dry Density [gm/cm^3]**	**Specific Gravity**	**Type**	**Cohesion [kg/cm^2]**	**Angle of Friction [°]**	**Type**	**Cohesion [kPa]**	**Angle of Friction [°]**	**Swelling Index**	**Consolidation Index**	**Preconsolidation Pressure [kg/cm^2]**
0.00	DS	Top Soil						1.0	21.0	57.0	21.0	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Medium Stiff to Stiff, Yellowish to Whiteish Brown, fine-grained inorganic silt of low Plasticity with sand with Gravel (ML)	3	3	4	7	10	5.0	30.7	41.8	22.6	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							0.9	25.4	49.4	24.3	28.0	NP	NP	9.1	1.9	1.73	-	F	0.0	23.0	UU	14.0	27.0	-	-	-
3.50	SPT/DS		5	8	10	18	20	-																			
4.50	SPT/DS	Medium Dense, Brownish, fine-grained silty sand with Gravel (SM)	4	9	9	18	18	4.6	65.7	19.1	10.6	26.0	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	DS							0.0	78.3	14.4	7.4	21.0	NP	NP	10.1	-	-	2.7	F	0.1	25.0	-	-	-	-	-	-
6.50	SPT/DS		4	8	8	16	15	-																			
7.50	SPT/DS		6	7	10	17	15	5.3	64.7	20.8	9.3	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS	Very Stiff, Yellowish, fine-grained inorganic silt of low Plasticity with sand and Gravel (ML)						3.51	30.7	43.80	21.99	26	NP	NP	11.23	1.91	1.72	-	F	0.06	24	UU	15	25	-	-	-
9.50	SPT/DS		7	9	10	19	16	-																			
10.50	SPT/DS		9	11	12	23	19	0.9	30.8	45.1	23.1	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	DS							0.4	10.6	63.9	25.1	29	NP	NP	14.84	-	-	2.60	F	0.07	25	-	-	-	-	-	-
12.50	SPT/DS		11	13	15	28	21	-																			
13.50	SPT/DS							2.2	24.5	47.8	25.5	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS	Medium Dense to Dense, Brownish to Whiteish Grey, fine-grained silty sand (SM)						0.4	72.7	18.1	8.8	23	NP	NP	12.17	-	-	2.61	F	0.03	28	-	-	-	-	-	-
15.50	SPT/DS		8	12	17	29	17	-																			
16.50	SPT/DS		5	12	21	33	19	9.7	67.5	14.9	7.9	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS							0.0	85.1	9.6	5.3	29	NP	NP	11.65	-	-	2.63	F	0.02	29	-	-	-	-	-	-
18.50	SPT/DS		10	13	15	28	17	-																			
19.50	SPT/DS		12	15	19	34	18	9.2	67.2	15.3	8.2	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS							0.3	84.9	9.5	5.3	26	NP	NP	13.18	-	-	2.65	F	0.05	30	-	-	-	-	-	-
21.50	SPT/DS		14	18	21	39	20	-																			
22.50	SPT/DS		15	20	23	43	21	12.3	64.9	16.4	6.4	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							0.1	76.7	15.6	7.6	25	NP	NP	12.56	-	-	2.63	F	0.07	28	-	-	-	-	-	-
24.50	SPT/DS		10	12	14	26	15	-																			
25.50	SPT/DS		12	14	15	29	16	10.1	65.1	17.8	7.0	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							0.1	75.2	16.1	8.6	21	NP	NP	13.21	-	-	2.62	F	0.02	31	-	-	-	-	-	-
27.50	SPT/DS		14	16	18	34	17	-																			
28.50	SPT/DS		16	18	20	38	18	9.6	68.8	14.0	7.6	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							0.9	74.2	17.2	7.6	21	NP	NP	12.66	-	-	2.65	F	0.04	32	-	-	-	-	-	-
30.50	SPT/DS		18	20	23	61	19	-																			
31.50	SPT/DS		17	21	26	47	20	8.9	70.7	14.1	6.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33.00	DS	Very Dense, Whiteish Grey, fine-grained silty sand (SM)						0.4	78.0	15.9	5.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33.50	SPT/DS		20	27	30	57	22	-																			
35.00	SPT/DS		21	28	32	60	21	6.2	62.8	24.8	6.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

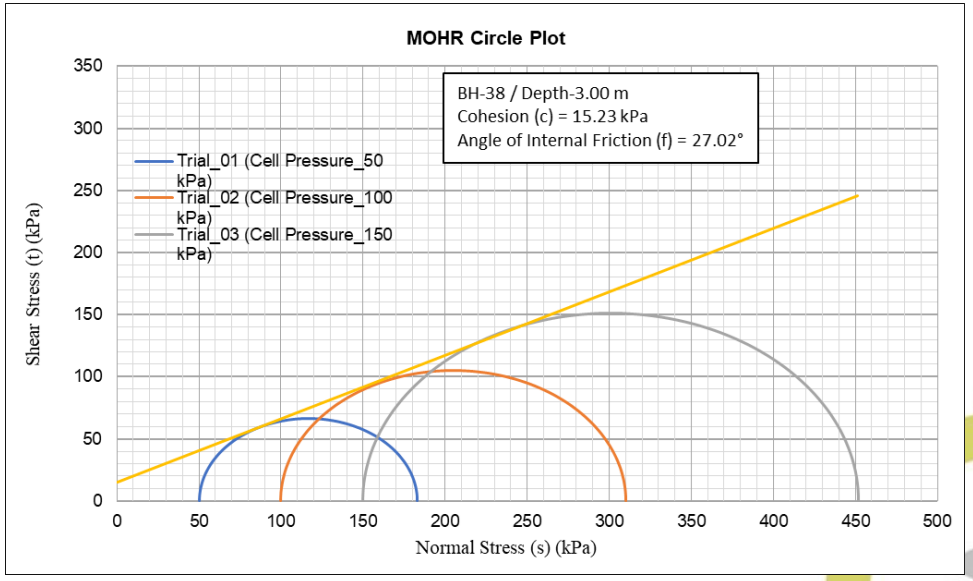
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

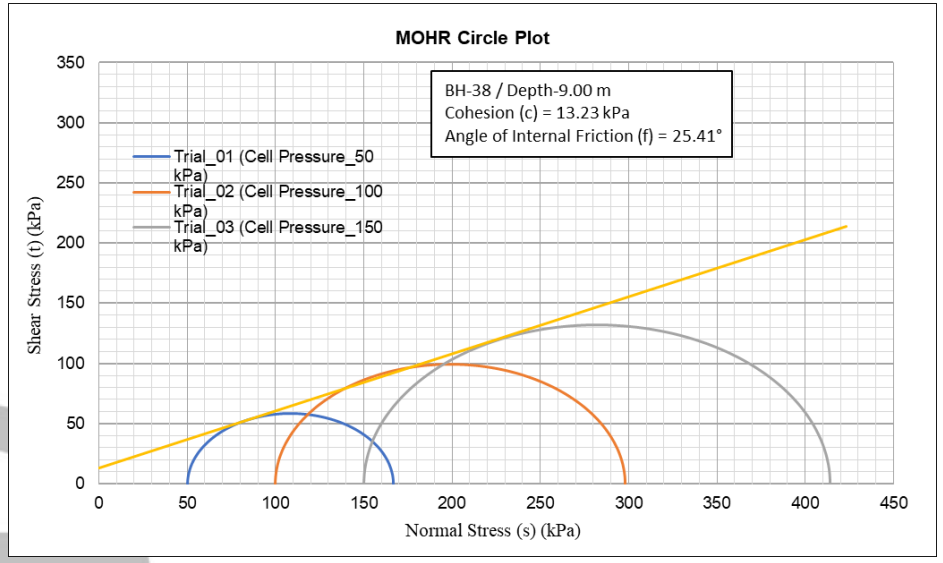

Grain Size Distribution Curve
BH-38_0.00m
BH-38_1.50m
BH-38_3.00m
BH-38_4.50m
BH-38_6.00m
BH-38_7.50m
BH-38_9.00m
Percent Finer (%)
Particle Size (mm)

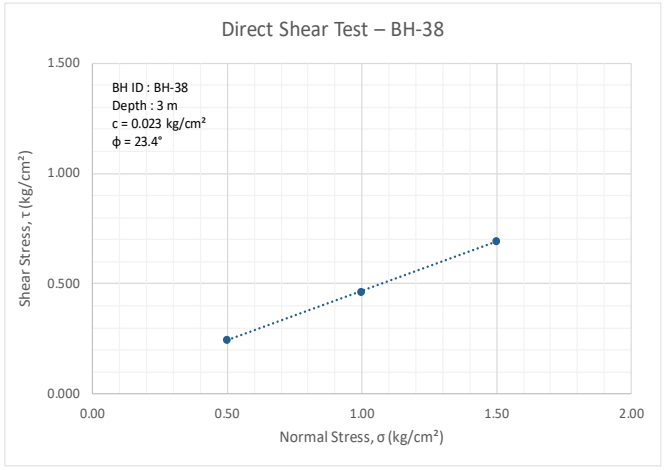

Grain Size Distribution Curve
BH-38_10.50m
BH-38_12.00m
BH-38_13.50m
BH-38_15.00m
BH-38_16.50m
BH-38_18.00m
BH-38_19.50m
Percent Finer (%)
Particle Size (mm)

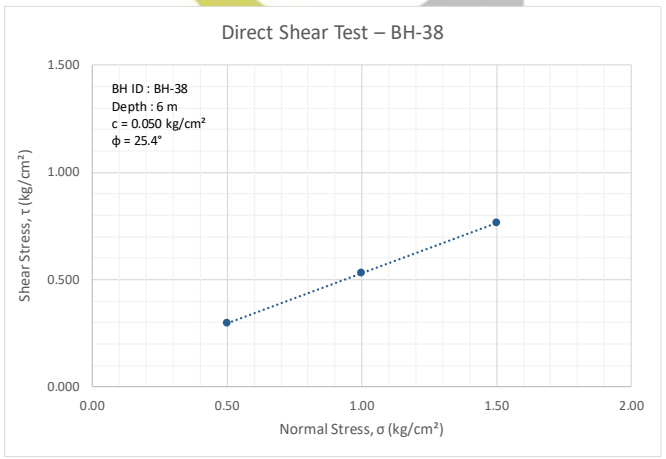

Grain Size Distribution Curve
BH-38_21.00m
BH-38_22.50m
BH-38_24.00m
BH-38_25.50m
BH-38_27.00m
BH-38_28.50m
BH-38_30.00m
Percent Finer (%)
Particle Size (mm)

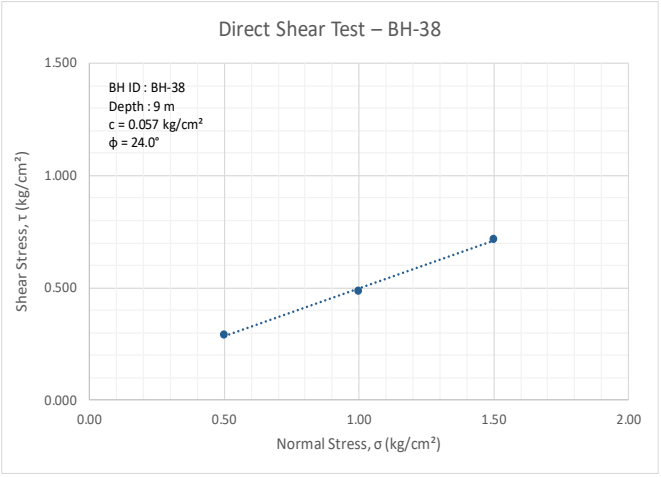

Grain Size Distribution Curve
BH-38_31.50m
BH-38_33.00m
BH-38_35.00m
Percent Finer (%)
Particle Size (mm)

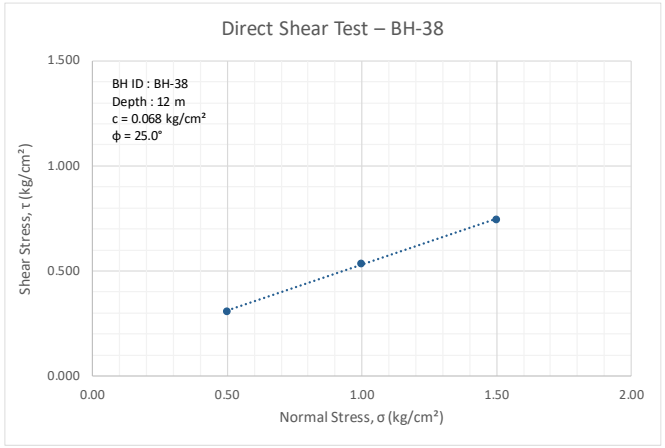

MOHR Circle Plot
BH-38 / Depth-3.00 m
Cohesion (c) = 15.23 kPa
Angle of Internal Friction (f) = 27.02°
Trial_01 (Cell Pressure_50 kPa)
Trial_02 (Cell Pressure_100 kPa)
Trial_03 (Cell Pressure_150 kPa)
Shear Stress (t) (kPa)
Normal Stress (s) (kPa)
0
50
100
150
200
250
300
350
400
450
500

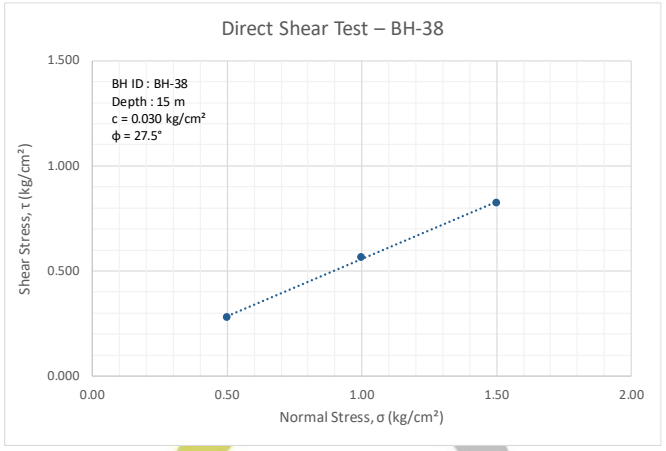

MOHR Circle Plot
BH-38 / Depth-9.00 m
Cohesion (c) = 13.23 kPa
Angle of Internal Friction (f) = 25.41°
Trial_01 (Cell Pressure_50 kPa)
Trial_02 (Cell Pressure_100 kPa)
Trial_03 (Cell Pressure_150 kPa)
Shear Stress (t) (kPa)
Normal Stress (s) (kPa)
0
50
100
150
200
250
300
350
400
450

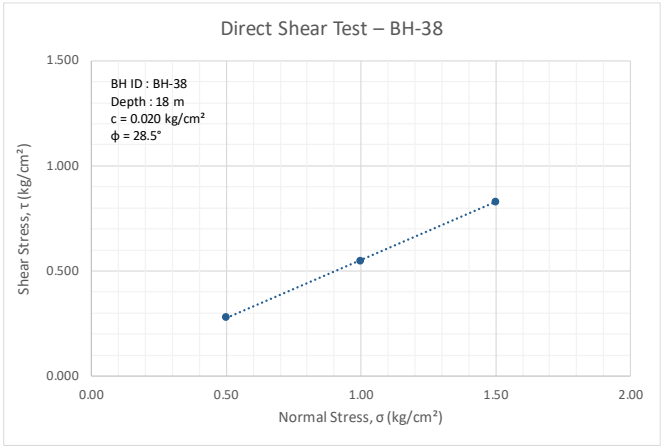

Direct Shear Test – BH-38
BH ID : BH-38
Depth : 3 m
c = 0.023 kg/cm²
ϕ = 23.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

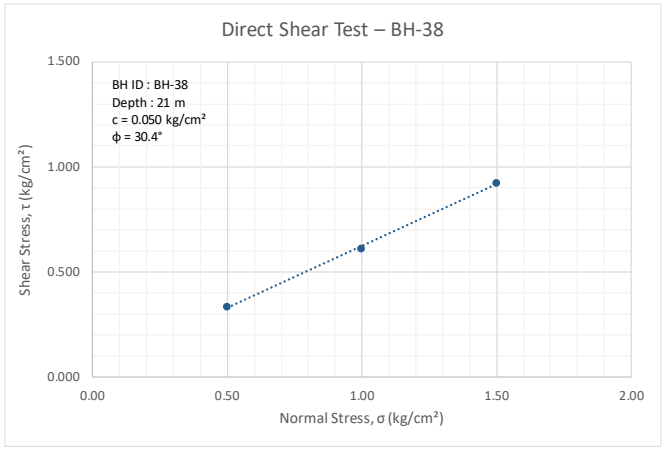

Direct Shear Test – BH-38
BH ID : BH-38
Depth : 6 m
c = 0.050 kg/cm²
ϕ = 25.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

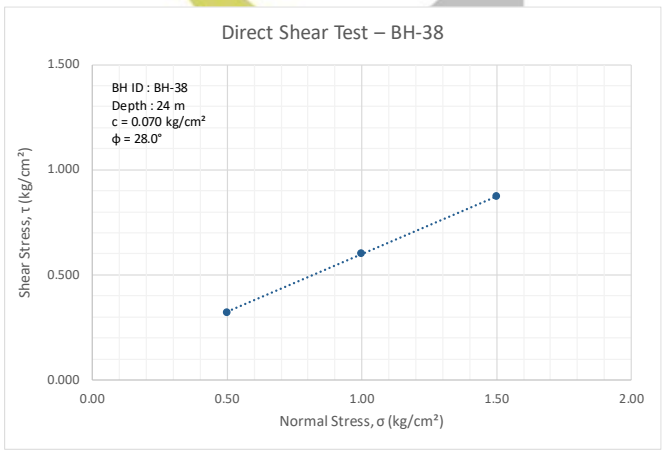

Direct Shear Test – BH-38
BH ID : BH-38
Depth : 9 m
c = 0.057 kg/cm²
ϕ = 24.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

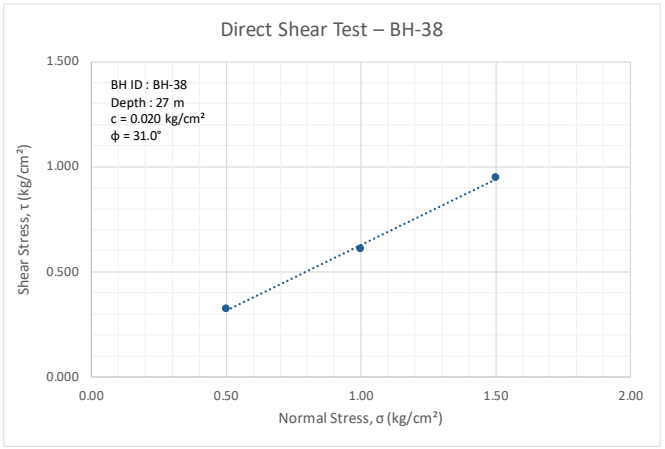

Direct Shear Test – BH-38
BH ID : BH-38
Depth : 12 m
c = 0.068 kg/cm²
ϕ = 25.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

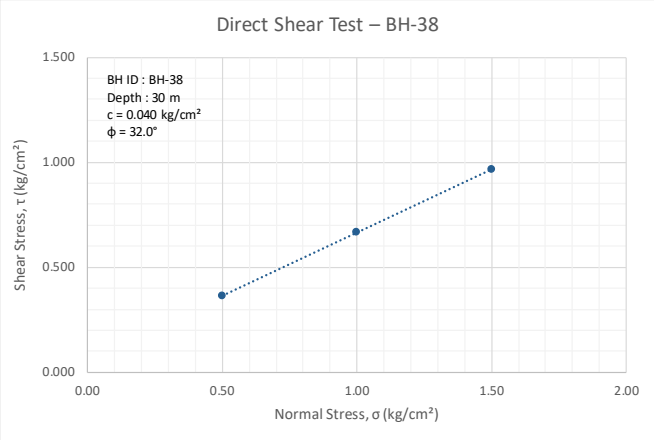

Direct Shear Test – BH-38
BH ID : BH-38
Depth : 15 m
c = 0.030 kg/cm²
ϕ = 27.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-38
BH ID : BH-38
Depth : 18 m
c = 0.020 kg/cm²
ϕ = 28.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-38
BH ID : BH-38
Depth : 21 m
c = 0.050 kg/cm²
ϕ = 30.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-38
BH ID : BH-38
Depth : 24 m
c = 0.070 kg/cm²
ϕ = 28.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-38
BH ID : BH-38
Depth : 27 m
c = 0.020 kg/cm²
ϕ = 31.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

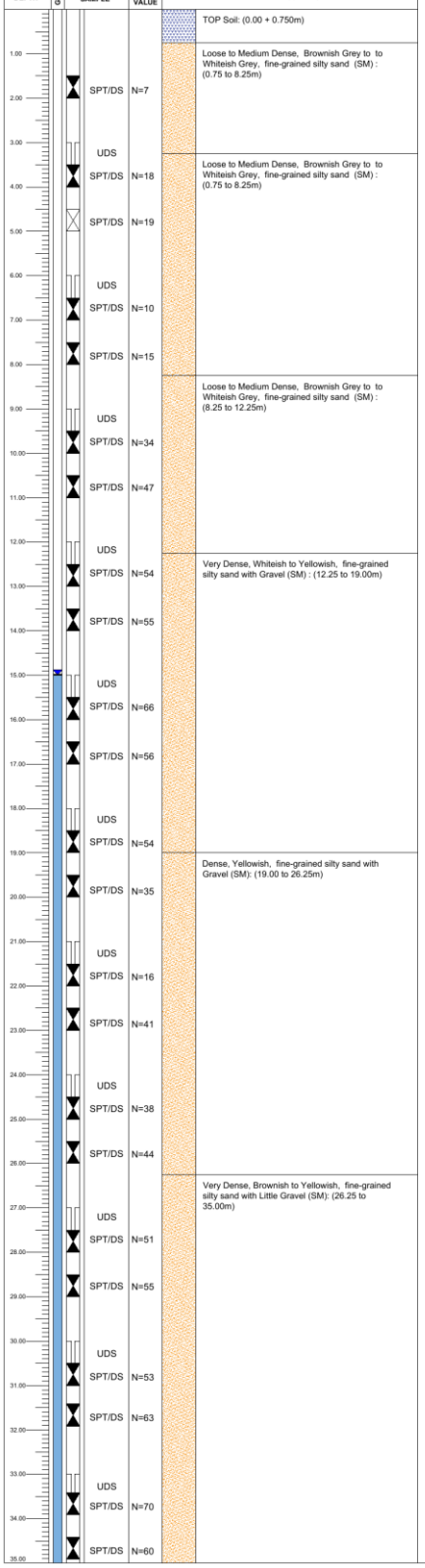

Direct Shear Test – BH-38
BH ID : BH-38
Depth : 30 m
c = 0.040 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Noida Sector-142 to Botanical Garden (3+000 km TO 4+000 km)

BH ID : BH-39 | **Chainage** : 4+425 KM

Groundwater Level : 15.00 M | **Location** : Lat. 28.539847, Long. 77.348843



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

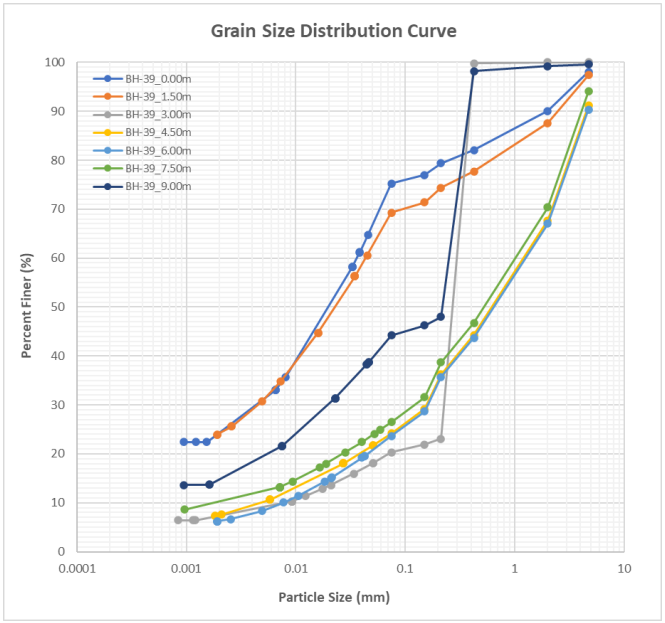
Soil

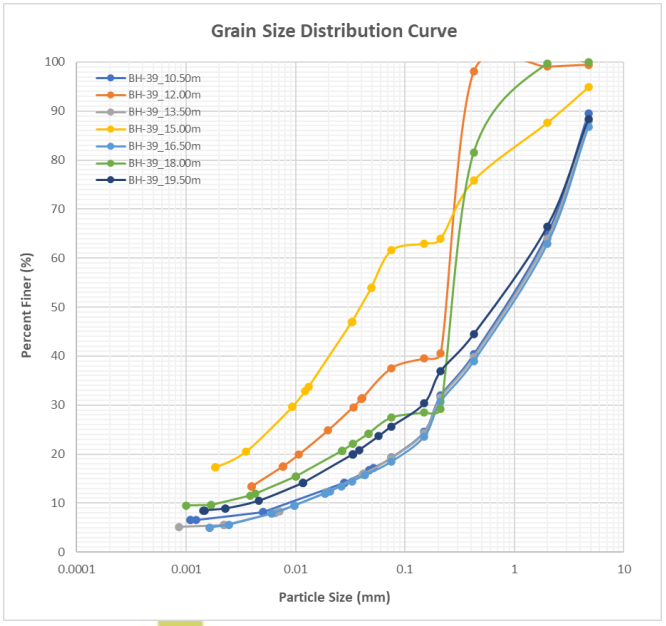
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

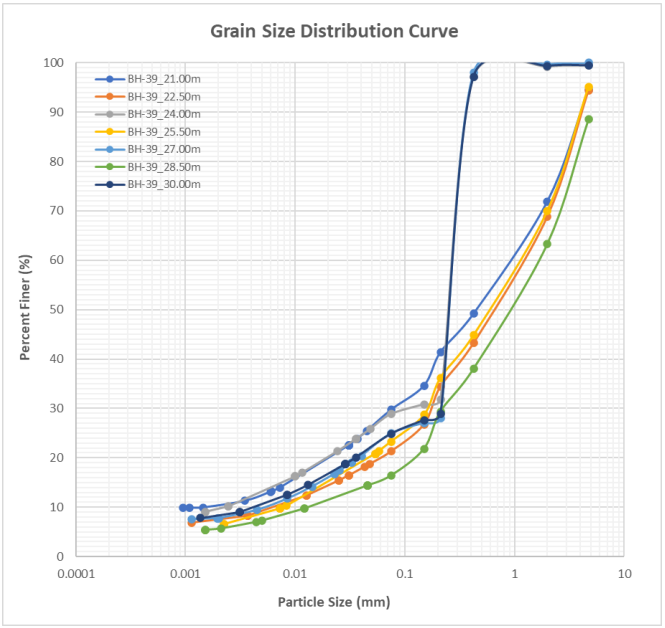
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-39	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	4+425	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	35.00	**Start Date:**	10-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	196.2	**End Date:**	12-01-2026
Project Code:	158_R5_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	15.00	**Location:**	Lat. 28.539847, Long. 77.348843

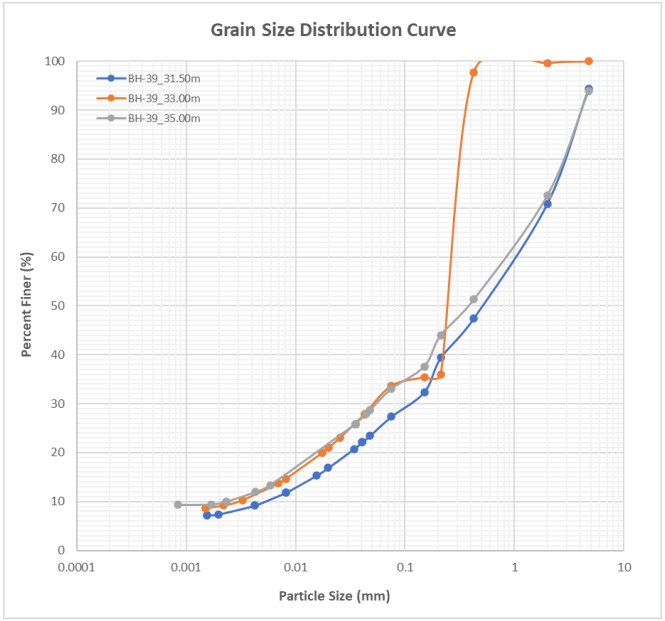
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						2.0	22.8	50.9	24.3	22.0	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Medium Stiff, Brownish to Whiteish, fine-grained inorganic silt of low Plasticity with sand (ML)	2	3	4	7	10	2.6	28.1	45.1	24.2	24.0	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							0.0	79.7	12.9	7.4	26.0	NP	NP	14.10	1.67	1.47	2.69	F	0.07	23	-	-	-	-	-	-
3.50	SPT/DS		5	8	10	18	20	-																			
4.50	SPT/DS	Loose to Medium Dense, Brownish, fine-grained silty sand with Gravel (SM)	3	9	10	19	19	8.9	66.9	16.6	7.6	29.0	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							9.7	66.7	17.4	6.3	25.0	NP	NP	8.79	1.86	1.71	-	F	0.03	24	UU	16.0	24.0	-	-	-
6.50	SPT/DS		3	4	6	10	9	-																			
7.50	SPT/DS		3	7	8	15	14	6.0	67.5	16.2	10.3	27.0	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS	Dense , Yellowish to Whiteish Grey, fine-grained silty sand with Gravel (SM)						0.4	55.4	29.4	14.8	26.0	NP	NP	10.12	1.93	1.76	2.65	F	0.06	26	-	-	-	-	-	-
9.50	SPT/DS		7	13	21	34	29	-																			
10.50	SPT/DS		11	19	28	47	39	10.5	70.2	12.1	7.2	21.0	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							0.5	62.0	29.2	8.3	26.0	NP	NP	11.55	2.02	1.81	2.61	F	0.04	28	-	-	-	-	-	-
12.50	SPT/DS	Very Dense, Whiteish to Yellowish, fine-grained silty sand with Gravel (SM)	12	24	30	54	41	-																			
13.50	SPT/DS		12	26	29	55	39	12.0	68.8	13.7	5.5	25.0	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS							5.1	33.3	43.9	17.7	26.0	NP	NP	13.15	-	-	2.60	F	0.05	28	-	-	-	-	-	-
15.50	SPT/DS		18	30	36	66	29	-																			
16.50	SPT/DS		10	22	34	56	26	13.2	68.4	13.1	5.3	24.0	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS							0.0	72.6	17.4	10.0	29.0	NP	NP	12.78	-	-	2.62	F	0.03	29	-	-	-	-	-	-
18.50	SPT/DS		11	24	30	54	25	-																			
19.50	SPT/DS	Dense, Yellowish, fine-grained silty sand with Gravel (SM)	9	14	21	35	18	11.6	62.8	16.9	8.8	26.0	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	UDS							5.4	64.9	19.3	10.4	21.0	NP	NP	9.16	1.94	1.78	-	F	0.10	27	UU	18.0	19.0	-	-	-
21.50	SPT/DS		5	7	9	16	10	-																			
22.50	SPT/DS		8	16	25	41	20	5.6	73.1	13.8	7.5	24.0	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	UDS							0.5	70.6	19.2	9.7	26.0	NP	NP	14.66	-	-	2.67	F	0.05	30	-	-	-	-	-	-
24.50	SPT/DS		10	16	22	38	18	-																			
25.50	SPT/DS		13	18	26	44	20	4.9	71.9	17.8	5.5	21.0	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS	Very Dense, Brownish to Yellowish, fine-grained silty sand with Little Gravel (SM)						0.0	75.1	17.2	7.7	23.0	NP	NP	13.21	-	-	2.60	F	0.04	32	-	-	-	-	-	-
27.50	SPT/DS		16	22	29	51	21	-																			
28.50	SPT/DS		18	24	31	55	22	11.5	72.1	10.8	5.6	28.0	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							0.5	74.6	16.5	8.3	24.0	NP	NP	12.66	-	-	2.68	F	0.02	31	-	-	-	-	-	-
30.50	SPT/DS		14	21	29	50	20	-																			
31.50	SPT/DS		16	27	36	63	23	5.7	67.0	19.9	7.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33.00	DS							0.0	66.3	24.6	9.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33.50	SPT/DS		20	31	39	70	24	-																			
35.00	SPT/DS		19	28	32	60	20	6.1	60.9	23.4	9.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

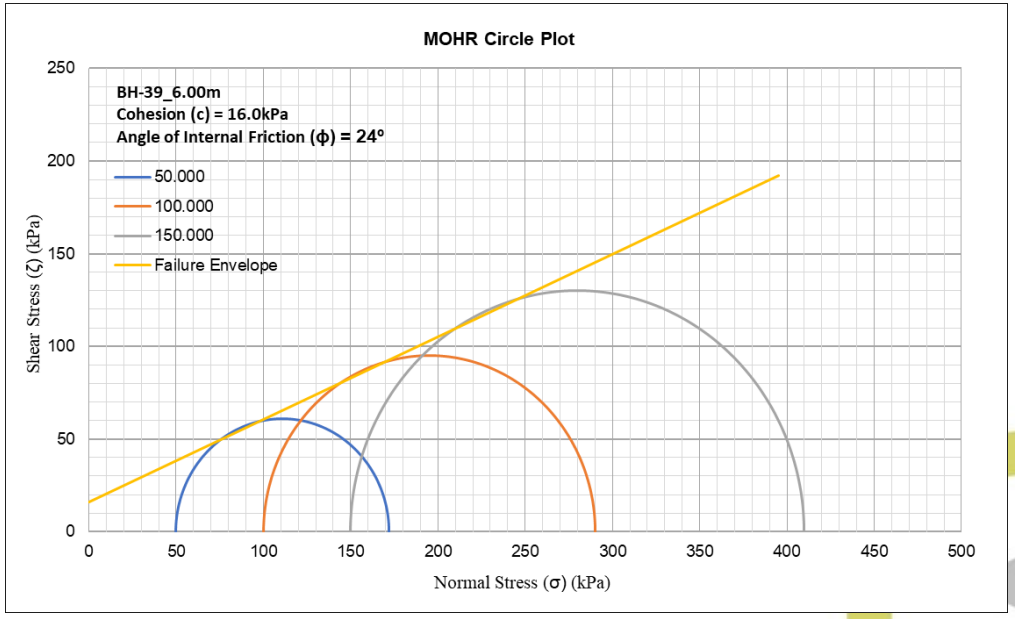
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

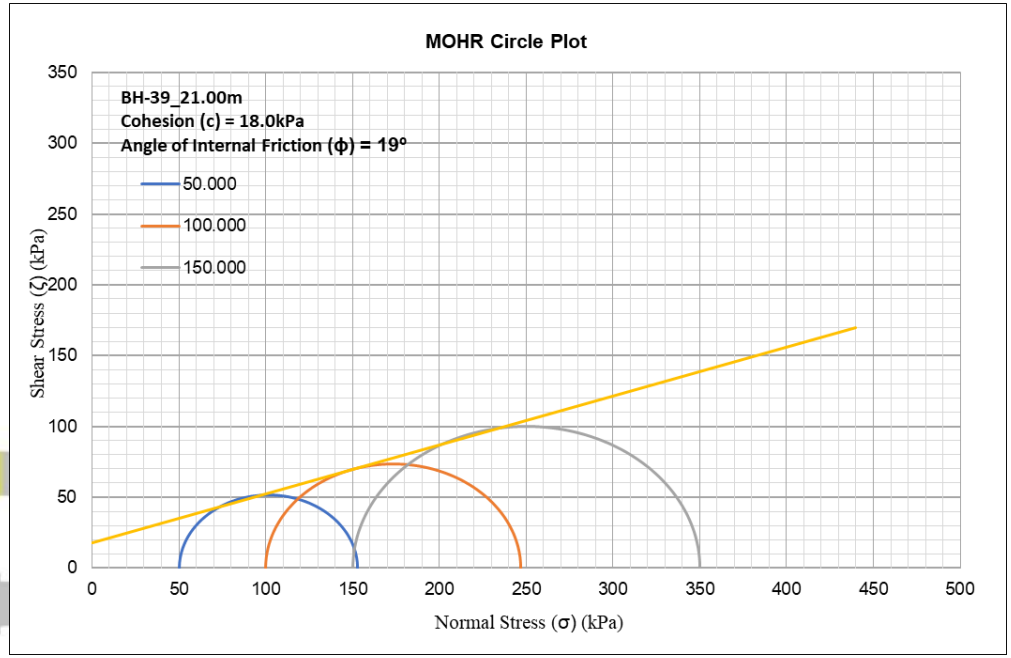

Grain Size Distribution Curve
BH-39_0.00m
BH-39_1.50m
BH-39_3.00m
BH-39_4.50m
BH-39_6.00m
BH-39_7.50m
BH-39_9.00m
Percent Finer (%)
Particle Size (mm)

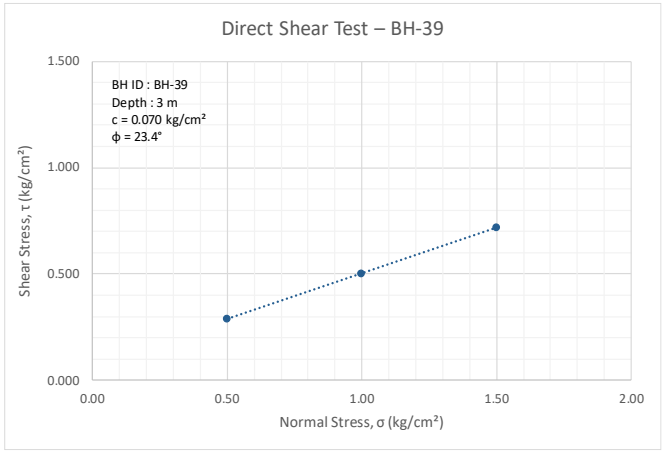

Grain Size Distribution Curve
BH-39_10.50m
BH-39_12.00m
BH-39_13.50m
BH-39_15.00m
BH-39_16.50m
BH-39_18.00m
BH-39_19.50m
Percent Finer (%)
Particle Size (mm)

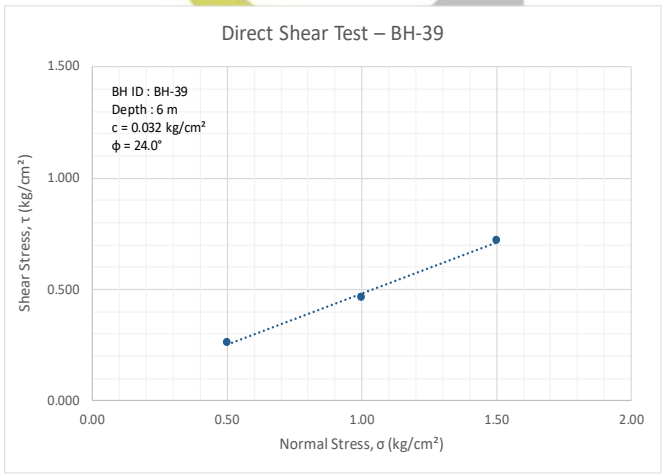

Grain Size Distribution Curve
BH-39_21.00m
BH-39_22.50m
BH-39_24.00m
BH-39_25.50m
BH-39_27.00m
BH-39_28.50m
BH-39_30.00m
Percent Finer (%)
Particle Size (mm)

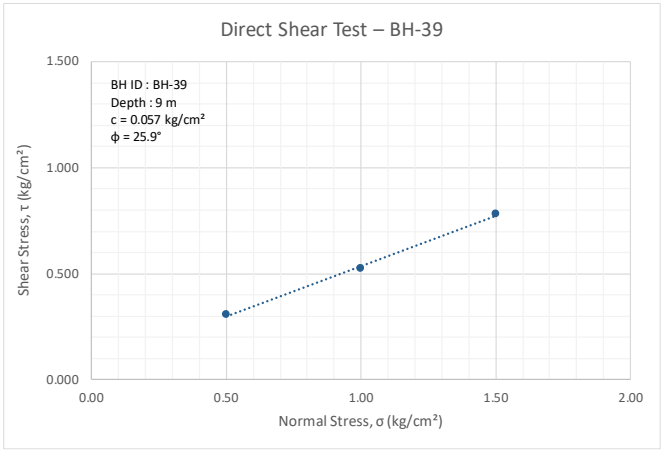

Grain Size Distribution Curve
BH-39_31.50m
BH-39_33.00m
BH-39_35.00m
Percent Finer (%)
Particle Size (mm)

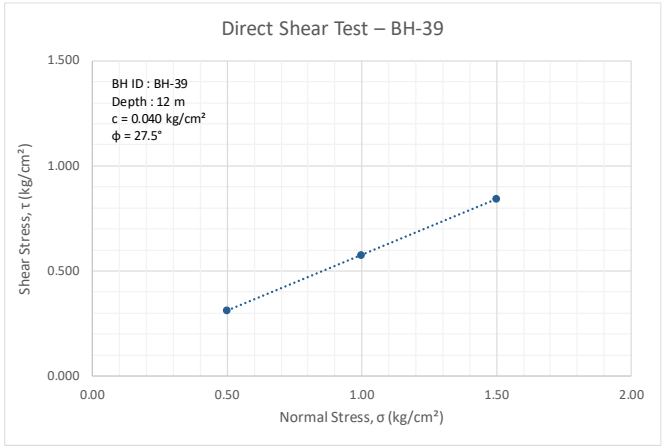

MOHR Circle Plot
BH-39_6.00m
Cohesion (c) = 16.0kPa
Angle of Internal Friction (ϕ) = 24°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

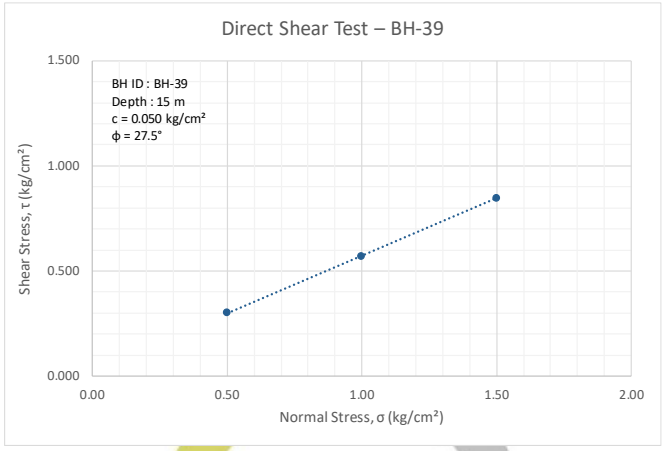

MOHR Circle Plot
BH-39_21.00m
Cohesion (c) = 18.0kPa
Angle of Internal Friction (ϕ) = 19°
50.000
100.000
150.000
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

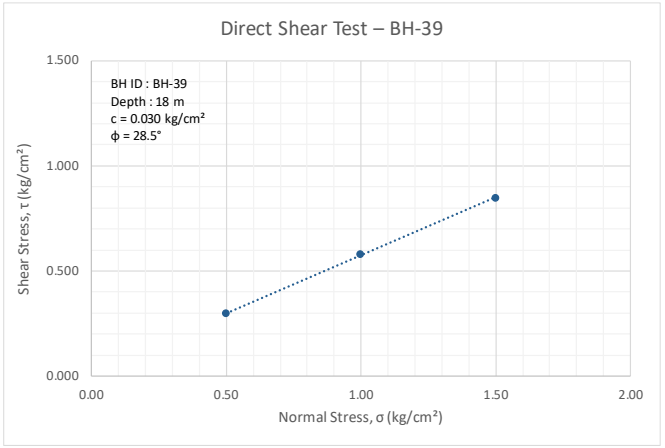

Direct Shear Test – BH-39
BH ID : BH-39
Depth : 3 m
c = 0.070 kg/cm²
ϕ = 23.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

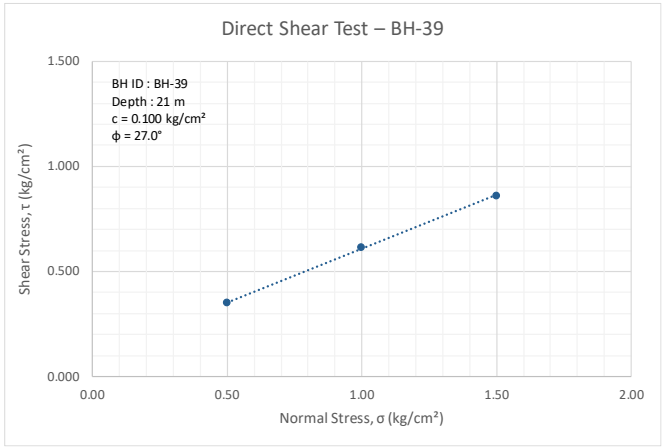

Direct Shear Test – BH-39
BH ID : BH-39
Depth : 6 m
c = 0.032 kg/cm²
ϕ = 24.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

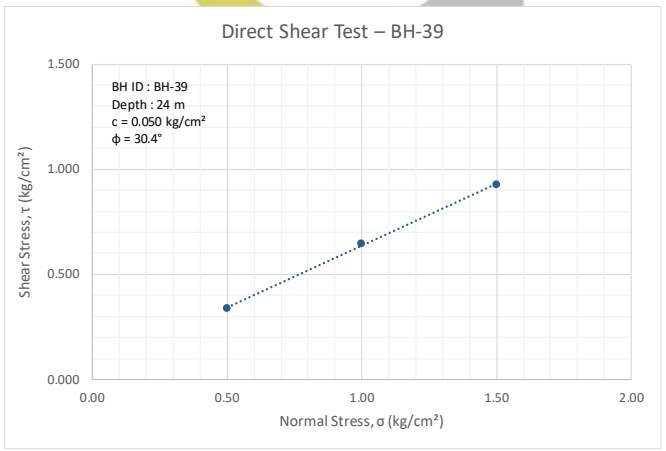

Direct Shear Test – BH-39
BH ID : BH-39
Depth : 9 m
c = 0.057 kg/cm²
ϕ = 25.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

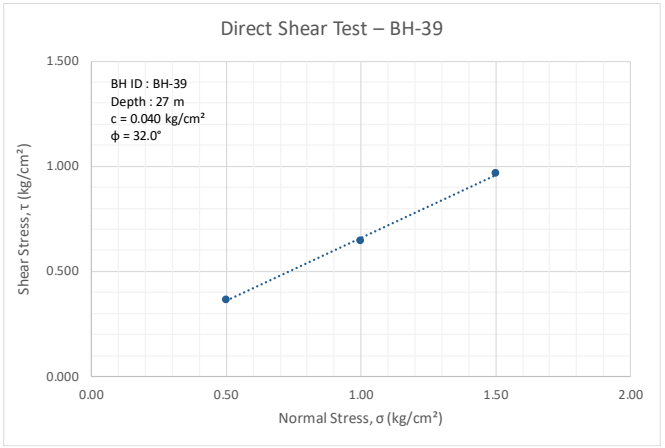

Direct Shear Test – BH-39
BH ID : BH-39
Depth : 12 m
c = 0.040 kg/cm²
ϕ = 27.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

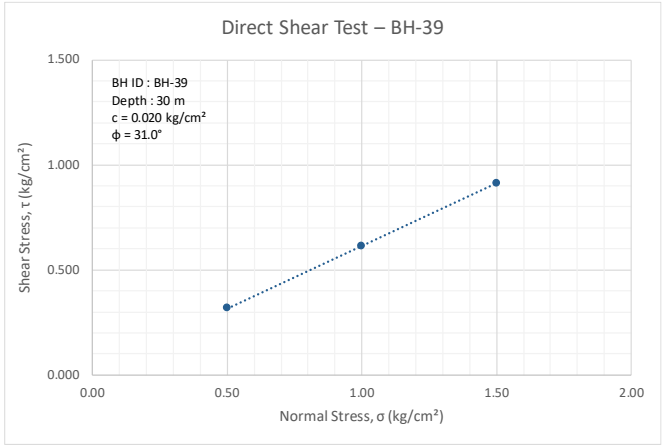

Direct Shear Test – BH-39
BH ID : BH-39
Depth : 15 m
c = 0.050 kg/cm²
ϕ = 27.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-39
BH ID : BH-39
Depth : 18 m
c = 0.030 kg/cm²
ϕ = 28.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-39
BH ID : BH-39
Depth : 21 m
c = 0.100 kg/cm²
ϕ = 27.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-39
BH ID : BH-39
Depth : 24 m
c = 0.050 kg/cm²
ϕ = 30.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-39
BH ID : BH-39
Depth : 27 m
c = 0.040 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

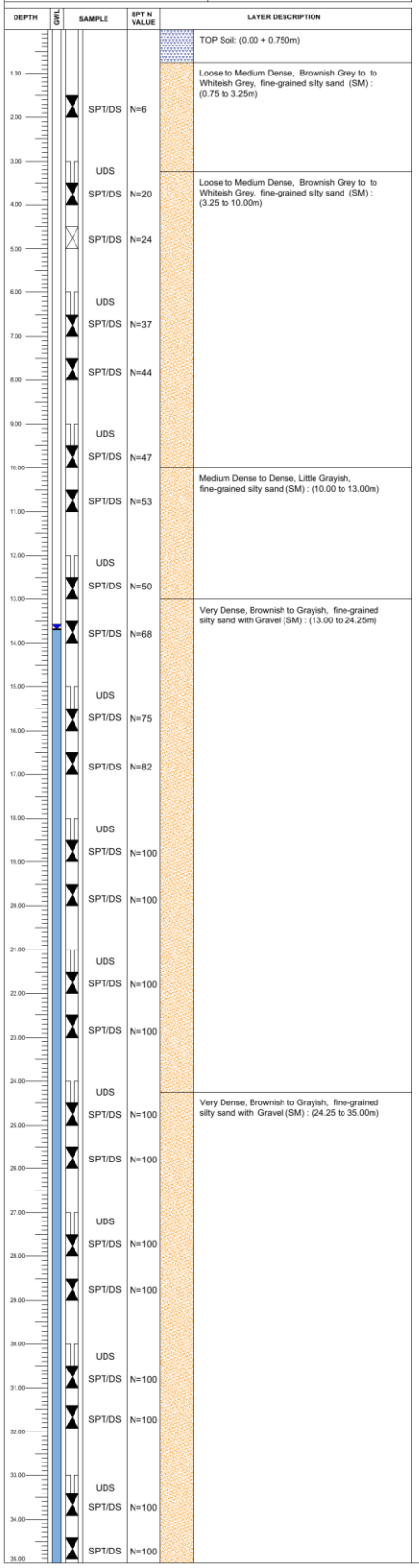

Direct Shear Test – BH-39
BH ID : BH-39
Depth : 30 m
c = 0.020 kg/cm²
ϕ = 31.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Noida Sector-142 to Botanical Garden (3+000 km TO 4+000 km)

BH ID : BH-40 | **Chainage** : 4+518 KM

Groundwater Level : 13.70 M | **Location** : Lat. 28.539304, Long. 77.34958



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

Soil

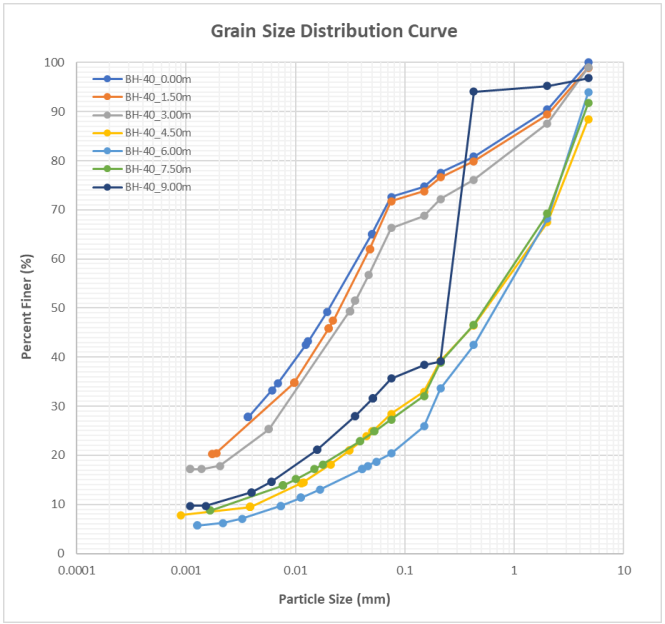
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

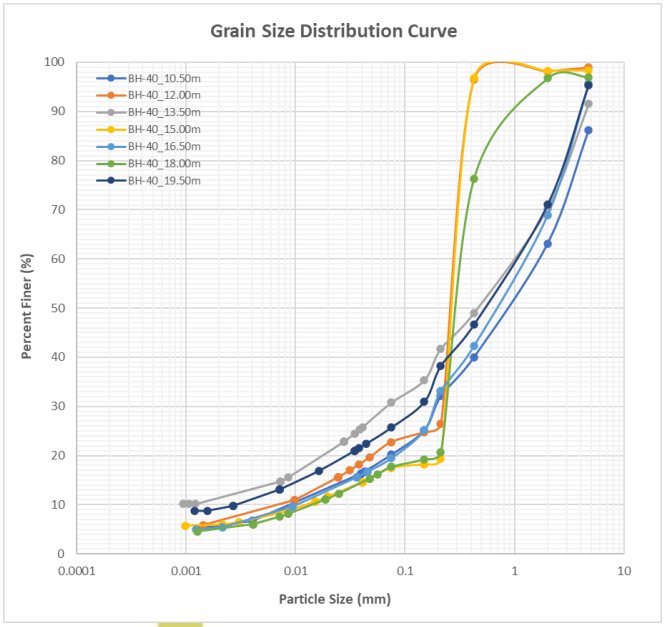
GOMA ENGINEERING AND CONSULTANCY
Quality we put forward

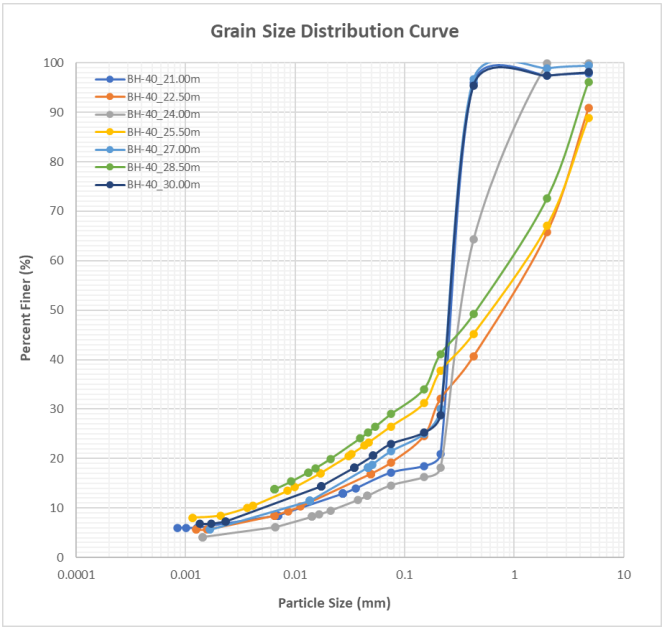
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-40	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	4+518	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	35.00	**Start Date:**	14-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	199	**End Date:**	16-01-2026
Project Code:	158_R5_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	13.70	**Location:**	Lat. 28.539304, Long. 77.34958

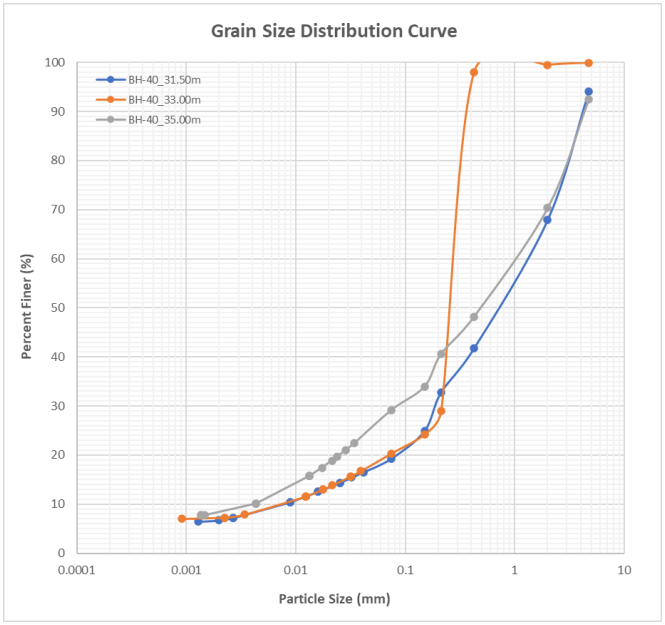
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						0.0	27.4	53.9	18.7	21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Medium Stiff, Brownish to Grayish, fine-grained inorganic silt of low Plasticity with sand (ML)	2	3	3	6	8	1.1	27.2	50.8	21.0	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							1.0	32.7	48.5	17.8	29.0	NP	NP	14.7	1.9	1.66	2.6	F	0.0	23.0	UU	12.0	26.0	-	-	-
3.50	SPT/DS	Medium Dense to Dense, Greyish, fine-grained silty sand with Gravel (SM)	7	8	12	20	22	-																			
4.50	SPT/DS		8	10	14	24	24	11.5	60.0	19.7	8.7	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							6.1	73.5	14.3	6.1	27	NP	NP	15.2	1.9	1.67	2.6	F	0.0	26.0	UU	13.0	24.0	-	-	-
6.50	SPT/DS		10	16	21	37	35	-																			
7.50	SPT/DS		12	18	26	44	40	8.3	64.5	17.9	9.4	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS							3.2	61.1	25.2	10.5	29	NP	NP	13.81	1.98	1.74	2.69	F	0.03	27	-	-	-	-	-	-
9.50	SPT/DS		14	20	27	47	40	-																			
10.50	SPT/DS	Medium Dense to Dense, Little Grayish, fine-grained silty sand (SM)	17	22	31	53	43	13.8	66.1	14.4	5.8	21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							1.1	76.2	16.0	6.7	29	NP	NP	14.22	2.09	1.83	2.65	F	0.05	29	-	-	-	-	-	-
12.50	SPT/DS		12	23	27	50	38	-																			
13.50	SPT/DS	Very Dense, Brownish to Grayish, fine-grained silty sand with Gravel (SM)	25	33	35	68	49	8.5	60.8	19.3	11.5	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS							1.7	80.9	11.5	5.9	27	NP	NP	12.72	-	-	2.63	F	0.02	30	-	-	-	-	-	-
15.50	SPT/DS		32	34	41	75	33	-																			
16.50	SPT/DS		37	40	42	82	35	4.4	76.1	14.1	5.4	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS							3.0	79.3	12.6	5.2	28	NP	NP	13.16	-	-	2.63	F	0.01	31	-	-	-	-	-	-
18.50	SPT/DS		39	50/7cm	-	100	40	-																			
19.50	SPT/DS		44	50/10cm	-	100	39	4.6	69.7	16.4	9.2	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS							2.1	80.8	10.5	6.7	29	NP	NP	14.13	-	-	2.67	F	0.04	30	-	-	-	-	-	-
21.50	SPT/DS		46	50/11cm	-	100	38	-																			
22.50	SPT/DS		45	50/10cm	-	100	38	9.2	71.7	13.1	6.1	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							0.1	85.3	10.0	4.6	21	NP	NP	10.95	-	-	2.66	F	0.02	32	-	-	-	-	-	-
24.50	SPT/DS	Very Dense, Brownish to Grayish, fine-grained silty sand with Gravel (SM)	42	50/9cm	-	100	37	-																			
25.50	SPT/DS		45	50/8cm	-	100	37	11.1	62.4	18.0	8.4	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							0.6	77.9	15.4	6.1	28	NP	NP	11.77	-	-	2.64	F	0.05	31	-	-	-	-	-	-
27.50	SPT/DS		46	50/14cm	-	100	36	-																			
28.50	SPT/DS		50/3cm	-	-	100	35	3.8	67.2	23.4	5.6	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							1.9	75.2	15.9	7.0	21	NP	NP	12.22	-	-	2.62	F	0.03	33	-	-	-	-	-	-
30.50	SPT/DS		50/12cm	-	-	100	34	-																			
31.50	SPT/DS		50/6cm	-	-	100	34	5.9	74.8	12.6	6.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33.00	DS							0.1	79.6	13.1	7.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33.50	SPT/DS		50/5cm	-	-	100	32	-																			
35.00	SPT/DS		50/4cm	-	-	100	31	7.5	63.3	20.8	8.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

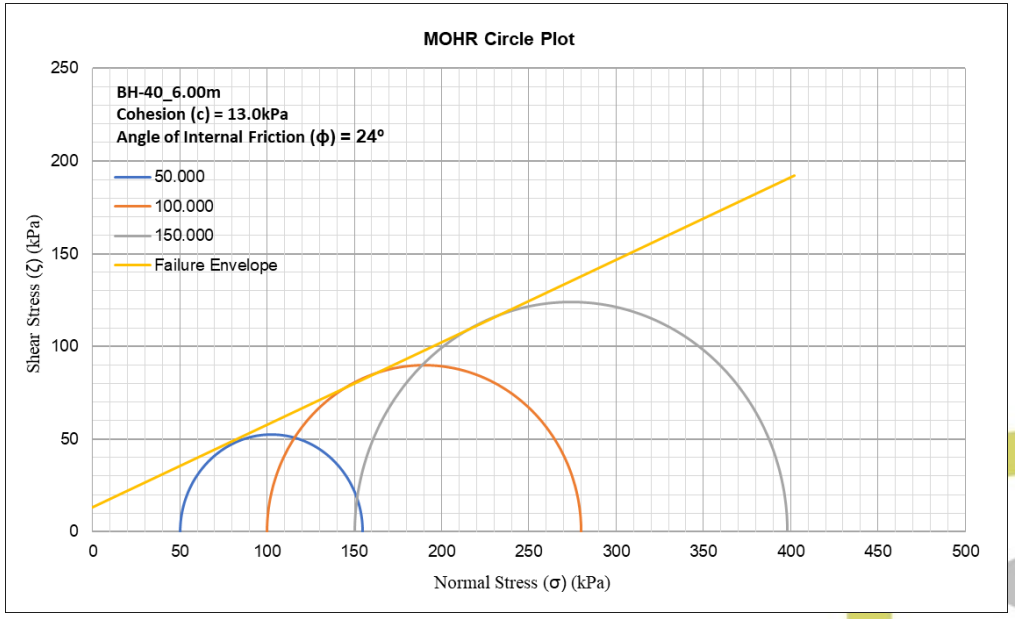
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

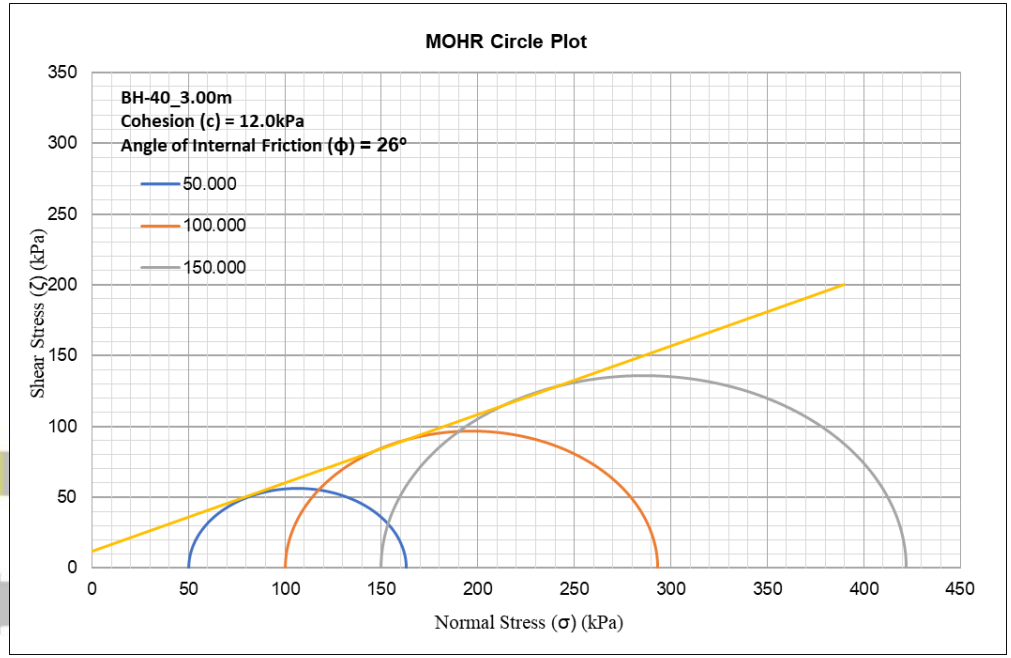

Grain Size Distribution Curve
BH-40_0.00m
BH-40_1.50m
BH-40_3.00m
BH-40_4.50m
BH-40_6.00m
BH-40_7.50m
BH-40_9.00m
Percent Finer (%)
Particle Size (mm)

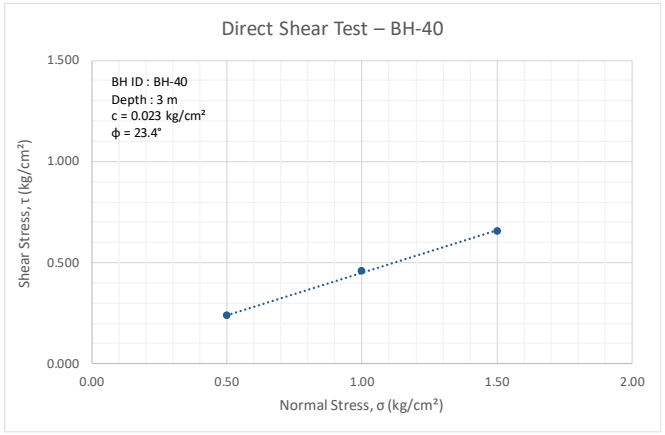

Grain Size Distribution Curve
BH-40_10.50m
BH-40_12.00m
BH-40_13.50m
BH-40_15.00m
BH-40_16.50m
BH-40_18.00m
BH-40_19.50m
Percent Finer (%)
Particle Size (mm)

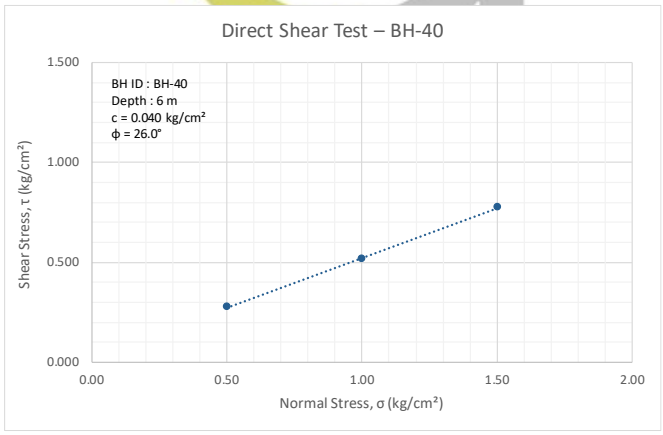

Grain Size Distribution Curve
BH-40_21.00m
BH-40_22.50m
BH-40_24.00m
BH-40_25.50m
BH-40_27.00m
BH-40_28.50m
BH-40_30.00m
Percent Finer (%)
Particle Size (mm)

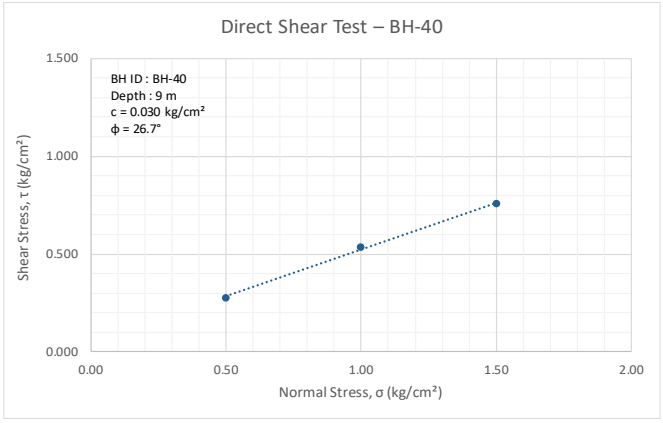

Grain Size Distribution Curve
BH-40_31.50m
BH-40_33.00m
BH-40_35.00m
Percent Finer (%)
Particle Size (mm)

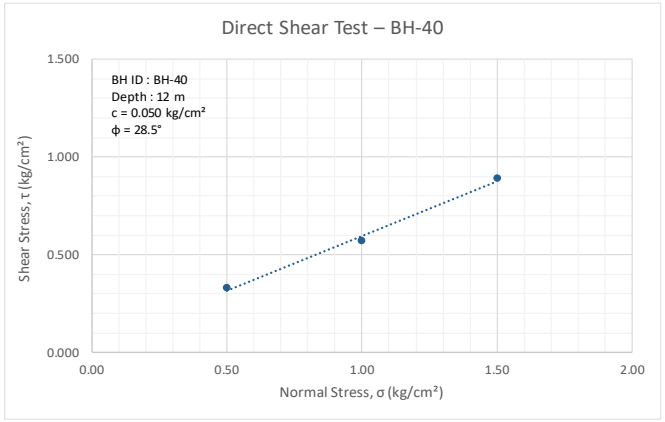

MOHR Circle Plot
BH-40_6.00m
Cohesion (c) = 13.0kPa
Angle of Internal Friction (ϕ) = 24°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

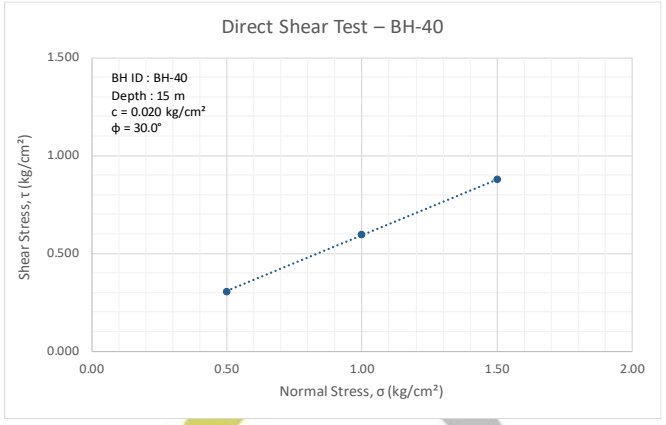

MOHR Circle Plot
BH-40_3.00m
Cohesion (c) = 12.0kPa
Angle of Internal Friction (ϕ) = 26°
50.000
100.000
150.000
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

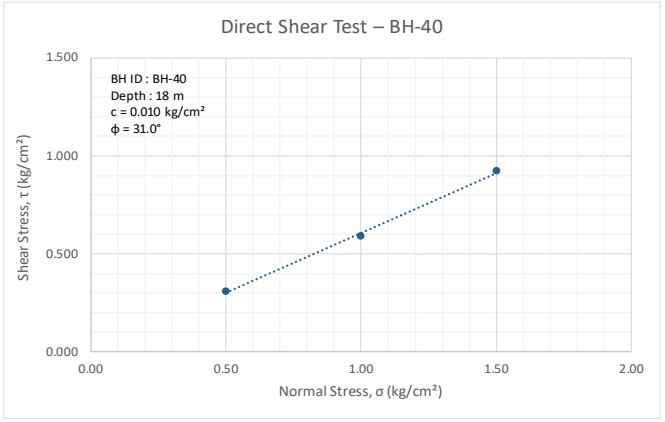

Direct Shear Test – BH-40
BH ID : BH-40
Depth : 3 m
c = 0.023 kg/cm²
ϕ = 23.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

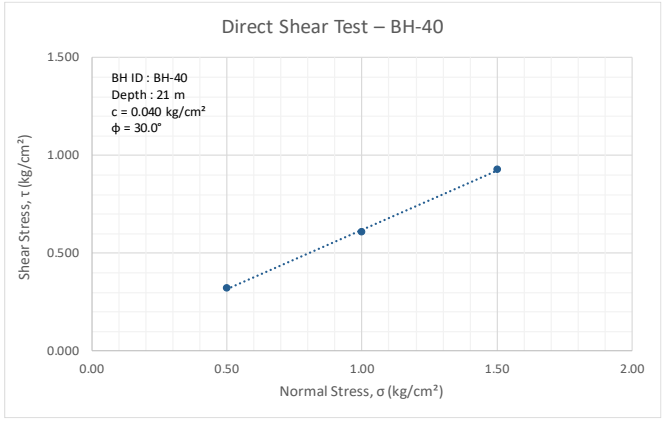

Direct Shear Test – BH-40
BH ID : BH-40
Depth : 6 m
c = 0.040 kg/cm²
ϕ = 26.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

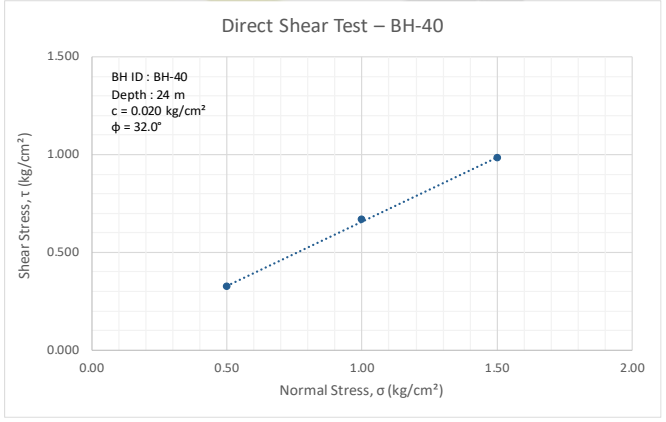

Direct Shear Test – BH-40
BH ID : BH-40
Depth : 9 m
c = 0.030 kg/cm²
ϕ = 26.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

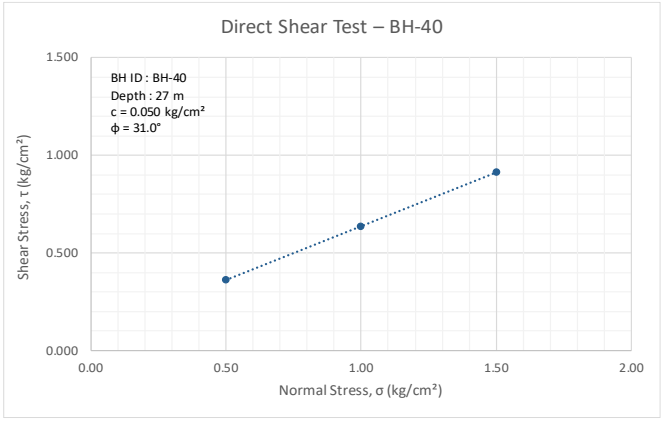

Direct Shear Test – BH-40
BH ID : BH-40
Depth : 12 m
c = 0.050 kg/cm²
ϕ = 28.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

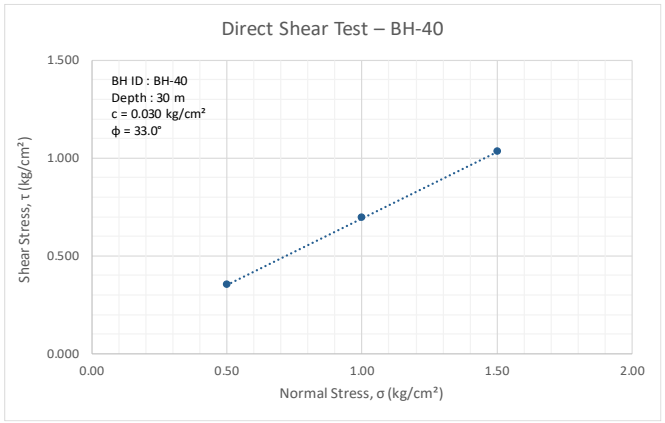

Direct Shear Test – BH-40
BH ID : BH-40
Depth : 15 m
c = 0.020 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-40
BH ID : BH-40
Depth : 18 m
c = 0.010 kg/cm²
ϕ = 31.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

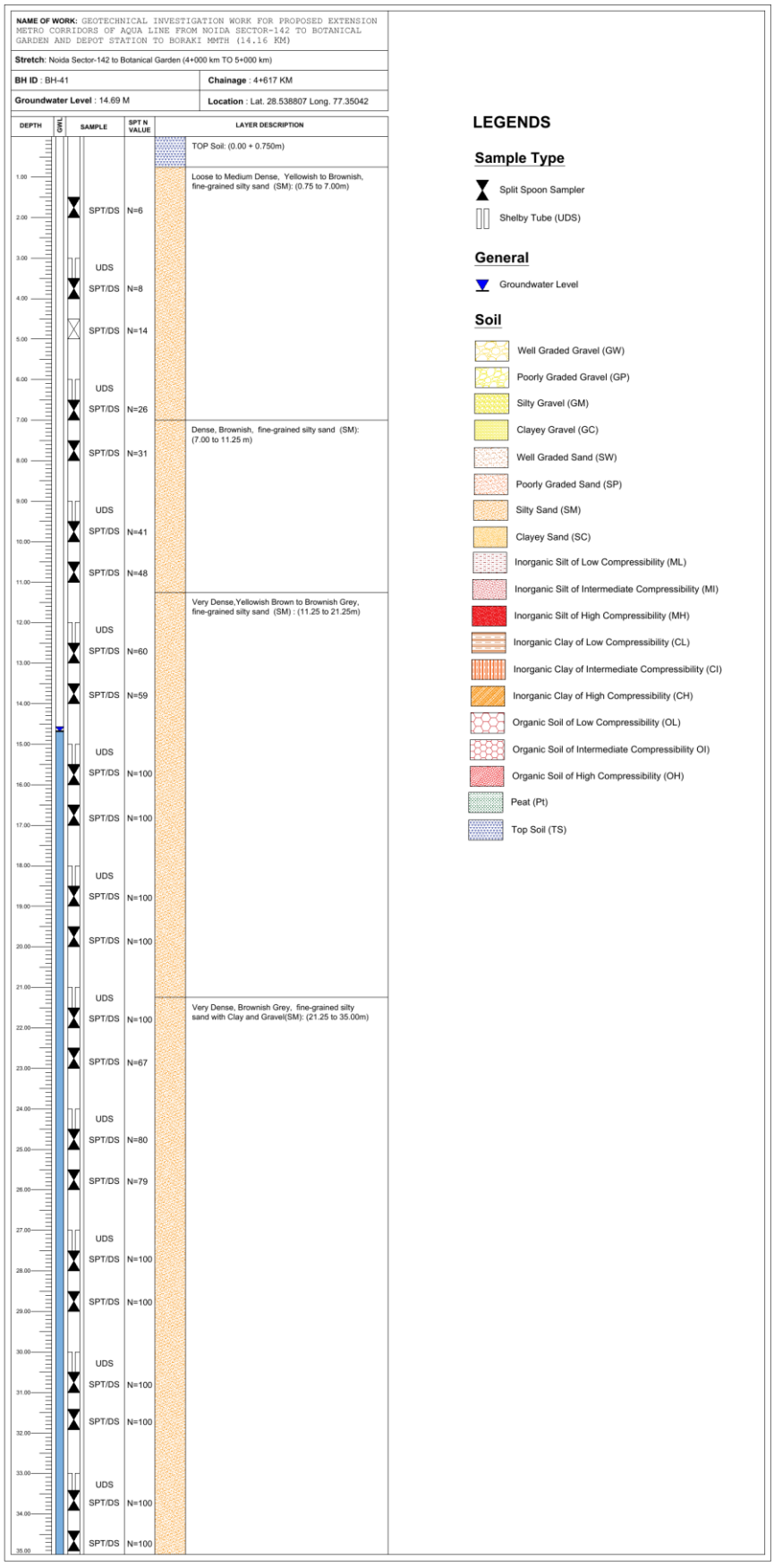

Direct Shear Test – BH-40
BH ID : BH-40
Depth : 21 m
c = 0.040 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-40
BH ID : BH-40
Depth : 24 m
c = 0.020 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-40
BH ID : BH-40
Depth : 27 m
c = 0.050 kg/cm²
ϕ = 31.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-40
BH ID : BH-40
Depth : 30 m
c = 0.030 kg/cm²
ϕ = 33.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

C.6. Zone 6: CH: 4+515 km to 5+530 km (BH-41 to BH-50)

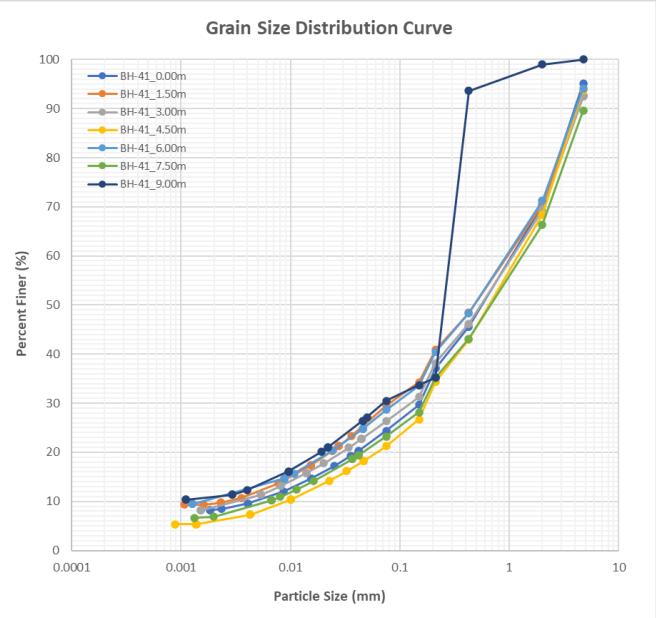


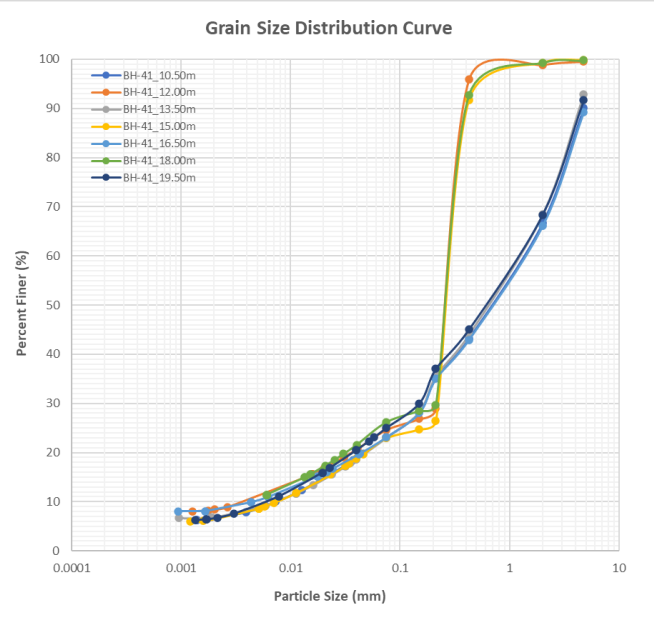
GOMA ENGINEERING AND CONSULTANCY
Quality we put forward

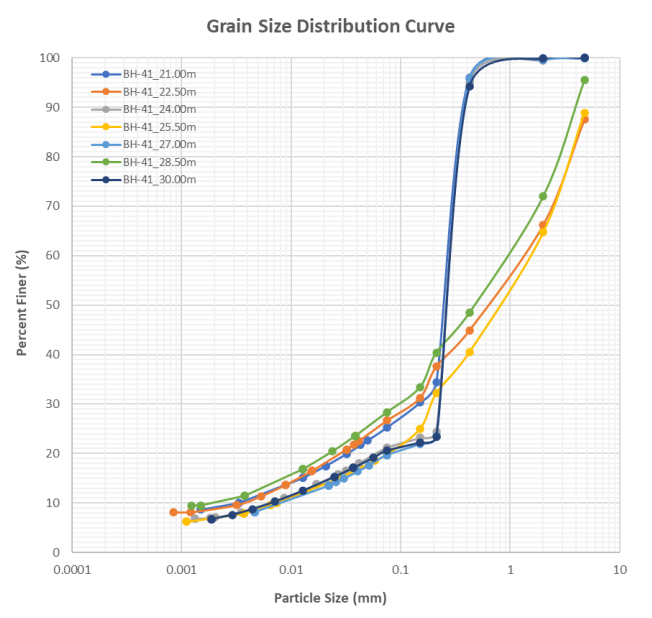
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-41	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	4+617	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	35.00	**Start Date:**	12-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	198.2	**End Date:**	13-01-2026
Project Code:	158_R06_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	14.69	**Location:**	Lat. 28.538807, Long. 77.35042

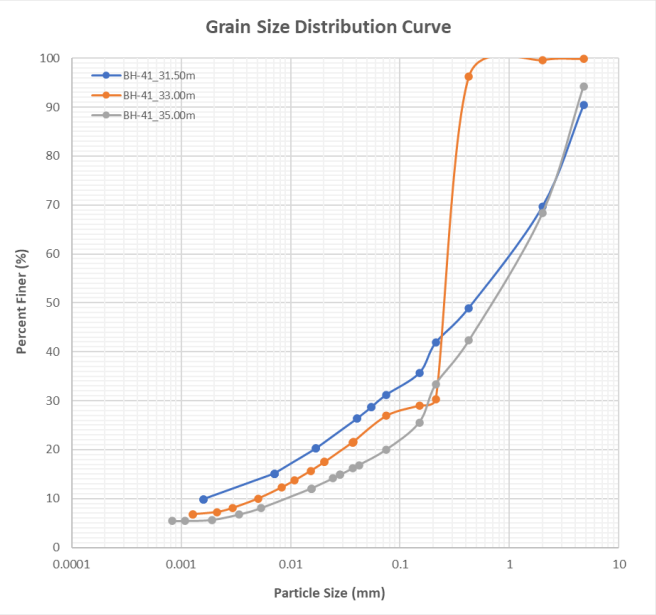
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [^{o}]	Type	Cohesion [kPa]	Angle of Friction [^{o}]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Loose to Medium Dense, Yellowish to Brownish, fine-grained silty sand (SM)	2	3	3	6	8	7.4	63.1	19.9	9.6	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							7.5	66.2	17.4	8.9	23	NP	NP	10.56	1.93	1.75	2.61	F	0.02	21.0	UU	12.0	27.0	-	-	-
3.50	SPT/DS		3	3	5	8	9	-																			
4.50	SPT/DS		4	6	8	14	14	6.2	72.6	15.2	6.0	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							5.9	65.4	18.0	10.7	24	NP	NP	11.32	1.94	1.74	2.64	F	0.04	25.0	UU	14.0	25.0	-	-	-
6.50	SPT/DS		7	12	14	26	24	-																			
7.50	SPT/DS	Dense, Brownish, fine-grained silty sand (SM)	9	13	18	31	28	10.4	66.4	16.3	6.9	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS							0.0	69.5	19.5	11.0	27	NP	NP	10.61	1.77	1.60	2.61	F	0.07	27	-	-	-	-	-	-
9.50	SPT/DS		14	19	22	41	35	-																			
10.50	SPT/DS		15	23	25	48	39	9.9	66.9	16.3	6.9	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS	Very Dense,Yellowish Brown to Brownish Grey, fine-grained silty sand (SM)						0.4	75.0	16.2	8.4	21	NP	NP	11.52	1.90	1.71	2.63	F	0.09	29	-	-	-	-	-	-
12.50	SPT/DS		24	27	33	60	45	-																			
13.50	SPT/DS		22	24	35	59	42	7.1	69.8	16.1	6.9	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS							0.1	76.9	16.4	6.6	29	NP	NP	9.85	2.02	1.84	2.65	F	0.03	30	-	-	-	-	-	-
15.50	SPT/DS		36	45	(50/9cm)	100	41	-																			
16.50	SPT/DS		44	(50/8cm)	-	100	40	10.8	66.2	14.7	8.4	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS							0.2	73.6	19.1	7.1	26	NP	NP	12.26	-	-	2.65	F	0.07	30	-	-	-	-	-	-
18.50	SPT/DS		34	(50/13cm)	-	100	39	-																			
19.50	SPT/DS		37	(50/8cm)	-	100	39	8.3	66.7	18.4	6.6	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS							0.0	74.7	16.1	9.2	24	NP	NP	15.11	-	-	2.61	F	0.05	31	-	-	-	-	-	-
21.50	SPT/DS	Very Dense, Brownish Grey, fine-grained silty sand with Clay and Gravel(SM)	45	(50/12cm)	-	100	38	-																			
22.50	SPT/DS		33	(50/10cm)	-	100	37	12.5	60.8	17.8	8.9	21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							0.1	78.7	14.1	7.1	25	NP	NP	13.18	-	-	2.62	F	0.02	32	-	-	-	-	-	-
24.50	SPT/DS		44	(50/9cm)	-	100	36	-																			
25.50	SPT/DS		42	(50/10cm)	-	100	36	11.1	69.1	12.8	7.0	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							0.1	80.3	14.2	5.5	25	NP	NP	15.26	-	-	2.69	F	0.00	34	-	-	-	-	-	-
27.50	SPT/DS		(50/13cm)	-	-	100	35	-																			
28.50	SPT/DS		(50/12cm)	-	-	100	35	4.5	67.2	18.3	10.1	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							0.0	79.4	13.7	6.9	27	NP	NP	12.55	-	-	2.69	F	0.03	36	-	-	-	-	-	-
30.50	SPT/DS		(50/10cm)	-	-	100	33	-																			
31.50	SPT/DS		(50/9cm)	-	-	100	33	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33.00	DS							0.1	73.0	19.7	7.2	23	NP	NP	13.18	-	-	2.69	-	-	-	-	-	-	-	-	-
33.50	SPT/DS		(50/7cm)	-	-	100	31	-																			
35.00	SPT/DS		(50/6cm)	-	-	100	29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

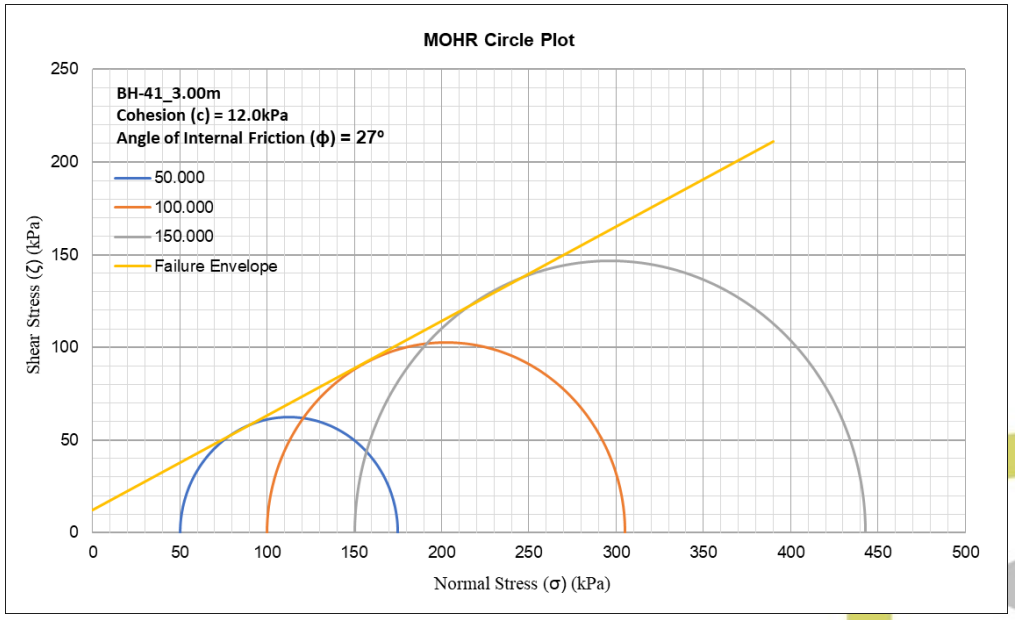
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

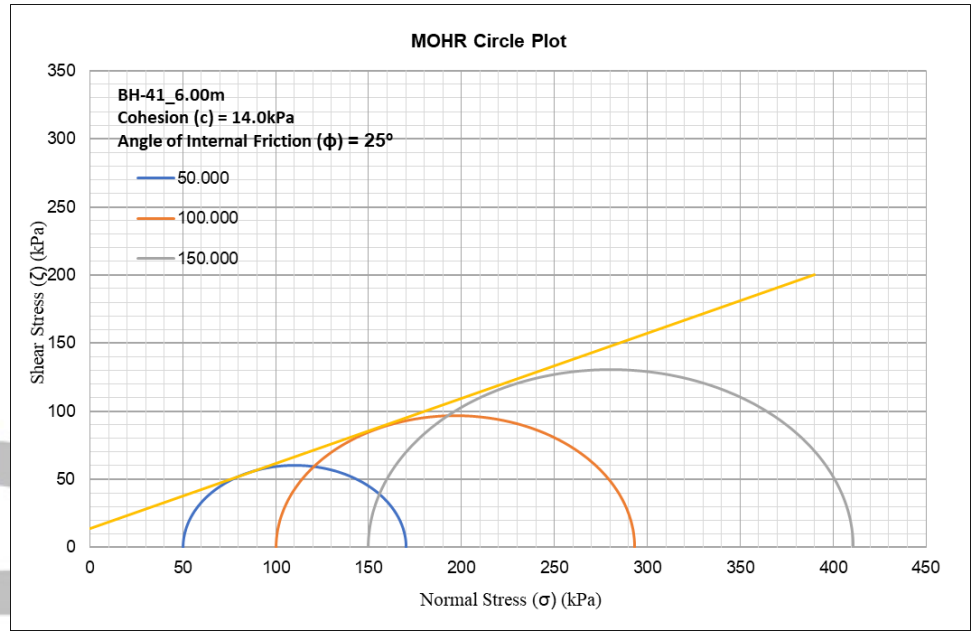

Grain Size Distribution Curve
BH-41_0.00m
BH-41_1.50m
BH-41_3.00m
BH-41_4.50m
BH-41_6.00m
BH-41_7.50m
BH-41_9.00m
Percent Finer (%)
Particle Size (mm)

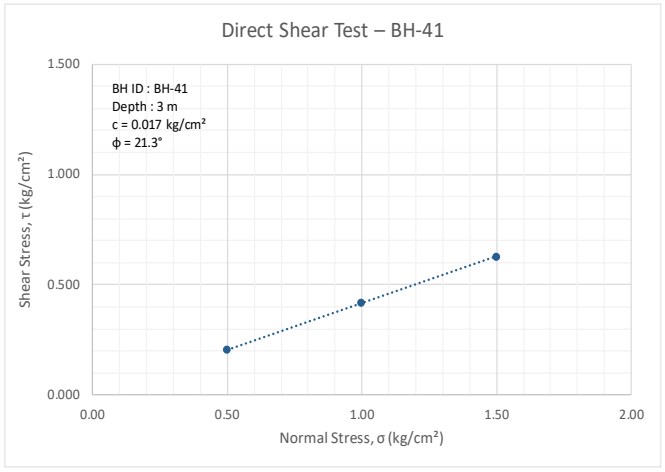

Grain Size Distribution Curve
BH-41_10.50m
BH-41_12.00m
BH-41_13.50m
BH-41_15.00m
BH-41_16.50m
BH-41_18.00m
BH-41_19.50m
Percent Finer (%)
Particle Size (mm)

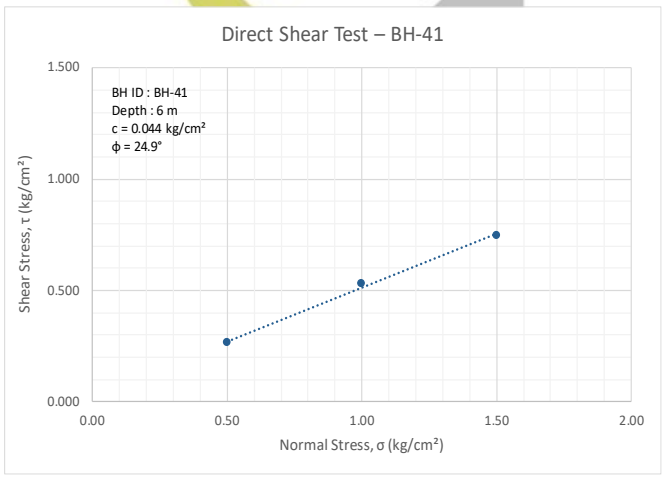

Grain Size Distribution Curve
BH-41_21.00m
BH-41_22.50m
BH-41_24.00m
BH-41_25.50m
BH-41_27.00m
BH-41_28.50m
BH-41_30.00m
Percent Finer (%)
Particle Size (mm)

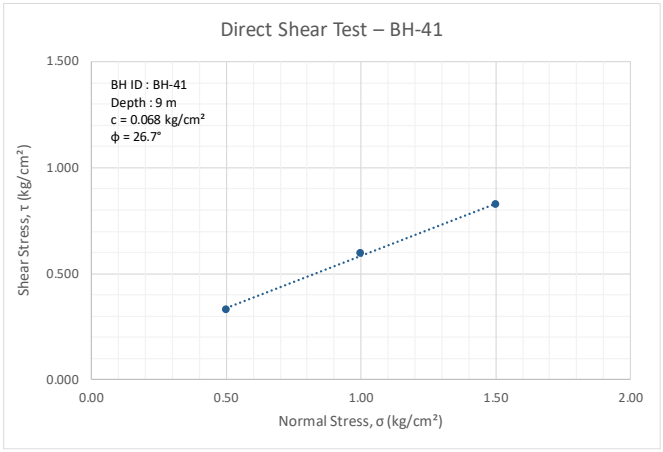

Grain Size Distribution Curve
BH-41_31.50m
BH-41_33.00m
BH-41_35.00m
Percent Finer (%)
Particle Size (mm)

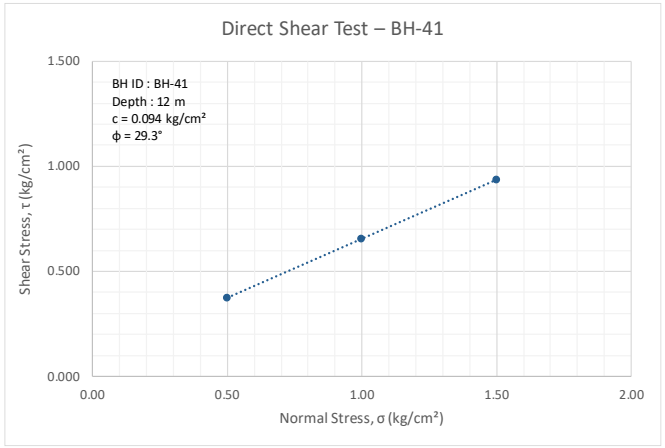

MOHR Circle Plot
BH-41_3.00m
Cohesion (c) = 12.0kPa
Angle of Internal Friction (ϕ) = 27°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

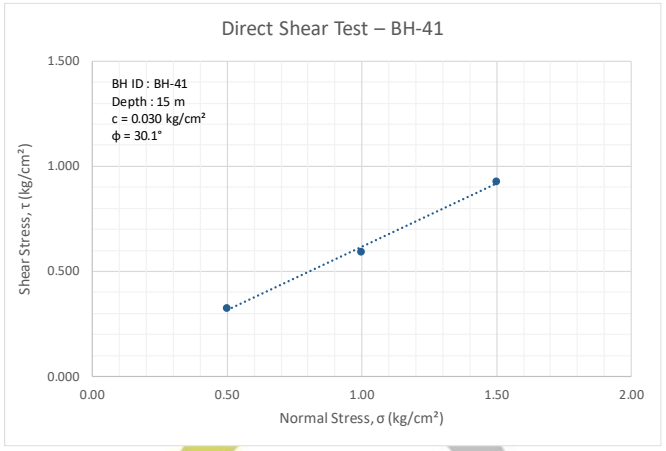

MOHR Circle Plot
BH-41_6.00m
Cohesion (c) = 14.0kPa
Angle of Internal Friction (ϕ) = 25°
50.000
100.000
150.000
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

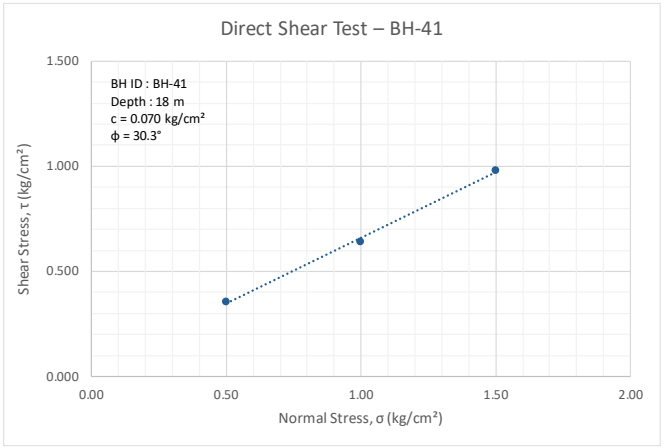

Direct Shear Test – BH-41
BH ID : BH-41
Depth : 3 m
c = 0.017 kg/cm²
ϕ = 21.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

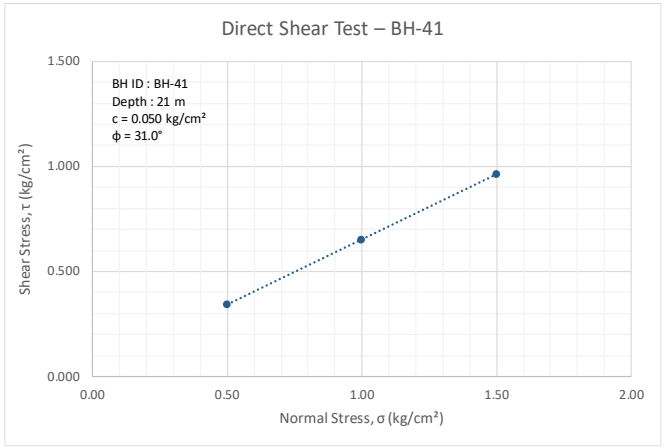

Direct Shear Test – BH-41
BH ID : BH-41
Depth : 6 m
c = 0.044 kg/cm²
ϕ = 24.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

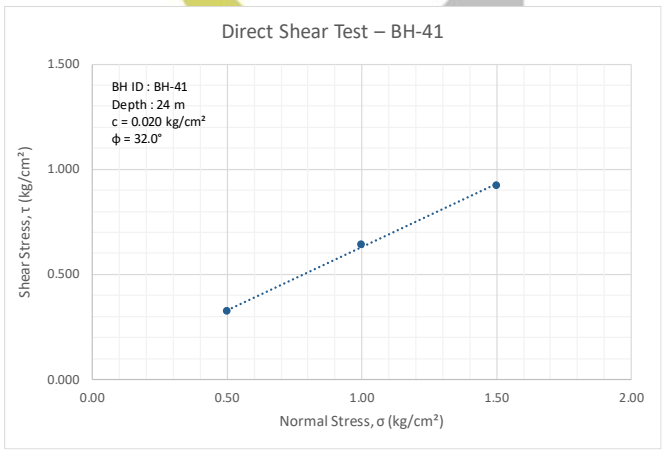

Direct Shear Test – BH-41
BH ID : BH-41
Depth : 9 m
c = 0.068 kg/cm²
ϕ = 26.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

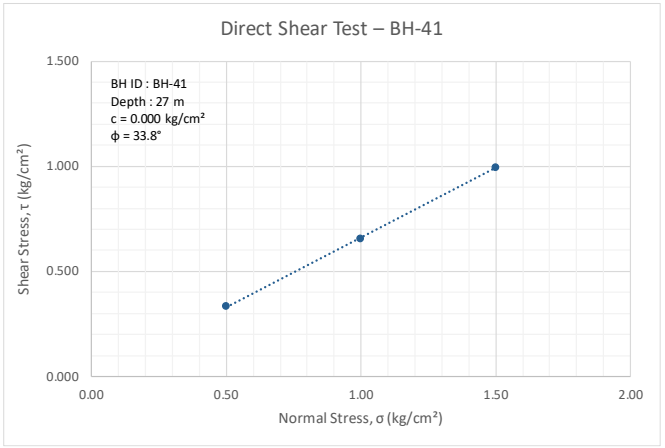

Direct Shear Test – BH-41
BH ID : BH-41
Depth : 12 m
c = 0.094 kg/cm²
ϕ = 29.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

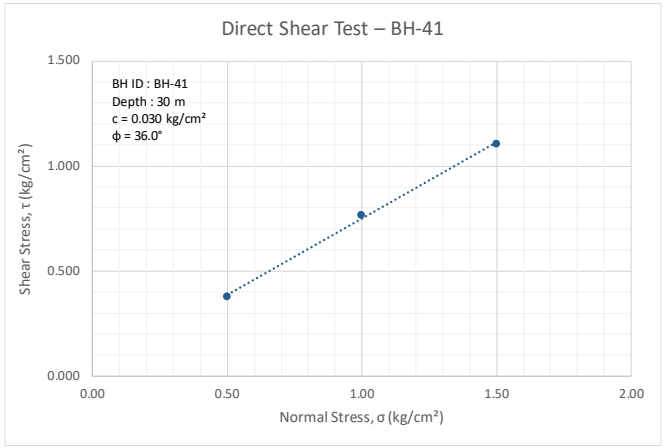

Direct Shear Test – BH-41
BH ID : BH-41
Depth : 15 m
c = 0.030 kg/cm²
ϕ = 30.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-41
BH ID : BH-41
Depth : 18 m
c = 0.070 kg/cm²
ϕ = 30.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-41
BH ID : BH-41
Depth : 21 m
c = 0.050 kg/cm²
ϕ = 31.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-41
BH ID : BH-41
Depth : 24 m
c = 0.020 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-41
BH ID : BH-41
Depth : 27 m
c = 0.000 kg/cm²
ϕ = 33.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

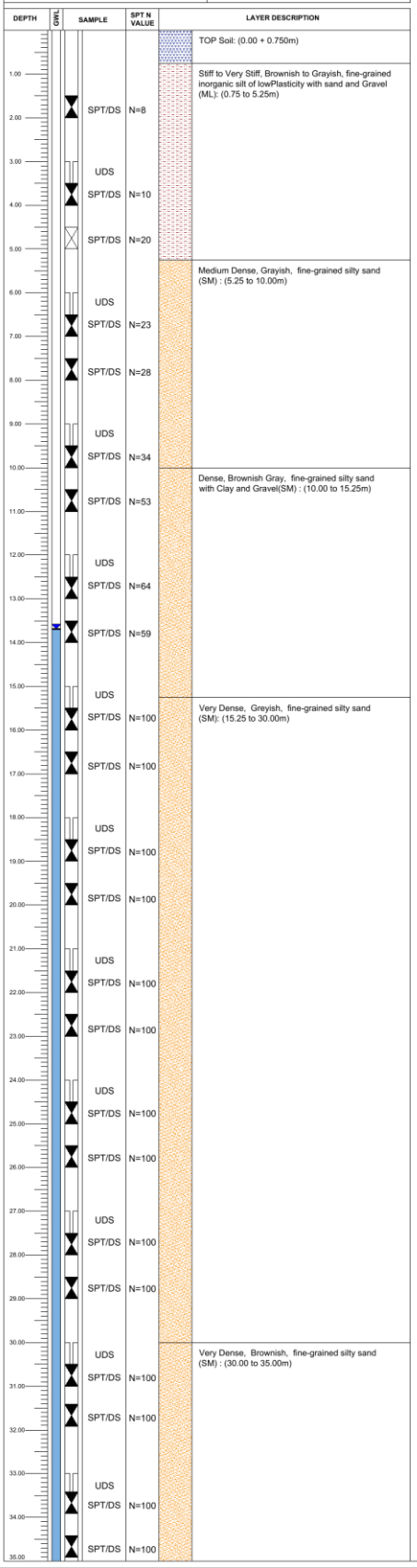

Direct Shear Test – BH-41
BH ID : BH-41
Depth : 30 m
c = 0.030 kg/cm²
ϕ = 36.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Noida Sector-142 to Botanical Garden (4+000 km TO 5+000 km)

BH ID : BH-42 | **Chainage** : 4+751 KM

Groundwater Level : 13.70 M | **Location** : Lat. 28.538135, Long. 77.351558



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

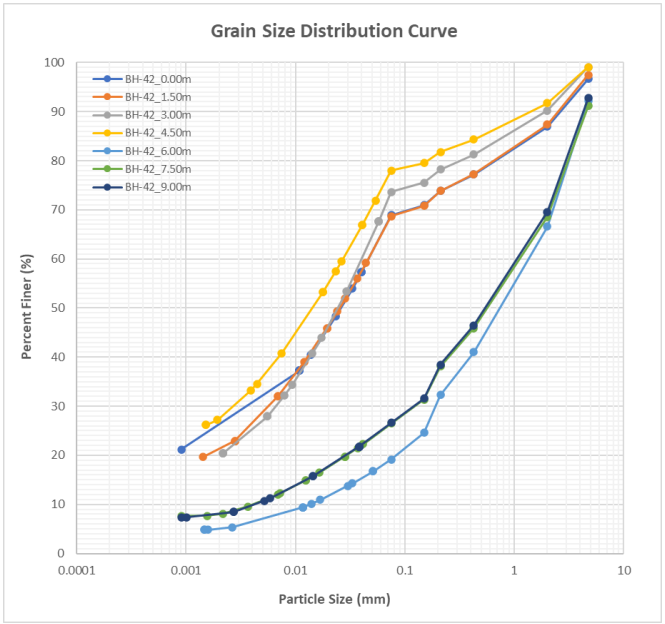
Soil

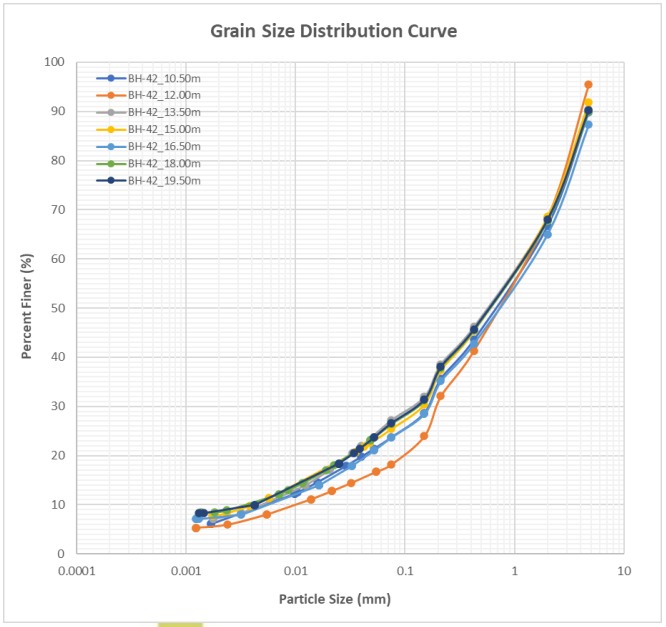
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

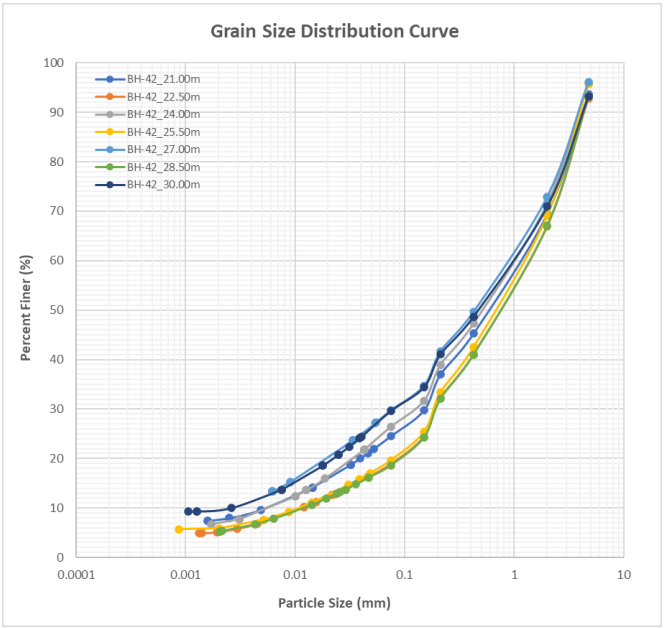
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-42	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	4+751	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	35.00	**Start Date:**	10-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	198.4	**End Date:**	11-01-2026
Project Code:	158_R06_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	13.70	**Location:**	Lat. 28.538135, Long. 77.351558

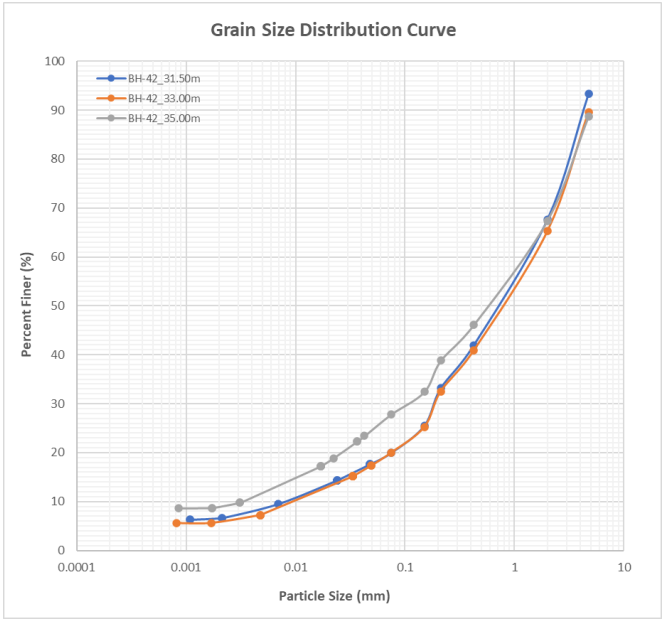
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						3.4	27.7	42.6	26.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Stiff to Very Stiff, Brownish to Grayish, fine-grained inorganic silt of lowPlasticity with sand and Gravel (ML)	3	4	4	8	11	2.5	28.8	47.3	21.3	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							0.9	25.5	73.6	0.0	21	NP	NP	12.78	1.87	1.66	2.64	F	0.02	23	UU	34	17	-	-	-
3.50	SPT/DS		3	4	6	10	11	-																			
4.50	SPT/DS		6	8	12	20	20	0.9	21.1	50.4	27.5	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS	Medium Dense, Grayish, fine-grained silty sand (SM)						7.8	73.1	14.1	5.1	24	NP	NP	13.48	1.89	1.67	2.67	F	0.07	26	UU	30	18	-	-	-
6.50	SPT/DS		6	8	15	23	22	-																			
7.50	SPT/DS		8	13	15	28	26	8.8	64.7	18.5	8.0	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	DS							7.3	66.1	18.5	8.1	25	NP	NP	12.26	-	-	2.68	F	0.08	28	-	-	-	-	-	-
9.50	SPT/DS		14	16	18	34	29	-																			
10.50	SPT/DS	Dense, Brownish Gray, fine-grained silty sand with Clay and Gravel(SM)	17	20	33	53	43	10.2	66.1	17.0	6.7	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	DS							4.6	77.3	12.4	5.8	24	NP	NP	13.28	-	-	2.60	F	0.02	29	-	-	-	-	-	-
12.50	SPT/DS		23	28	36	64	48	-																			
13.50	SPT/DS		21	24	35	59	42	9.6	63.2	19.8	7.4	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	UDS							8.2	66.4	17.5	8.0	21	NP	NP	17.18	-	-	2.63	F	0.04	29	-	-	-	-	-	-
15.50	SPT/DS	Very Dense, Greyish, fine-grained silty sand (SM)	33	(50/14cm)	-	100	42	-																			
16.50	SPT/DS		36	(50/12cm)	-	100	41	12.7	63.6	16.2	7.6	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS							10.0	63.6	17.8	8.6	22	NP	NP	15.11	-	-	2.62	F	0.00	30	-	-	-	-	-	-
18.50	SPT/DS		40	(50/12cm)	-	100	40	-																			
19.50	SPT/DS		34	(50/11cm)	-	100	39	9.7	63.7	17.8	8.8	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS							6.4	69.1	16.9	7.7	25	NP	NP	11.98	-	-	2.66	F	0.02	31	-	-	-	-	-	-
21.50	SPT/DS		44	(50/10cm)	-	100	38	-																			
22.50	SPT/DS		46	(50/8cm)	-	100	38	7.2	73.9	13.8	5.1	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							4.1	69.4	19.4	7.0	28	NP	NP	12.22	-	-	2.66	F	0.00	32	-	-	-	-	-	-
24.50	SPT/DS		40	(50/10cm)	-	100	37	-																			
25.50	SPT/DS		45	(50/8cm)	-	100	37	4.3	76.1	13.8	5.9	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							3.8	66.4	22.6	7.2	23	NP	NP	16.21	-	-	2.67	F	0.01	34	-	-	-	-	-	-
27.50	SPT/DS		(50/13cm)		-	100	36	-																			
28.50	SPT/DS		(50/11cm)	-	-	100	35	6.8	74.6	13.4	5.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							6.8	63.6	20.0	9.7	22	NP	NP	13.16	-	-	2.67	F	0.03	35	-	-	-	-	-	-
30.50	SPT/DS		(50/10cm)	-	-	100	34	-																			
31.50	SPT/DS	Very Dense, Brownish, fine-grained silty sand (SM)	(50/8cm)	-	-	100	34	6.7	73.7	13.4	6.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33.00	DS							10.4	69.6	14.1	5.9	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
33.50	SPT/DS		(50/8cm)	-	-	100	32	-																			
35.00	SPT/DS		(50/7cm)	-	-	100	31	11.3	60.9	18.9	9.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

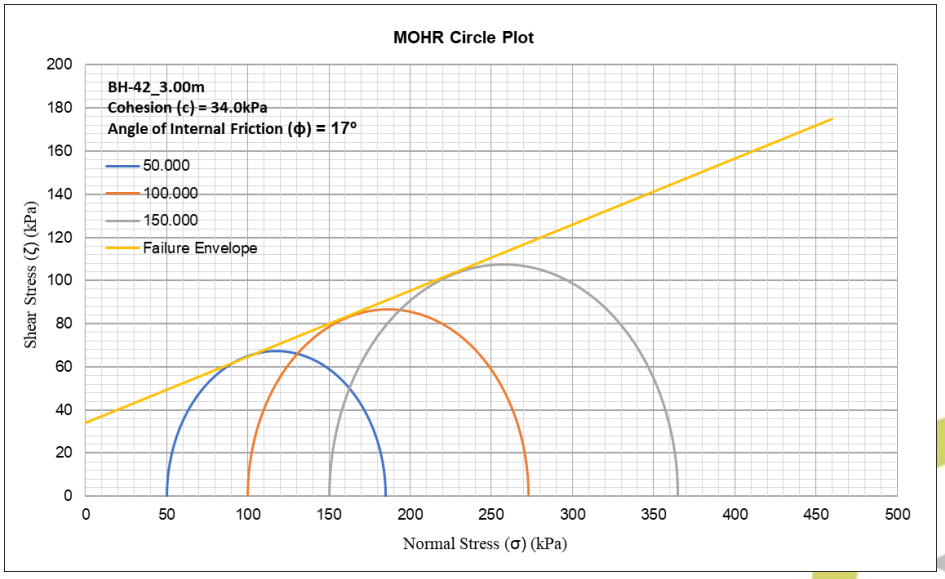
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

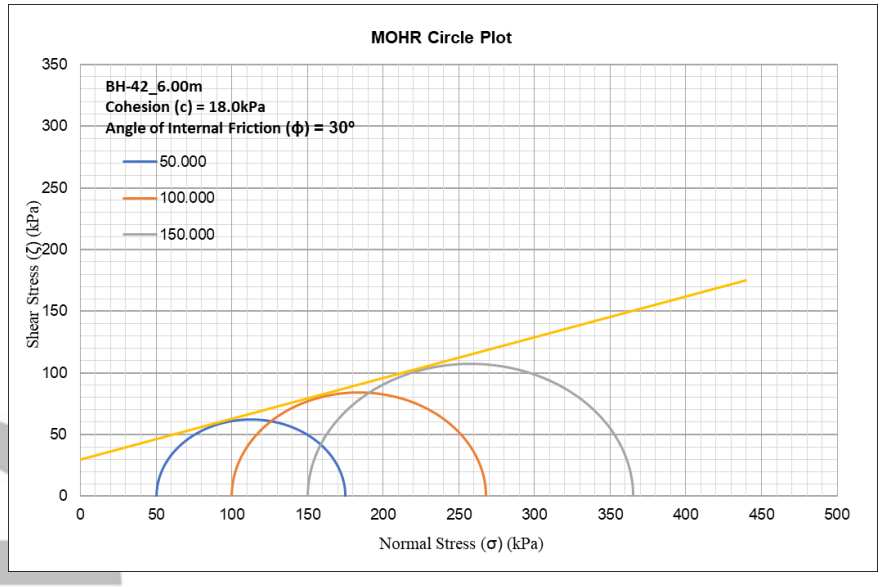

Grain Size Distribution Curve
BH-42_0.00m
BH-42_1.50m
BH-42_3.00m
BH-42_4.50m
BH-42_6.00m
BH-42_7.50m
BH-42_9.00m
Percent Finer (%)
Particle Size (mm)

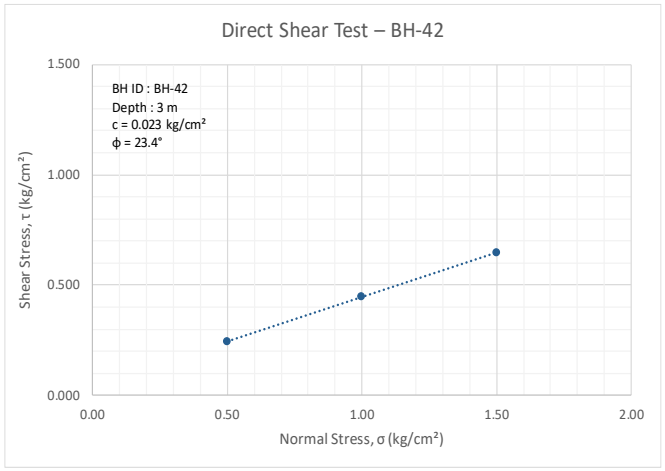

Grain Size Distribution Curve
BH-42_10.50m
BH-42_12.00m
BH-42_13.50m
BH-42_15.00m
BH-42_16.50m
BH-42_18.00m
BH-42_19.50m
Percent Finer (%)
Particle Size (mm)

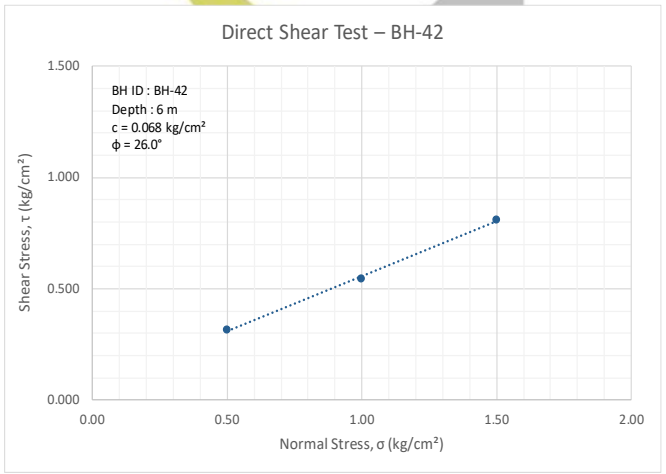

Grain Size Distribution Curve
BH-42_21.00m
BH-42_22.50m
BH-42_24.00m
BH-42_25.50m
BH-42_27.00m
BH-42_28.50m
BH-42_30.00m
Percent Finer (%)
Particle Size (mm)

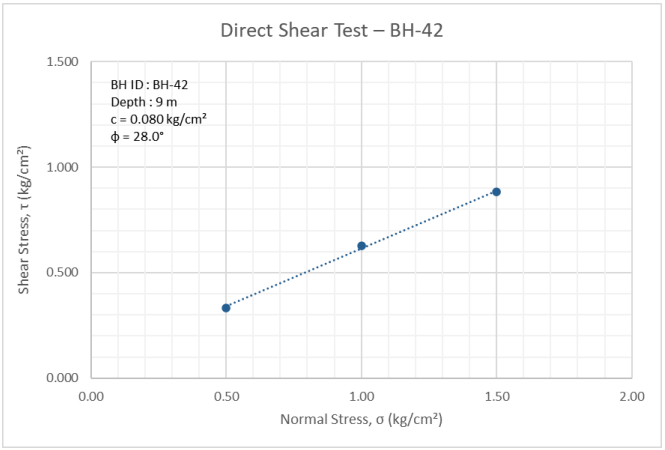

Grain Size Distribution Curve
BH-42_31.50m
BH-42_33.00m
BH-42_35.00m
Percent Finer (%)
Particle Size (mm)

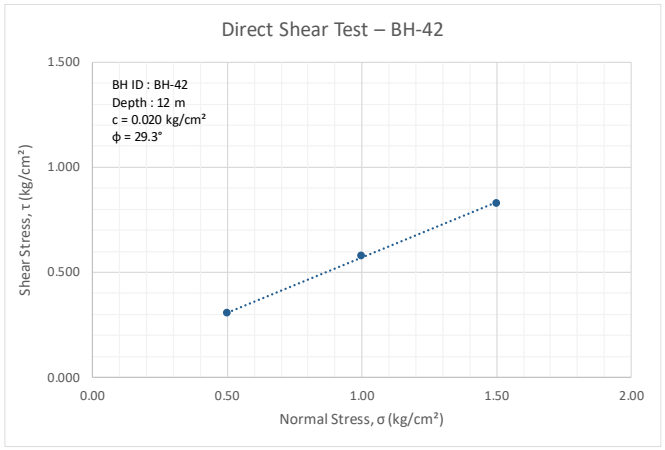

MOHR Circle Plot
BH-42_3.00m
Cohesion (c) = 34.0kPa
Angle of Internal Friction (ϕ) = 17°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

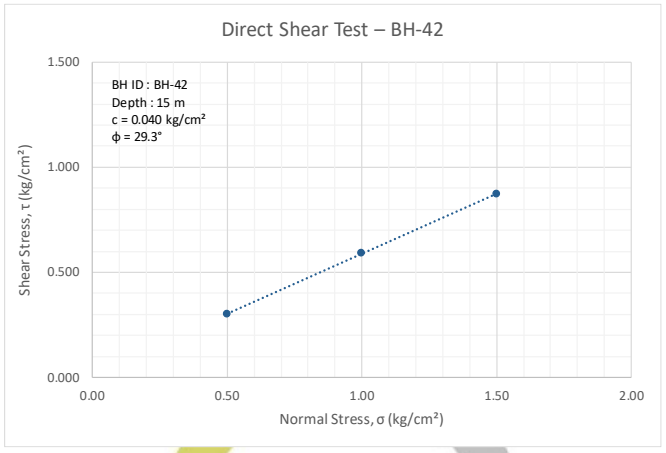

MOHR Circle Plot
BH-42_6.00m
Cohesion (c) = 18.0kPa
Angle of Internal Friction (ϕ) = 30°
50.000
100.000
150.000
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

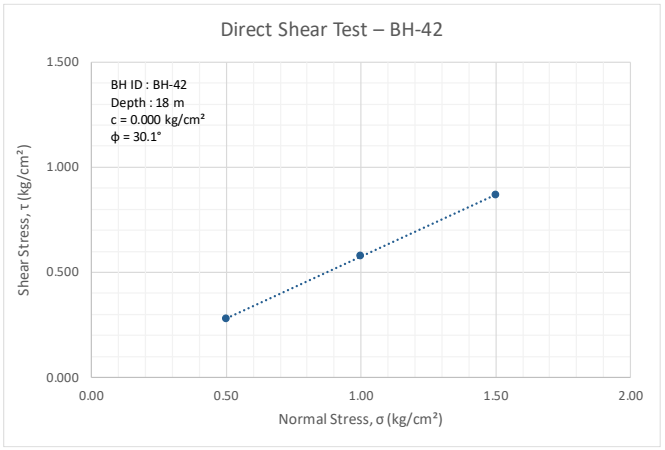

Direct Shear Test – BH-42
BH ID : BH-42
Depth : 3 m
c = 0.023 kg/cm²
ϕ = 23.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

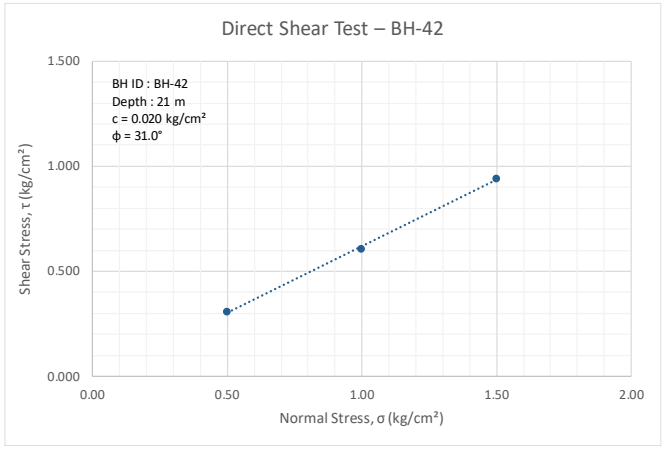

Direct Shear Test – BH-42
BH ID : BH-42
Depth : 6 m
c = 0.068 kg/cm²
ϕ = 26.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

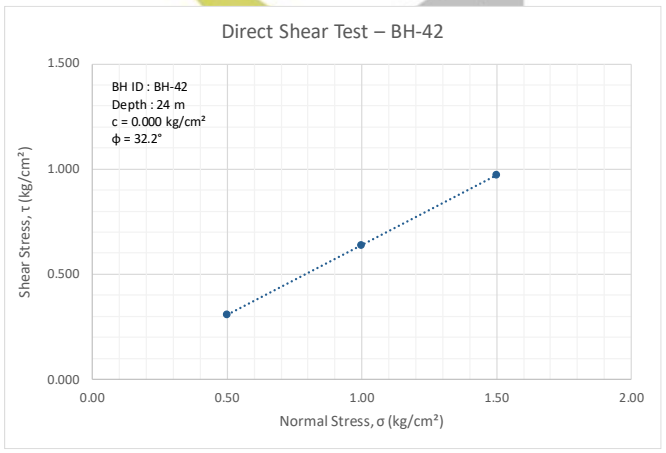

Direct Shear Test – BH-42
BH ID : BH-42
Depth : 9 m
c = 0.080 kg/cm²
ϕ = 28.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

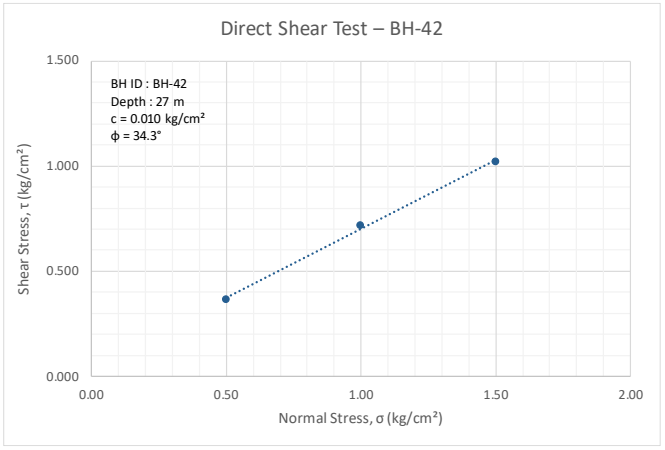

Direct Shear Test – BH-42
BH ID : BH-42
Depth : 12 m
c = 0.020 kg/cm²
ϕ = 29.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

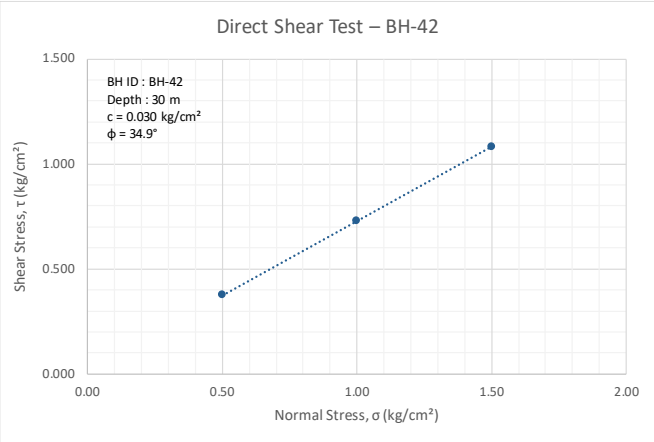

Direct Shear Test – BH-42
BH ID : BH-42
Depth : 15 m
c = 0.040 kg/cm²
ϕ = 29.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-42
BH ID : BH-42
Depth : 18 m
c = 0.000 kg/cm²
ϕ = 30.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-42
BH ID : BH-42
Depth : 21 m
c = 0.020 kg/cm²
ϕ = 31.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-42
BH ID : BH-42
Depth : 24 m
c = 0.000 kg/cm²
ϕ = 32.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-42
BH ID : BH-42
Depth : 27 m
c = 0.010 kg/cm²
ϕ = 34.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

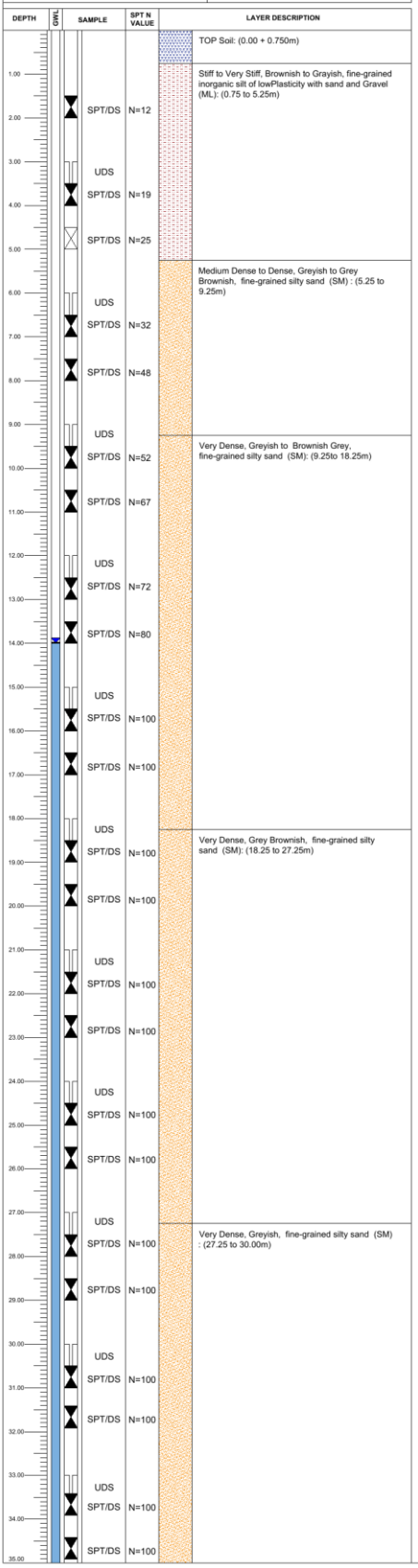

Direct Shear Test – BH-42
BH ID : BH-42
Depth : 30 m
c = 0.030 kg/cm²
ϕ = 34.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Noida Sector-142 to Botanical Garden (4+000 km TO 5+000 km)

BH ID : BH-43 | **Chainage** : 4+833 KM

Groundwater Level : 14.00 M | **Location** : Lat. 28.537904, Long. 77.352401



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

Soil

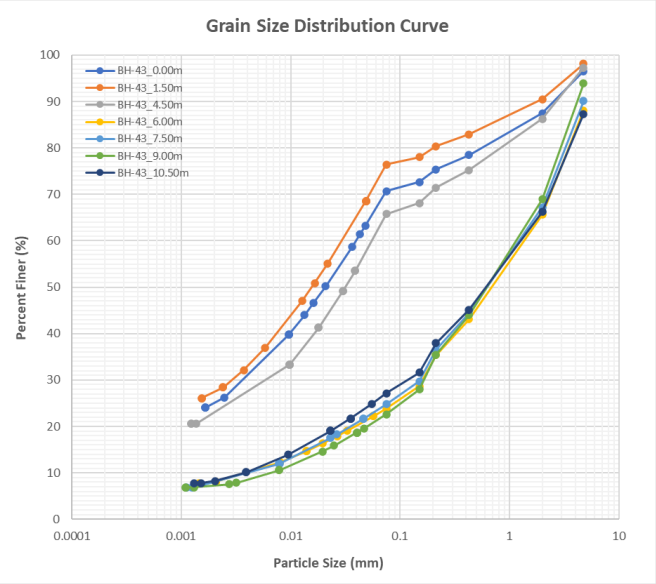
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

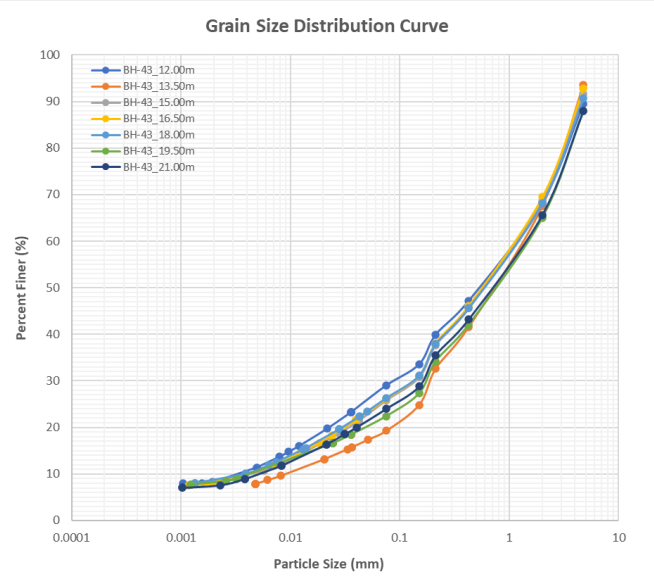
GOMA ENGINEERING AND CONSULTANCY
Quality we put forward

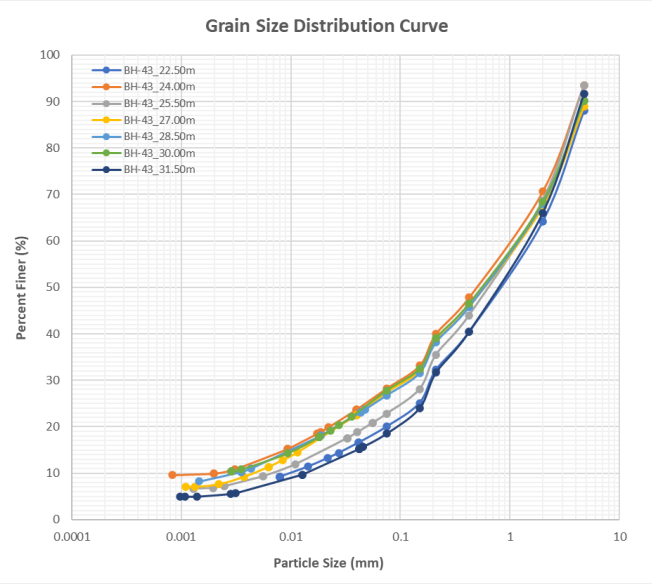
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-43	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	4+833	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	35.00	**Start Date:**	12-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	202.8	**End Date:**	13-01-2026
Project Code:	158_R06_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	14.00	**Location:**	Lat. 28.537904, Long. 77.352401

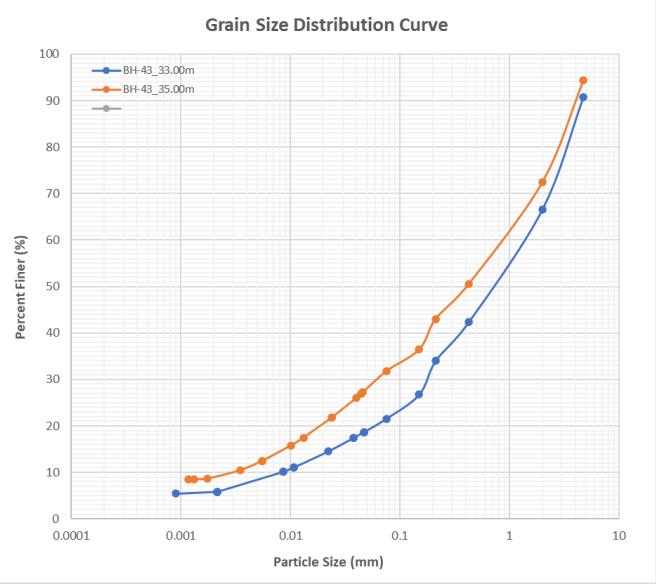
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [^{o}]	Type	Cohesion [kPa]	Angle of Friction [^{o}]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Stiff to Very Stiff, Brownish to Grayish, fine-grained inorganic silt of lowPlasticity with sand and Gravel (ML)	3	5	7	12	17	1.1	22.6	55.5	20.8	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							5.3	26.3	46.9	21.6	24	NP	NP	8.25	1.91	1.76	2.69	F	0.04	24	UU	10	28	-	-	-
3.50	SPT/DS		5	7	12	19	21	-																			
4.50	SPT/DS		7	10	15	25	26	2.7	31.3	48.0	18.0	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	DS	Medium Dense to Dense, Greyish to Grey Brownish, fine-grained silty sand (SM)						10.8	63.3	17.2	8.6	27	NP	NP	12.21	-	-	2.69	F	0.05	25	-	-	-	-	-	-
6.50	SPT/DS		10	12	20	32	30	-																			
7.50	SPT/DS		18	22	26	48	44	5.0	62.5	22.8	9.7	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	DS							6.3	68.7	17.3	7.7	25	NP	NP	15.17	-	-	2.66	F	0.07	27	-	-	-	-	-	-
9.50	SPT/DS	Very Dense, Greyish to Brownish Grey, fine-grained silty sand (SM)	18	25	27	52	44	-																			
10.50	SPT/DS		22	30	37	67	55	11.7	63.3	17.6	7.4	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							4.7	67.9	20.5	6.9	24	NP	NP	13.57	-	-	2.65	F	0.08	29	-	-	-	-	-	-
12.50	SPT/DS		25	31	41	72	54	-																			
13.50	SPT/DS		27	33	47	80	57	9.0	68.0	14.0	8.9	21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS							7.4	63.0	19.3	10.3	29	NP	NP	12.77	-	-	2.63	F	0.01	30	-	-	-	-	-	-
15.50	SPT/DS		35	41	(50/8cm)	100	42	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
16.50	SPT/DS		37	48	(50/6cm)	100	41	7.7	61.5	20.5	10.3	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS							4.2	66.9	19.8	9.0	26	NP	NP	14.18	-	-	2.62	F	0.03	30	-	-	-	-	-	-
18.50	SPT/DS	Very Dense, Grey Brownish, fine-grained silty sand (SM)	40	(50/11cm)	-	100	40	-																			
19.50	SPT/DS		42	(50/9cm)	-	100	39	4.2	57.8	21.6	9.7	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS							11.2	72.0	11.9	4.9	23	NP	NP	13.11	-	-	2.61	F	0.02	32	-	-	-	-	-	-
21.50	SPT/DS		42	(50/8cm)	-	100	38	-																			
22.50	SPT/DS		39	(50/9cm)	-	100	38	10.7	70.5	12.7	6.1	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							10.9	68.9	13.6	6.6	28	NP	NP	10.77	-	-	2.70	F	0.03	33	-	-	-	-	-	-
24.50	SPT/DS		38	(50/7cm)	-	100	37	-																			
25.50	SPT/DS		41	(50/6cm)	-	100	36	8.9	70.3	14.2	6.6	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							8.4	68.2	15.8	7.5	24	NP	NP	12.31	-	-	2.60	F	0.04	35	-	-	-	-	-	-
27.50	SPT/DS	Very Dense, Greyish, fine-grained silty sand (SM)	(50/12cm)	-	-	100	36	-																			
28.50	SPT/DS		(50/11cm)	-	-	100	35	11.8	64.5	15.2	8.4	21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							5.3	70.8	14.6	9.3	25	NP	NP	11.57	-	-	2.65	F	0.01	37	-	-	-	-	-	-
30.50	SPT/DS		(50/12cm)	-	-	100	34	-																			
31.50	SPT/DS		(50/10cm)	-	-	100	33	5.8	66.1	20.6	7.5	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
33.00	DS							12.8	65.0	15.9	6.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33.50	SPT/DS		(50/8cm)	-	-	100	32	-																			
35.00	SPT/DS		(50/7cm)	-	-	100	30	7.8	64.7	18.5	9.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

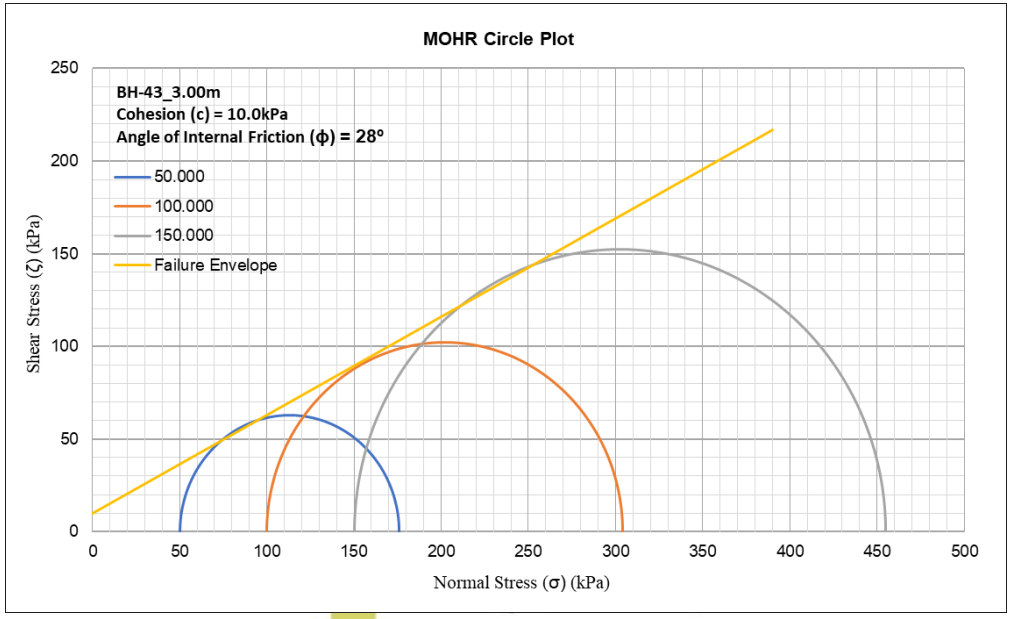
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

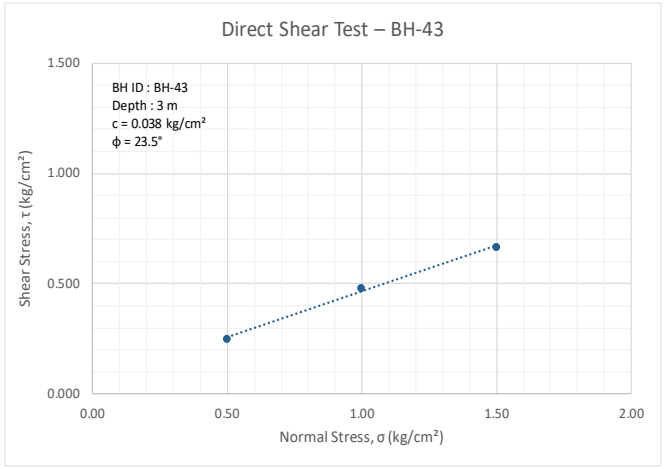

Grain Size Distribution Curve
BH-43_0.00m
BH-43_1.50m
BH-43_4.50m
BH-43_6.00m
BH-43_7.50m
BH-43_9.00m
BH-43_10.50m
Percent Finer (%)
Particle Size (mm)

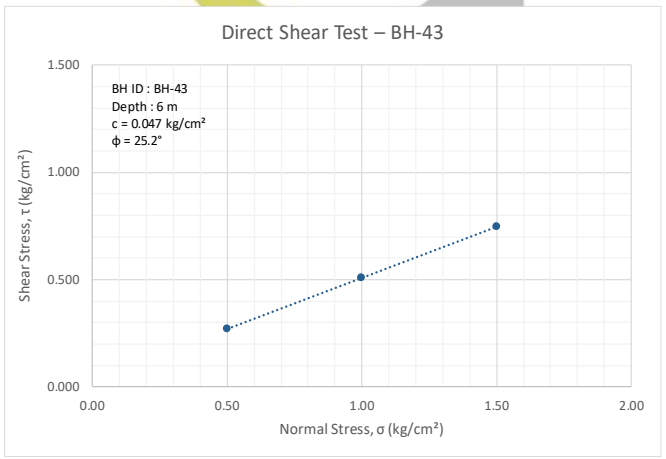

Grain Size Distribution Curve
BH-43_12.00m
BH-43_13.50m
BH-43_15.00m
BH-43_16.50m
BH-43_18.00m
BH-43_19.50m
BH-43_21.00m
Percent Finer (%)
Particle Size (mm)

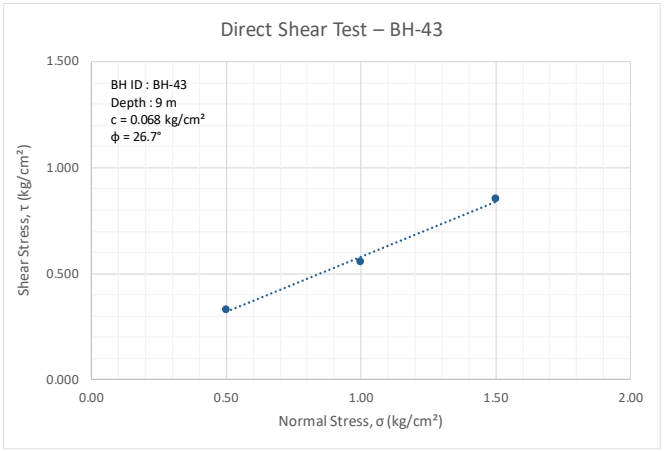

Grain Size Distribution Curve
BH-43_22.50m
BH-43_24.00m
BH-43_25.50m
BH-43_27.00m
BH-43_28.50m
BH-43_30.00m
BH-43_31.50m
Percent Finer (%)
Particle Size (mm)

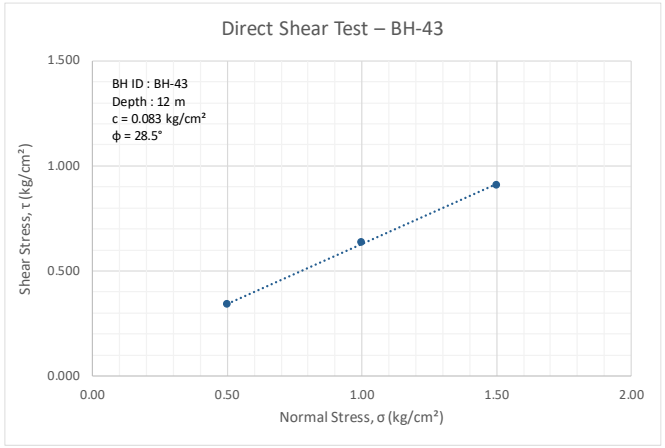

Grain Size Distribution Curve
BH-43_33.00m
BH-43_35.00m
Percent Finer (%)
Particle Size (mm)

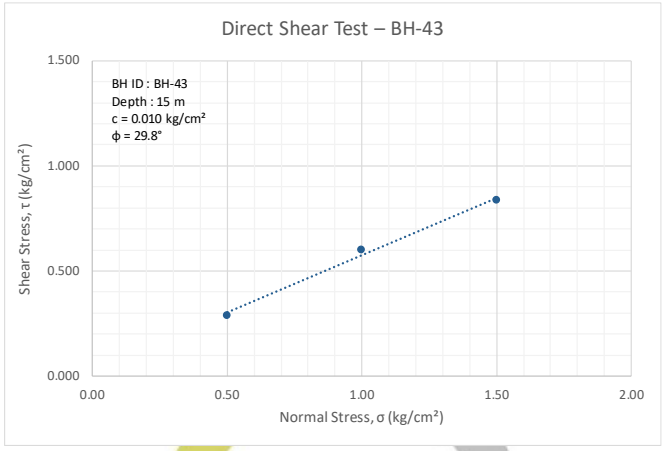

MOHR Circle Plot
BH-43_3.00m
Cohesion (c) = 10.0kPa
Angle of Internal Friction (ϕ) = 28°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)
0
50
100
150
200
250
300
350
400
450
500

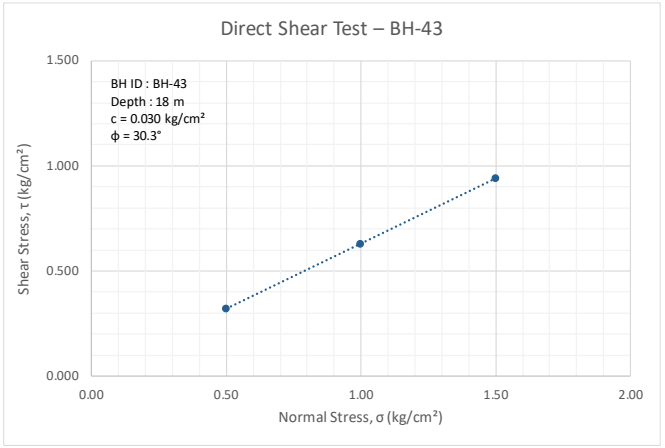

Direct Shear Test – BH-43
BH ID : BH-43
Depth : 3 m
c = 0.038 kg/cm²
ϕ = 23.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

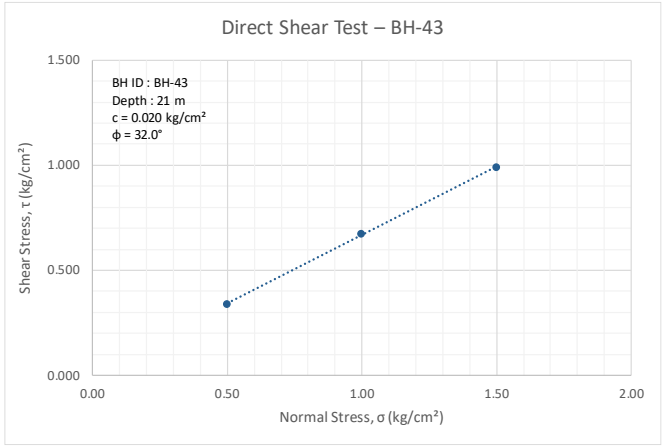

Direct Shear Test – BH-43
BH ID : BH-43
Depth : 6 m
c = 0.047 kg/cm²
ϕ = 25.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

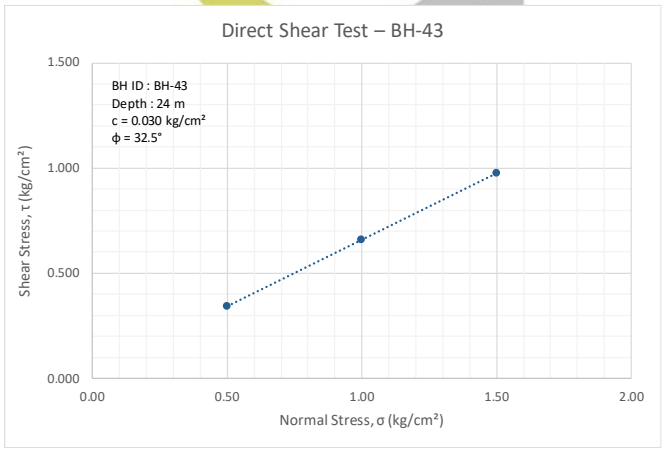

Direct Shear Test – BH-43
BH ID : BH-43
Depth : 9 m
c = 0.068 kg/cm²
ϕ = 26.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

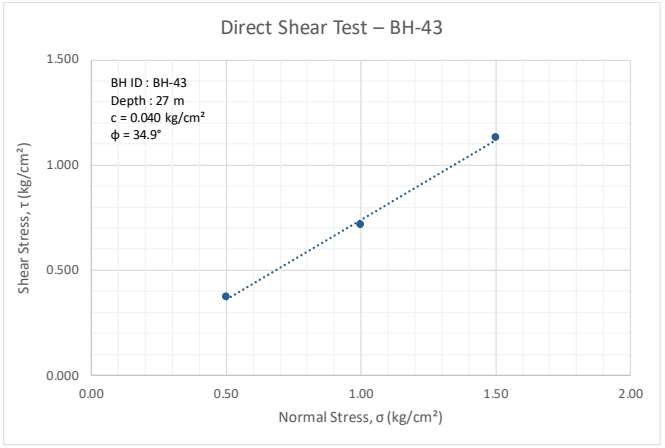

Direct Shear Test – BH-43
BH ID : BH-43
Depth : 12 m
c = 0.083 kg/cm²
ϕ = 28.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

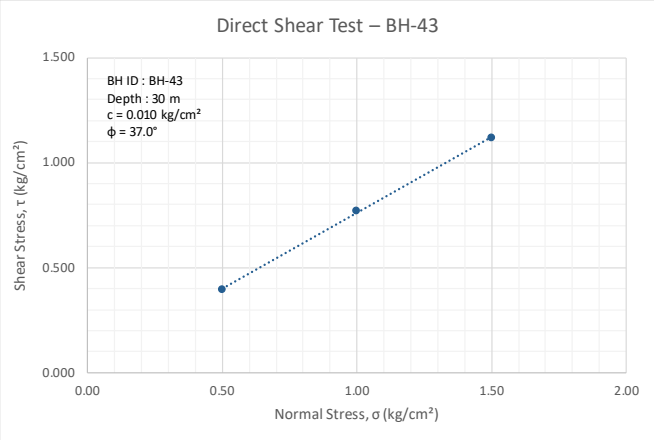

Direct Shear Test – BH-43
BH ID : BH-43
Depth : 15 m
c = 0.010 kg/cm²
ϕ = 29.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-43
BH ID : BH-43
Depth : 18 m
c = 0.030 kg/cm²
ϕ = 30.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-43
BH ID : BH-43
Depth : 21 m
c = 0.020 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-43
BH ID : BH-43
Depth : 24 m
c = 0.030 kg/cm²
ϕ = 32.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-43
BH ID : BH-43
Depth : 27 m
c = 0.040 kg/cm²
ϕ = 34.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

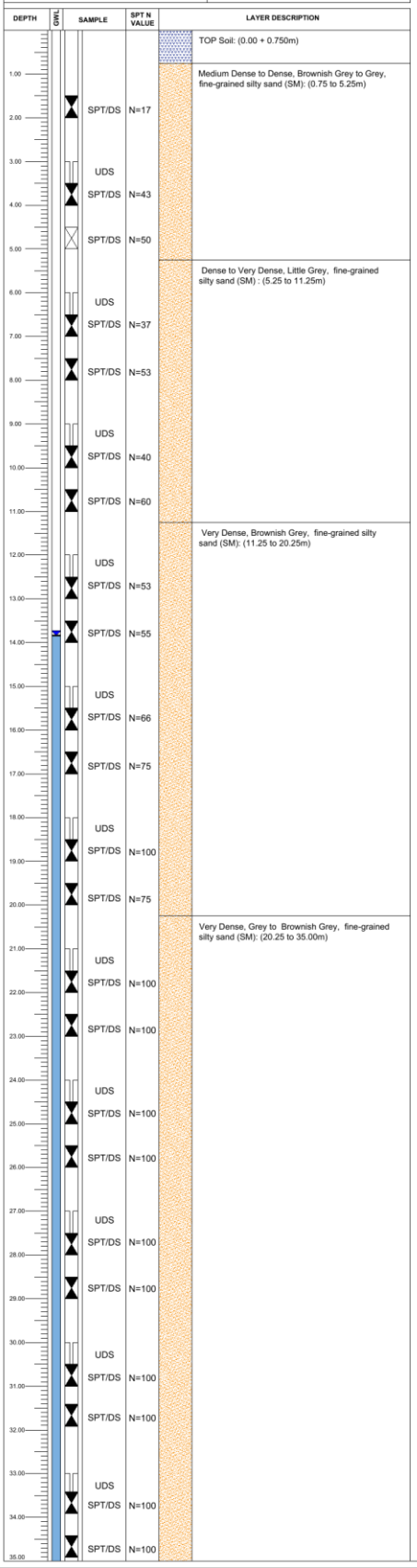

Direct Shear Test – BH-43
BH ID : BH-43
Depth : 30 m
c = 0.010 kg/cm²
ϕ = 37.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Noida Sector-142 to Botanical Garden (4+000 km TO 5+000 km)

BH ID : BH-44 | **Chainage** : 4+910 KM

Groundwater Level : 13.85 M | **Location** : Lat. 28.537169, Long. 77.352776



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

Soil

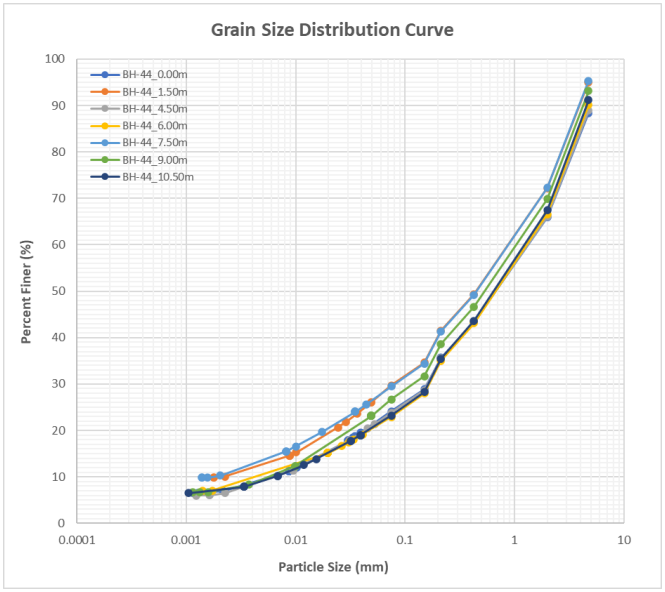
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

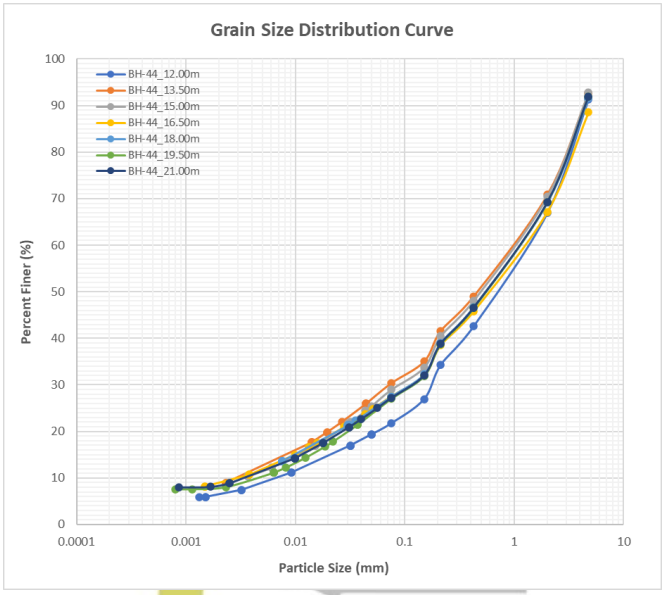
GOMA ENGINEERING AND CONSULTANCY
Quality we put forward

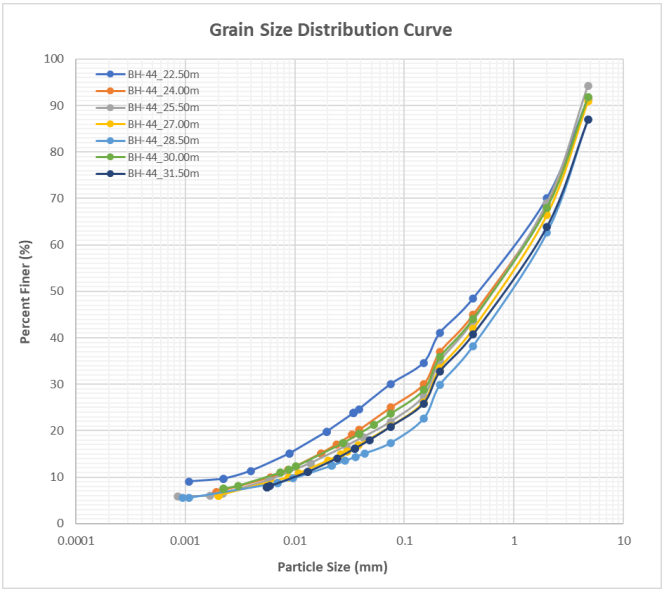
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-44	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	4+910	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	35.00	**Start Date:**	10-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	200.8	**End Date:**	11-01-2026
Project Code:	158_R06_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	13.85	**Location:**	Lat. 28.537169, Long. 77.352776

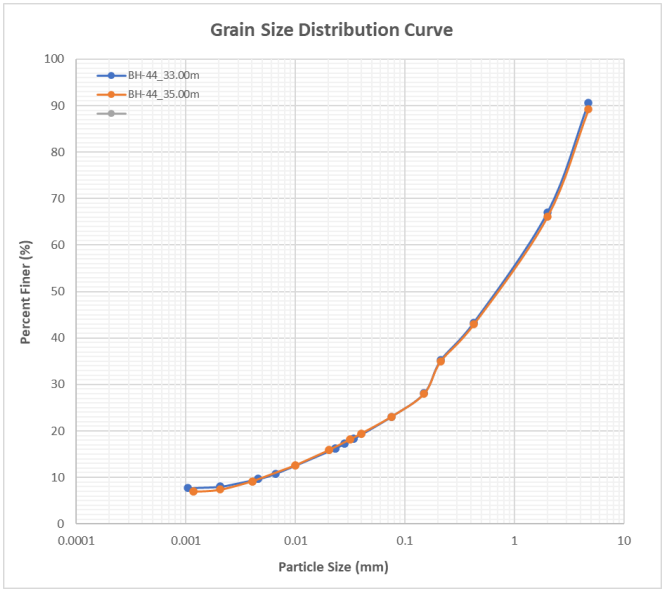
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [^{o}]	Type	Cohesion [kPa]	Angle of Friction [^{o}]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						5.4	74.8	13.2	6.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Medium Dense to Dense, Brownish Grey to Grey, fine-grained silty sand (SM)	6	8	9	17	24	11.7	60.2	17.3	10.9	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							11.4	69.9	12.5	6.2	22	NP	NP	11.56	1.86	1.67	2.60	F	0.05	24.00	UU	12	27	-	-	-
3.50	SPT/DS		12	18	25	43	47	-																			
4.50	SPT/DS		15	20	30	50	51	10.4	67.2	13.8	8.6	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	DS	Dense to Very Dense, Little Grey, fine-grained silty sand (SM)						5.4	62.5	21.4	10.7	21	NP	NP	13.11	-	-	2.70	F	0.08	28	-	-	-	-	-	-
6.50	SPT/DS		15	17	20	37	35	-																			
7.50	SPT/DS		15	20	33	53	48	6.8	63.6	19.0	10.5	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	DS							4.1	62.8	22.3	10.7	24	NP	NP	9.85	-	-	2.62	F	0.10	29	-	-	-	-	-	-
9.50	SPT/DS		12	15	25	40	34	-																			
10.50	SPT/DS		21	24	36	60	49	7.7	70.2	14.4	7.8	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	DS	Very Dense, Brownish Grey, fine-grained silty sand (SM)						6.8	74.4	13.2	5.6	29	NP	NP	16.18	-	-	2.68	F	0.02	30	-	-	-	-	-	-
12.50	SPT/DS		18	22	31	53	40	-																			
13.50	SPT/DS		15	20	35	55	39	9.9	60.3	23.9	5.9	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS							6.2	66.4	18.9	8.6	26	NP	NP	11.66	-	-	2.66	F	0.00	31	-	-	-	-	-	-
15.50	SPT/DS		18	25	41	66	30	-																			
16.50	SPT/DS		20	32	43	75	33	6.7	65.9	18.7	8.8	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS							7.9	63.2	19.5	9.5	27	NP	NP	13.28	-	-	2.65	F	0.04	31	-	-	-	-	-	-
18.50	SPT/DS		25	33	(50/12cm)	100	40	-																			
19.50	SPT/DS		26	30	45	75	31	10.4	66.1	15.1	8.4	21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS	Very Dense, Grey to Brownish Grey, fine-grained silty sand (SM)						5.1	66.1	19.2	9.6	29	NP	NP	12.82	-	-	2.64	F	0.01	32	-	-	-	-	-	-
21.50	SPT/DS		20	35	(50/11cm)	100	38	-																			
22.50	SPT/DS		30	42	(50/9cm)	100	38	11.8	59.8	19.5	8.8	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							11.8	58.8	19.4	10.0	26	NP	NP	14.09	-	-	2.69	F	0.05	32	-	-	-	-	-	-
24.50	SPT/DS		36	39	(50/8cm)	100	37	-																			
25.50	SPT/DS		37	(50/11cm)	-	100	37	8.0	70.4	14.8	6.8	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							9.3	69.8	13.9	7.0	29	NP	NP	14.17	-	-	2.65	F	0.01	34	-	-	-	-	-	-
27.50	SPT/DS		32	(50/10cm)	-	100	36	-																			
28.50	SPT/DS		35	(50/8cm)	-	100	35	5.6	74.3	13.9	6.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							5.7	72.2	13.3	5.8	25	NP	NP	13.98	-	-	2.66	F	0.03	33	-	-	-	-	-	-
30.50	SPT/DS		(50/13cm)	-	-	100	34	-																			
31.50	SPT/DS		(50/11cm)	-	-	100	33	10.6	66.7	16.2	6.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33.00	DS							6.4	61.6	23.4	8.6	27	NP	NP	12.51	-	-	2.68	-	-	-	-	-	-	-	-	-
33.50	SPT/DS		(50/8cm)	-	-	100	32	-																			
35.00	SPT/DS		(50/9cm)	-	-	100	31	6.0	74.0	14.1	5.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

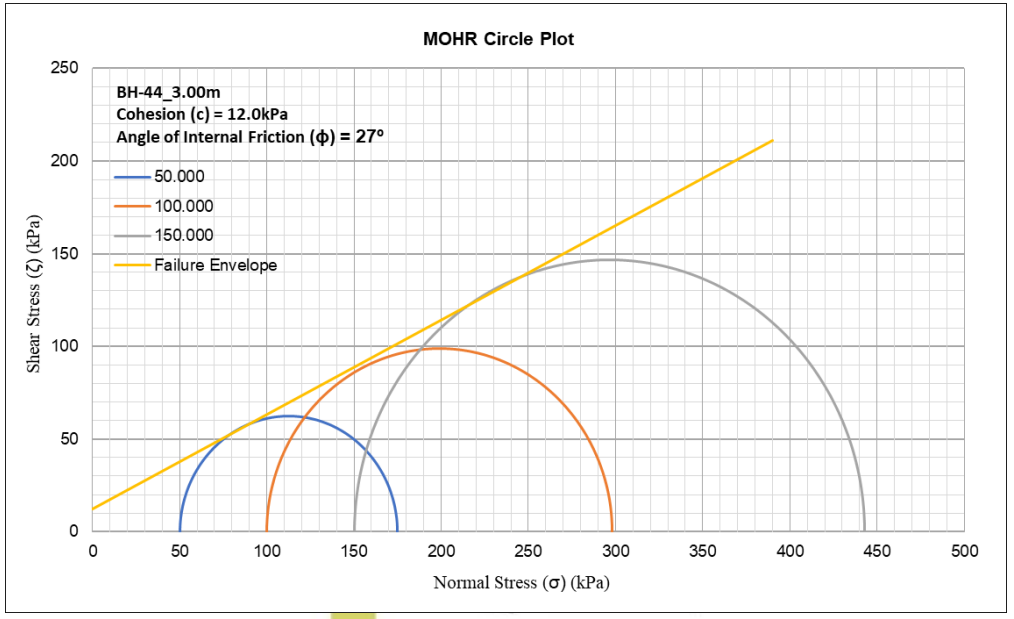
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

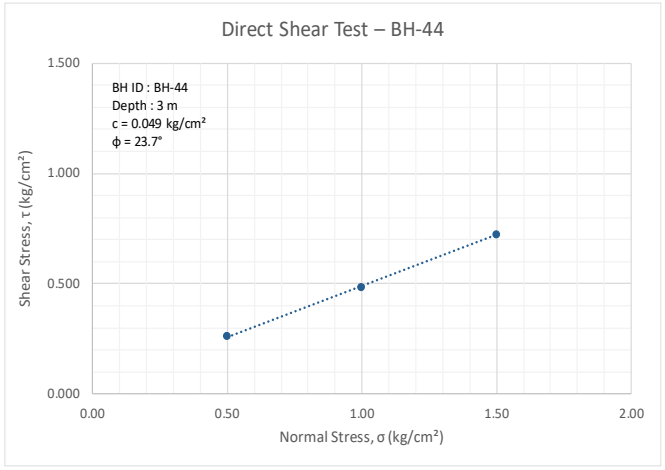

Grain Size Distribution Curve
Percent Finer (%)
Particle Size (mm)
BH-44_0.00m
BH-44_1.50m
BH-44_4.50m
BH-44_6.00m
BH-44_7.50m
BH-44_9.00m
BH-44_10.50m

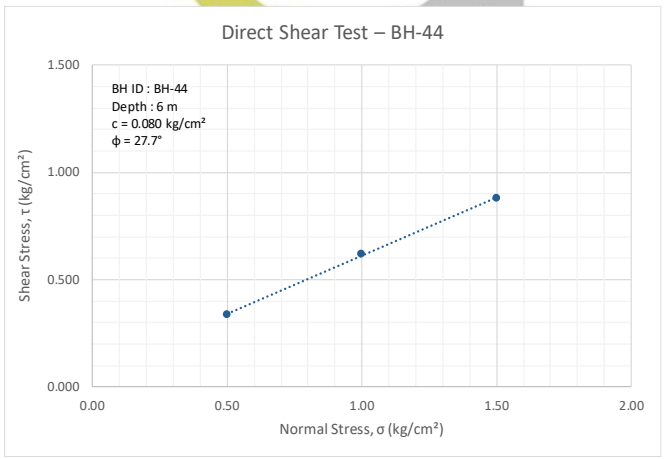

Grain Size Distribution Curve
Percent Finer (%)
Particle Size (mm)
BH-44_12.00m
BH-44_13.50m
BH-44_15.00m
BH-44_16.50m
BH-44_18.00m
BH-44_19.50m
BH-44_21.00m

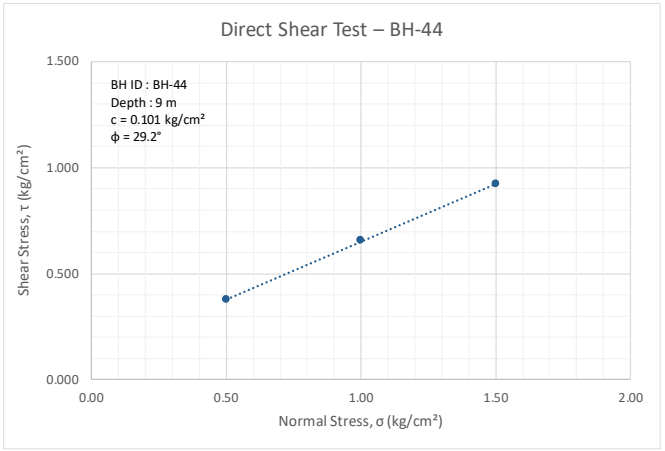

Grain Size Distribution Curve
Percent Finer (%)
Particle Size (mm)
BH-44_22.50m
BH-44_24.00m
BH-44_25.50m
BH-44_27.00m
BH-44_28.50m
BH-44_30.00m
BH-44_31.50m

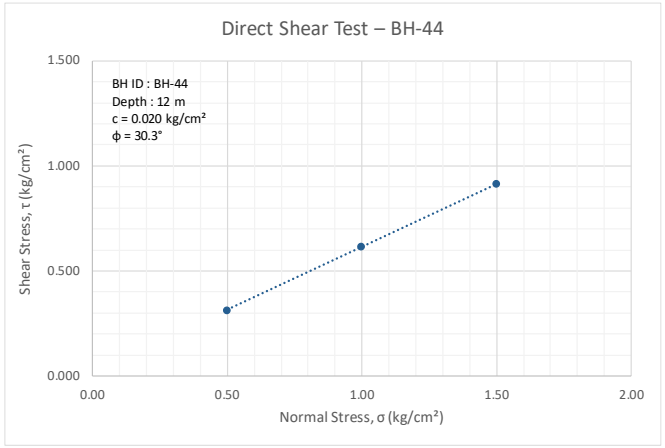

Grain Size Distribution Curve
Percent Finer (%)
Particle Size (mm)
BH-44_33.00m
BH-44_35.00m

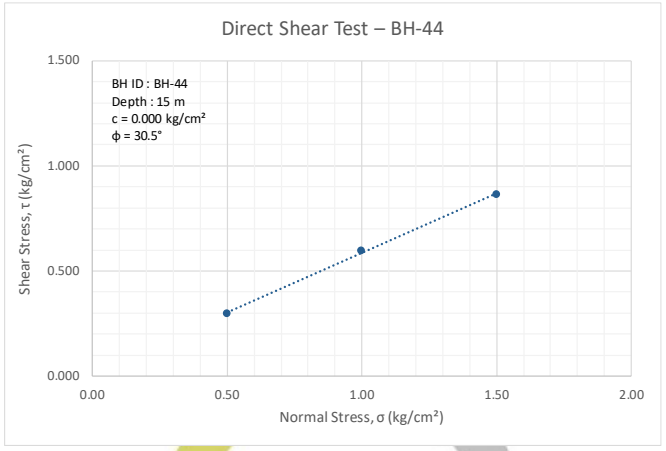

MOHR Circle Plot
BH-44_3.00m
Cohesion (c) = 12.0kPa
Angle of Internal Friction (ϕ) = 27°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)
0
50
100
150
200
250
300
350
400
450
500

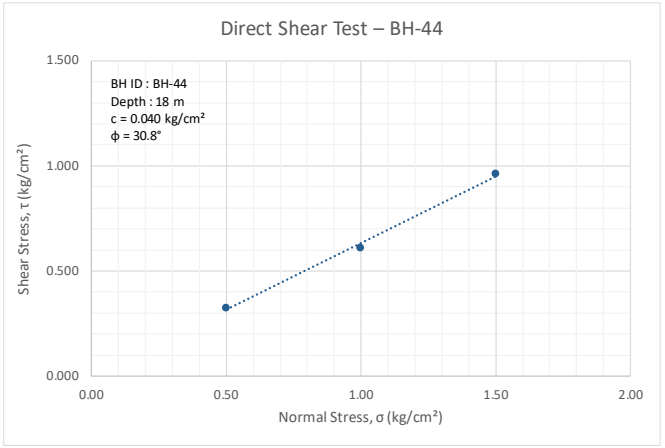

Direct Shear Test – BH-44
BH ID : BH-44
Depth : 3 m
c = 0.049 kg/cm²
ϕ = 23.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

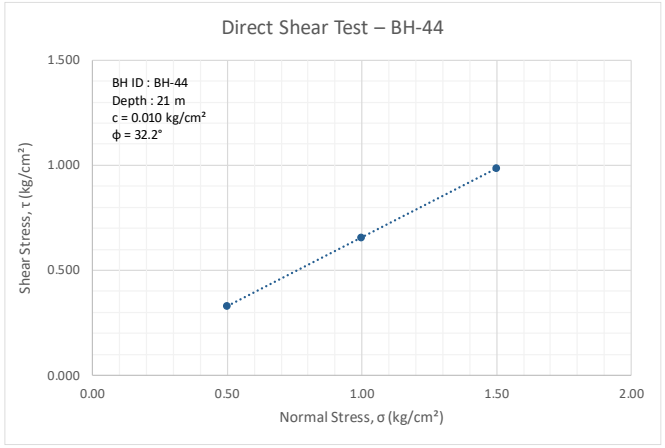

Direct Shear Test – BH-44
BH ID : BH-44
Depth : 6 m
c = 0.080 kg/cm²
ϕ = 27.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

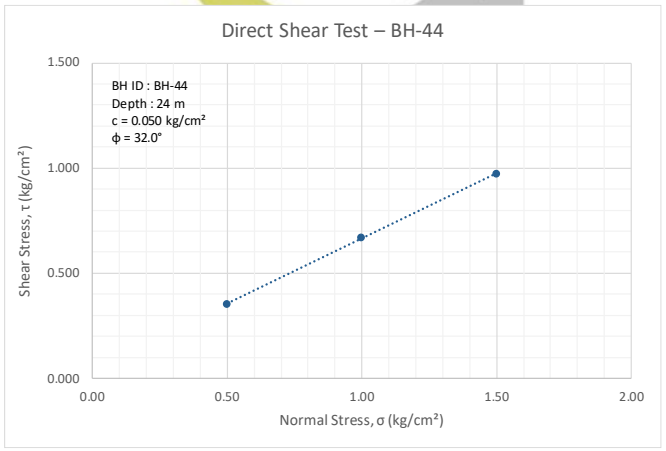

Direct Shear Test – BH-44
BH ID : BH-44
Depth : 9 m
c = 0.101 kg/cm²
ϕ = 29.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

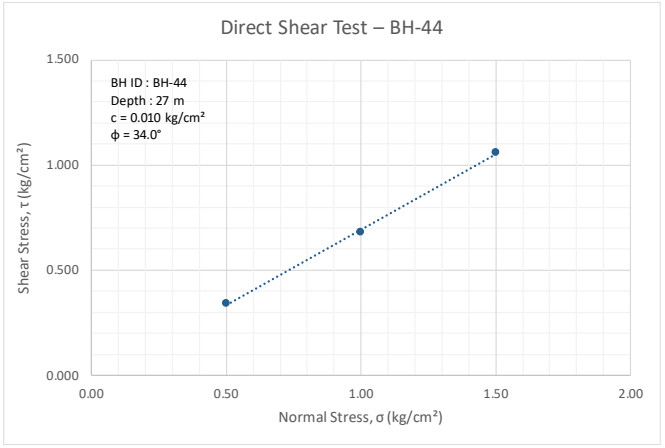

Direct Shear Test – BH-44
BH ID : BH-44
Depth : 12 m
c = 0.020 kg/cm²
ϕ = 30.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

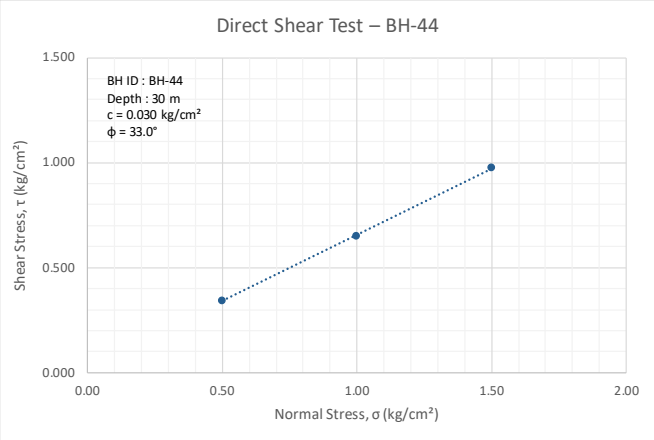

Direct Shear Test – BH-44
BH ID : BH-44
Depth : 15 m
c = 0.000 kg/cm²
ϕ = 30.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-44
BH ID : BH-44
Depth : 18 m
c = 0.040 kg/cm²
ϕ = 30.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-44
BH ID : BH-44
Depth : 21 m
c = 0.010 kg/cm²
ϕ = 32.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-44
BH ID : BH-44
Depth : 24 m
c = 0.050 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-44
BH ID : BH-44
Depth : 27 m
c = 0.010 kg/cm²
ϕ = 34.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

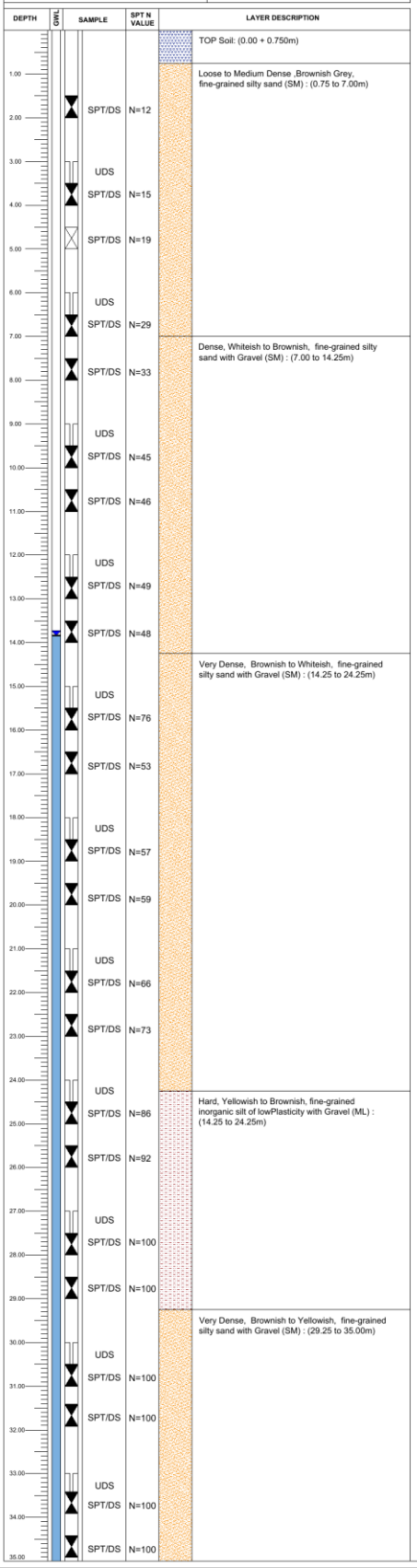

Direct Shear Test – BH-44
BH ID : BH-44
Depth : 30 m
c = 0.030 kg/cm²
ϕ = 33.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Noida Sector-142 to Botanical Garden (4+000 km TO 5+000 km)

BH ID : BH-45 | **Chainage** : 5+030 KM

Groundwater Level : 13.85 M | **Location** : Lat. 28.53612, Long. 77.353412



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

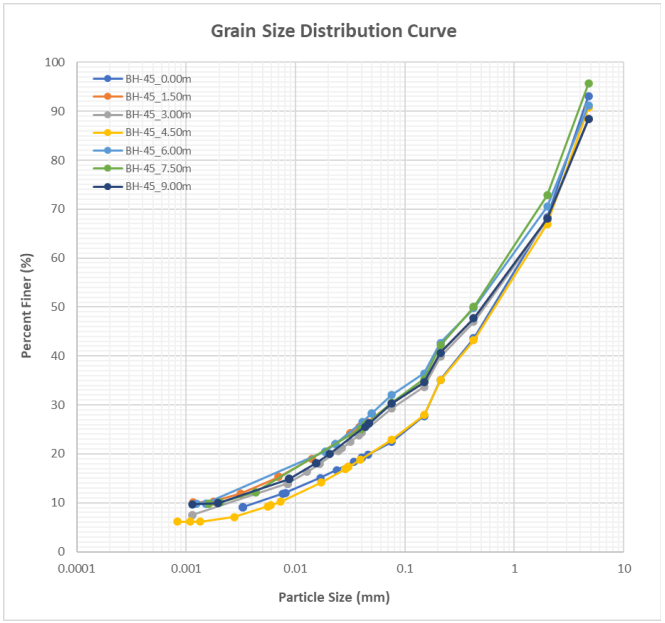
Soil

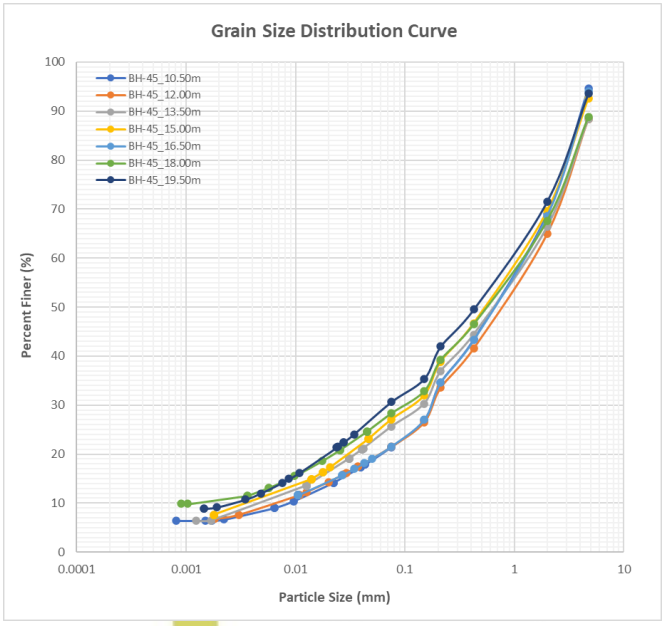
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

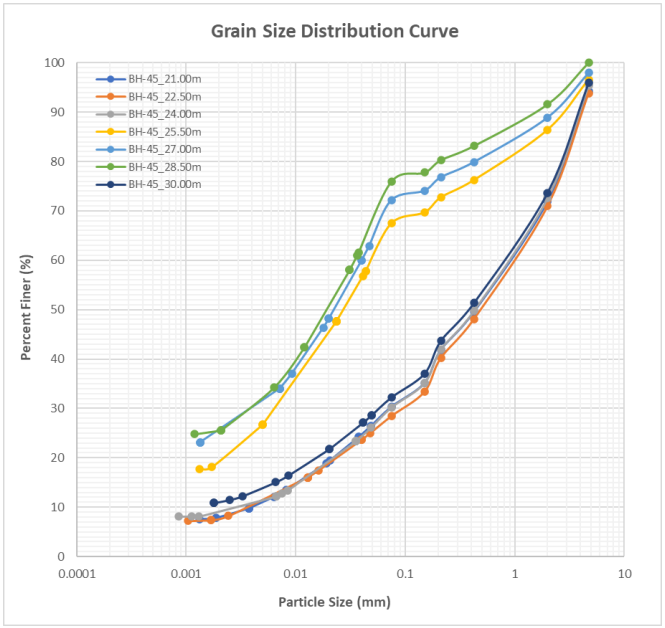
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-45	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	5+030	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	35.00	**Start Date:**	14-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	201.3	**End Date:**	15-01-2026
Project Code:	158_R06_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	13.10	**Location:**	Lat. 28.53612, Long. 77.353412

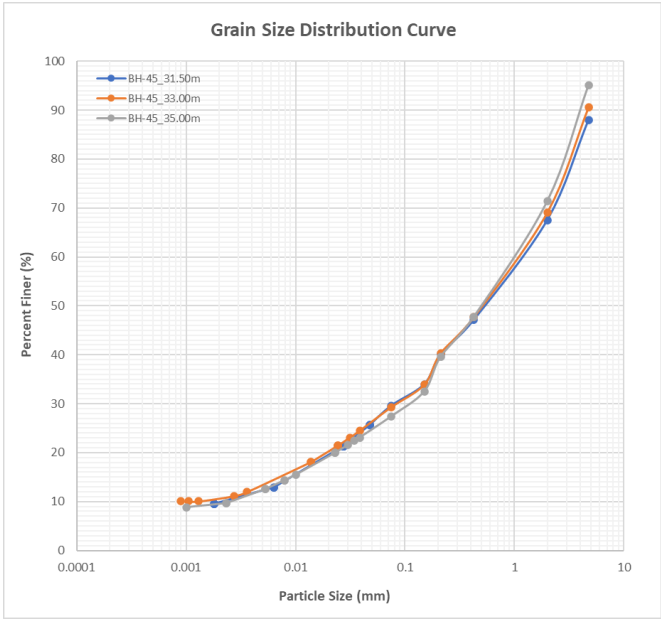
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [^{o}]	Type	Cohesion [kPa]	Angle of Friction [^{o}]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						6.9	70.7	13.6	8.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Loose to Medium Dense ,Brownish Grey, fine-grained silty sand (SM)	4	6	6	12	17	11.6	58.1	19.6	10.6	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							11.54	59.2	19.9	9.3	21	NP	NP	7.78	1.9	1.76	2.62	F	0.04	23.00	UU	11	23	-	-	-
3.50	SPT/DS		5	7	8	15	16	-																			
4.50	SPT/DS		7	9	10	19	19	9.3	67.8	16.2	6.7	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							8.80	59.2	20.9	11.1	28	NP	NP	8.72	1.92	1.77	2.62	F	0.06	26.00	UU	15	24	-	-	-
6.50	SPT/DS		11	13	16	29	27	-																			
7.50	SPT/DS	Dense, Whiteish to Brownish, fine-grained silty sand with Gravel (SM)	12	15	18	33	30	4.4	65.2	20.4	10.1	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS							11.6	58.1	20.2	10.0	26	NP	NP	13.26	1.98	1.75	2.69	F	0.08	28	-	-	-	-	-	-
9.50	SPT/DS		15	16	29	45	38	-																			
10.50	SPT/DS		19	21	25	46	38	5.4	73.2	14.9	6.6	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	DS							11.6	66.9	14.5	7.0	29	NP	NP	15.11	-	-	2.62	F	0.09	29	-	-	-	-	-	-
12.50	SPT/DS		18	24	25	49	37	-																			
13.50	SPT/DS		16	22	26	48	34	11.6	62.8	18.5	7.1	21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS	Very Dense, Brownish to Whiteish, fine-grained silty sand with Gravel (SM)						7.4	65.6	19.0	8.0	22	NP	NP	14.03	-	-	2.61	F	0.11	30	-	-	-	-	-	-
15.50	SPT/DS		9	24	52	76	33	-																			
16.50	SPT/DS		14	23	30	53	25	6.0	72.4	14.1	7.5	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS							11.2	60.5	17.6	10.7	24	NP	NP	17.22	2.09	1.78	2.68	F	0.02	29	-	-	-	-	-	-
18.50	SPT/DS		17	24	33	57	26	-																			
19.50	SPT/DS		20	25	34	59	26	6.5	62.9	21.3	9.3	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS							5.7	63.9	22.3	8.0	23	NP	NP	13.62	-	-	2.65	F	0.00	30	-	-	-	-	-	-
21.50	SPT/DS		24	30	36	66	28	-																			
22.50	SPT/DS		28	34	39	73	30	6.2	65.4	20.7	7.8	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							4.7	65.1	21.0	9.2	21	NP	NP	12.88	-	-	2.65	F	0.03	31	-	-	-	-	-	-
24.50	SPT/DS	Hard, Yellowish to Brownish, fine-grained inorganic silt of lowPlasticity with Gravel (ML)	34	40	46	86	33	-																			
25.50	SPT/DS		32	42	50	92	34	3.4	29.1	48.1	19.4	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							2.1	25.8	46.5	25.7	26	NP	NP	14.72	-	-	2.64	F	0.12	29	-	-	-	-	-	-
27.50	SPT/DS		36	42	(50/4cm)	100	36	-																			
28.50	SPT/DS		40	(50/13cm)	-	100	35	0.0	24.0	50.5	25.5	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS	Very Dense, Brownish to Yellowish, fine-grained silty sand with Gravel (SM)						4.0	63.7	21.2	11.0	29	NP	NP	13.88	-	-	2.68	F	0.02	33	-	-	-	-	-	-
30.50	SPT/DS		32	(50/5cm)	-	100	34	-																			
31.50	SPT/DS		40	(50/8cm)	-	100	33	12.0	58.4	19.8	9.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33.00	DS							9.5	61.2	18.7	10.7	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
33.50	SPT/DS		47	(50/9cm)	-	100	32	4.8	67.7	17.9	9.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
35.00	SPT/DS		(50/7cm)	-	-	100	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

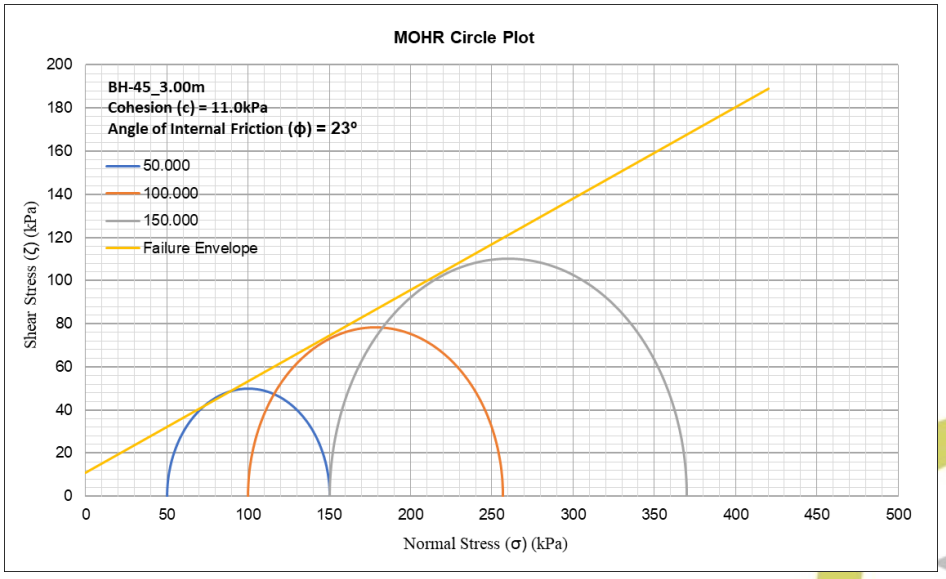
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

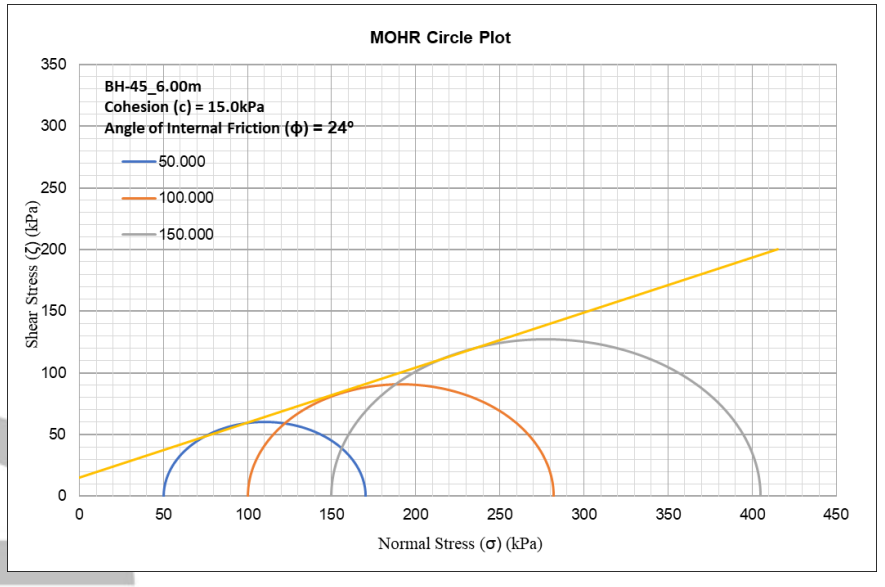

Grain Size Distribution Curve
BH-45_0.00m
BH-45_1.50m
BH-45_3.00m
BH-45_4.50m
BH-45_6.00m
BH-45_7.50m
BH-45_9.00m
Percent Finer (%)
Particle Size (mm)

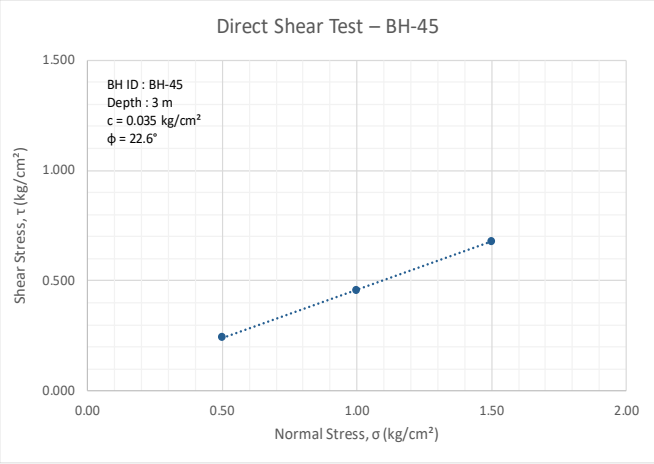

Grain Size Distribution Curve
BH-45_10.50m
BH-45_12.00m
BH-45_13.50m
BH-45_15.00m
BH-45_16.50m
BH-45_18.00m
BH-45_19.50m
Percent Finer (%)
Particle Size (mm)

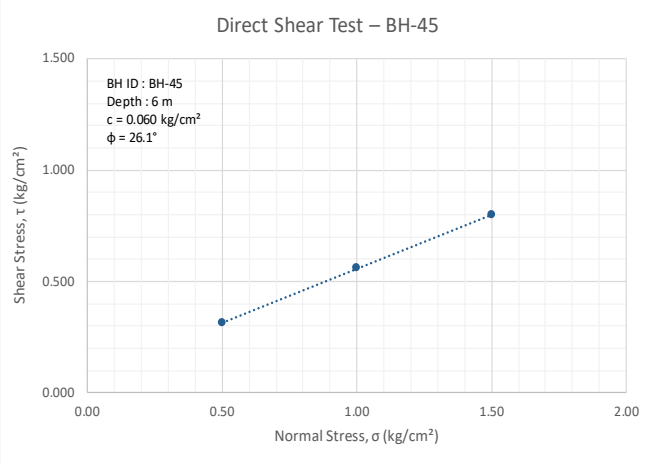

Grain Size Distribution Curve
BH-45_21.00m
BH-45_22.50m
BH-45_24.00m
BH-45_25.50m
BH-45_27.00m
BH-45_28.50m
BH-45_30.00m
Percent Finer (%)
Particle Size (mm)

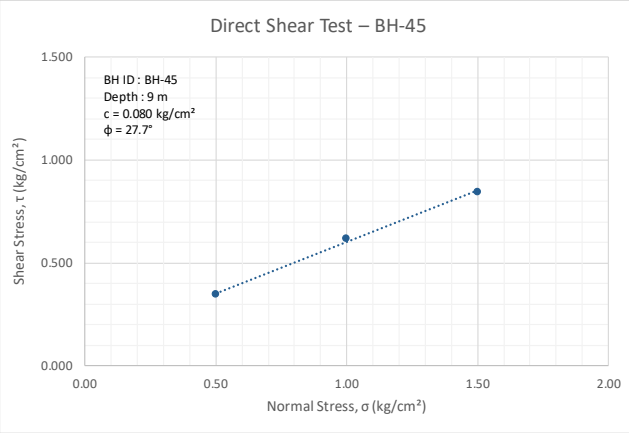

Grain Size Distribution Curve
BH-45_31.50m
BH-45_33.00m
BH-45_35.00m
Percent Finer (%)
Particle Size (mm)

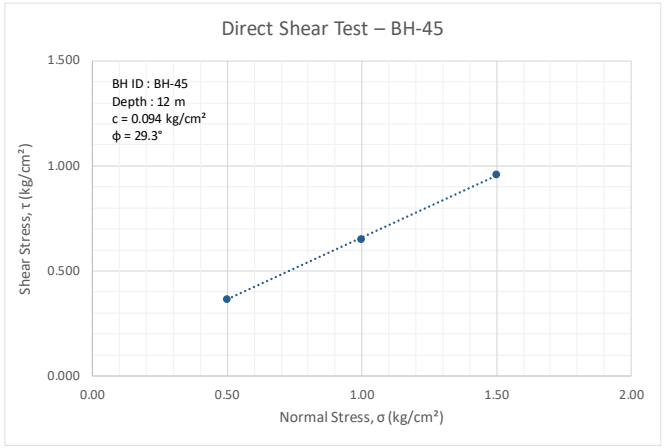

MOHR Circle Plot
BH-45_3.00m
Cohesion (c) = 11.0kPa
Angle of Internal Friction (ϕ) = 23°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

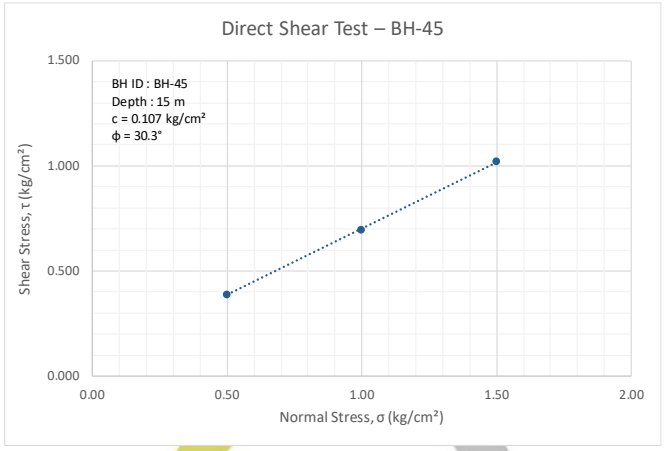

MOHR Circle Plot
BH-45_6.00m
Cohesion (c) = 15.0kPa
Angle of Internal Friction (ϕ) = 24°
50.000
100.000
150.000
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

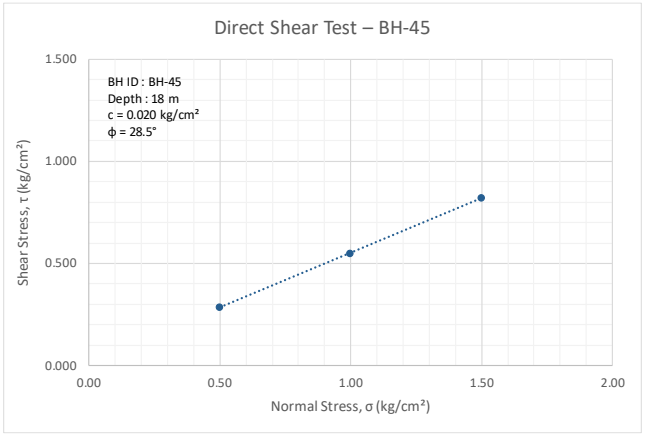

Direct Shear Test – BH-45
BH ID : BH-45
Depth : 3 m
c = 0.035 kg/cm²
ϕ = 22.6°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

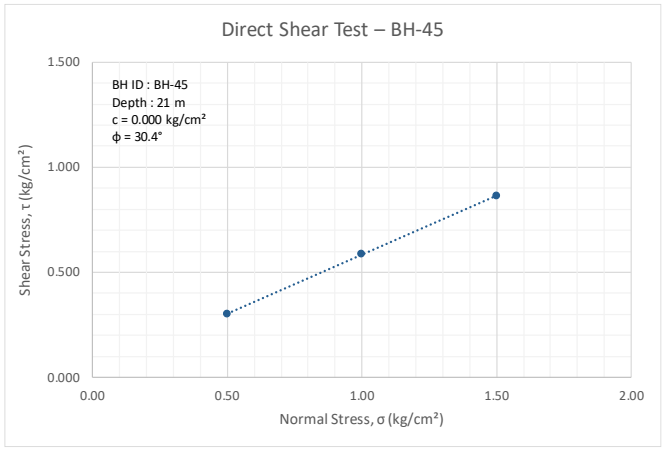

Direct Shear Test – BH-45
BH ID : BH-45
Depth : 6 m
c = 0.060 kg/cm²
ϕ = 26.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

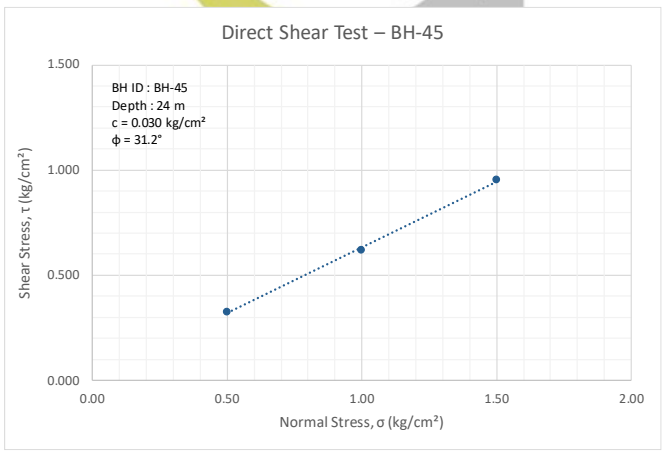

Direct Shear Test – BH-45
BH ID : BH-45
Depth : 9 m
c = 0.080 kg/cm²
ϕ = 27.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

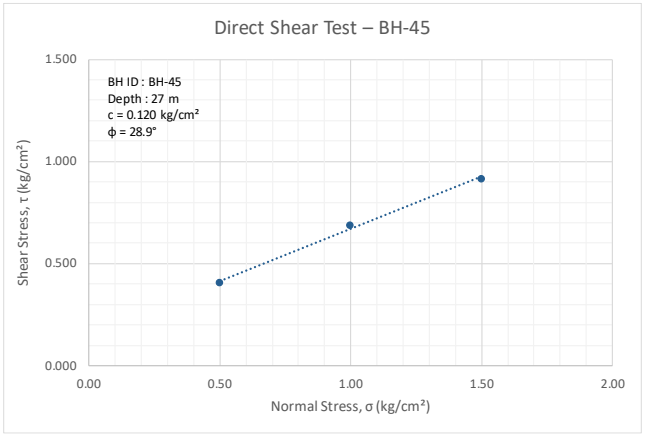

Direct Shear Test – BH-45
BH ID : BH-45
Depth : 12 m
c = 0.094 kg/cm²
ϕ = 29.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

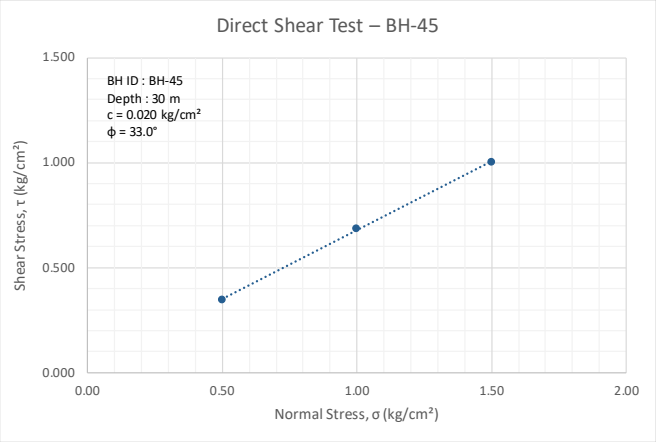

Direct Shear Test – BH-45
BH ID : BH-45
Depth : 15 m
c = 0.107 kg/cm²
ϕ = 30.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-45
BH ID : BH-45
Depth : 18 m
c = 0.020 kg/cm²
ϕ = 28.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-45
BH ID : BH-45
Depth : 21 m
c = 0.000 kg/cm²
ϕ = 30.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-45
BH ID : BH-45
Depth : 24 m
c = 0.030 kg/cm²
ϕ = 31.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-45
BH ID : BH-45
Depth : 27 m
c = 0.120 kg/cm²
ϕ = 28.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

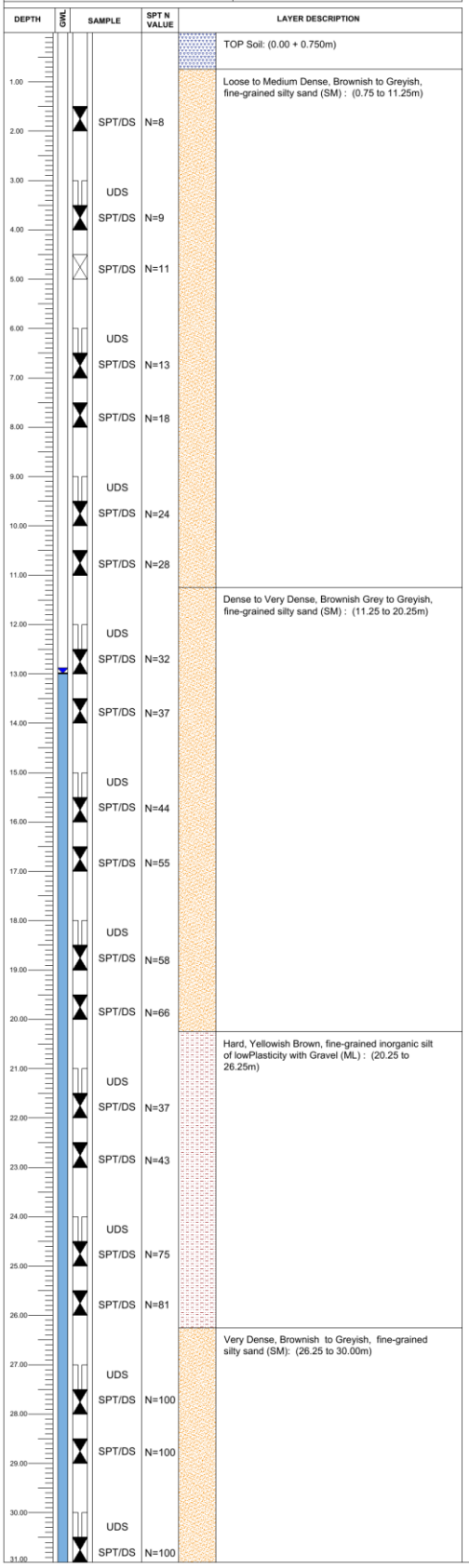

Direct Shear Test – BH-45
BH ID : BH-45
Depth : 30 m
c = 0.020 kg/cm²
ϕ = 33.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Noida Sector-142 to Botanical Garden (4+000 km TO 5+000 km)

BH ID : BH-45A | **Chainage** : 5+080 KM

Groundwater Level : 13.00 M | **Location** : Lat. 28.53612, Long. 77.353887



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

Soil

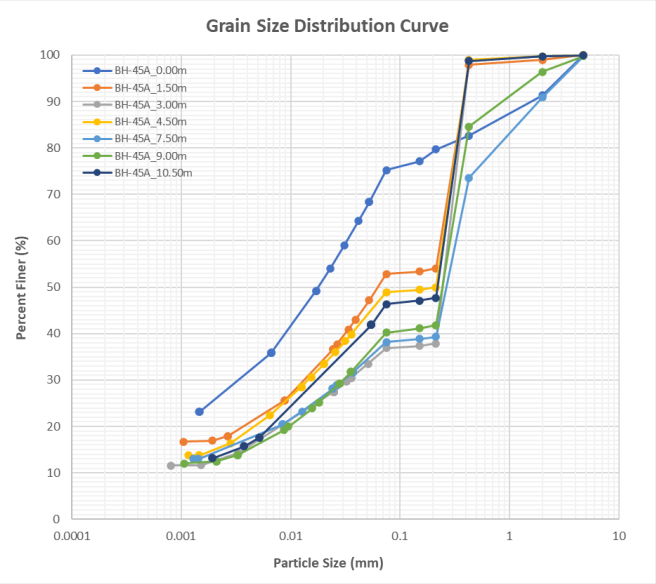
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

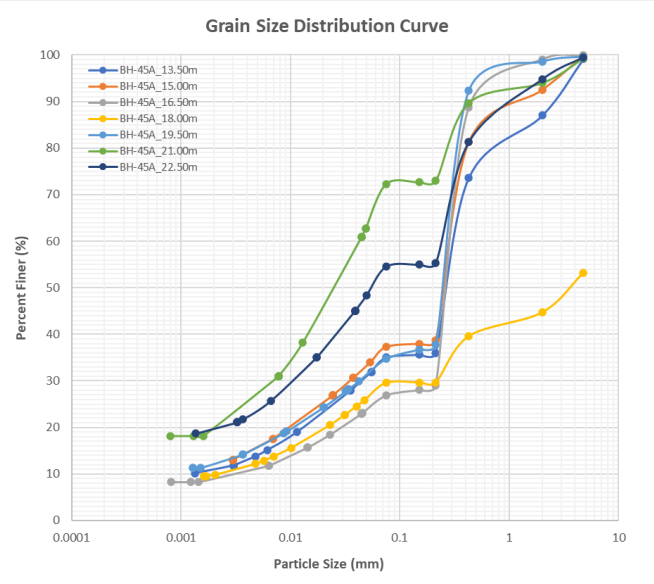
GOMA ENGINEERING AND CONSULTANCY
Quality we put forward

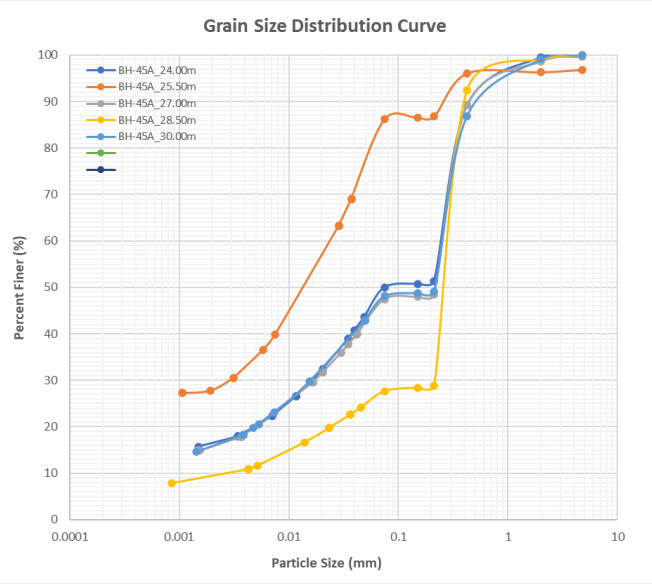
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-45A	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	5+080	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	30.00	**Start Date:**	30-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	203	**End Date:**	30-01-2026
Project Code:	158_R06_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	13.00	**Location:**	Lat. 28.535918 Long. 77.353887

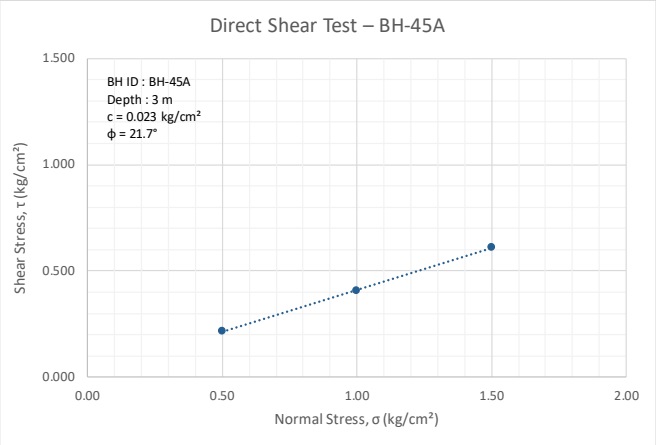
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						0.0	24.8	49.5	25.7	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Loose to Medium Dense, Brownish to Greyish, fine-grained silty sand (SM)	3	4	4	8	11	0.0	47.1	35.8	17.1	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							0.0	63.1	24.4	12.6	24	NP	NP	5.89	1.69	1.60	2.64	F	0.02	22	-	-	-	-	-	-
3.50	SPT/DS		3	4	5	9	10	-																			
4.50	SPT/DS		4	5	6	11	11	0.1	51.0	33.9	15.0	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							-	-	-	-	-	-	-	-	-	-	-	F	0.04	25	-	-	-	-	-	-
6.50	SPT/DS		5	6	7	13	12	-																			
7.50	SPT/DS		7	8	10	18	16	0.2	61.6	23.8	14.4	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	DS							0.2	59.5	27.8	12.4	27	NP	NP	14.82	-	-	2.64	F	0.04	25	-	-	-	-	-	-
9.50	SPT/DS		9	11	13	24	20	-																			
10.50	SPT/DS		10	13	15	28	23	0.0	53.7	33.0	13.3	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS	Dense to Very Dense, Brownish Grey to Greyish, fine-grained silty sand (SM)						-	-	-	-	-	-	-	-	-	-	-	F	0.07	28	-	-	-	-	-	-
12.50	SPT/DS		12	15	17	32	24	-																			
13.50	SPT/DS		14	17	20	37	27	0.8	64.2	24.0	11.0	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS							0.1	62.6	25.1	12.6	23	NP	NP	17.46	-	-	2.62	F	0.08	29	-	-	-	-	-	-
15.50	SPT/DS		16	20	24	44	22	-																			
16.50	SPT/DS		20	25	30	55	26	0.1	73.0	17.8	9.1	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS							46.8	23.7	19.8	9.8	29	NP	NP	13.16	-	-	2.61	F	0.04	30	-	-	-	-	-	-
18.50	SPT/DS		23	26	32	58	26	-																			
19.50	SPT/DS		25	30	36	66	28	0.3	64.9	22.5	12.3	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS	Hard, Yellowish Brown, fine-grained inorganic silt of lowPlasticity with Gravel (ML)						0.8	26.9	52.3	20.0	25	NP	NP	21.08	-	-	2.69	F	0.02	28	-	-	-	-	-	-
21.50	SPT/DS		13	17	20	37	19	-																			
22.50	SPT/DS		15	19	24	43	20	0.5	44.9	34.9	19.7	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							0.0	50.0	33.6	16.5	26	NP	NP	18.00	-	-	2.66	F	0.10	27	-	-	-	-	-	-
24.50	SPT/DS		24	34	41	75	29	-																			
25.50	SPT/DS		30	36	45	81	31	3.1	10.7	58.3	28.0	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS	Very Dense, Brownish to Greyish, fine-grained silty sand (SM)						0.3	52.2	31.7	15.7	29	NP	NP	15.87	-	-	2.62	F	0.05	30	-	-	-	-	-	-
27.50	SPT/DS		39	(50/11cm)	-	100	35	-																			
28.50	SPT/DS		44	(50/9cm)	-	100	35	0.1	72.2	18.2	9.5	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							0.0	51.9	32.3	15.8	27	NP	NP	17.17	-	-	2.65	F	0.02	34	-	-	-	-	-	-
30.50	SPT/DS		(50/12cm)	-	-	100	33	-																			

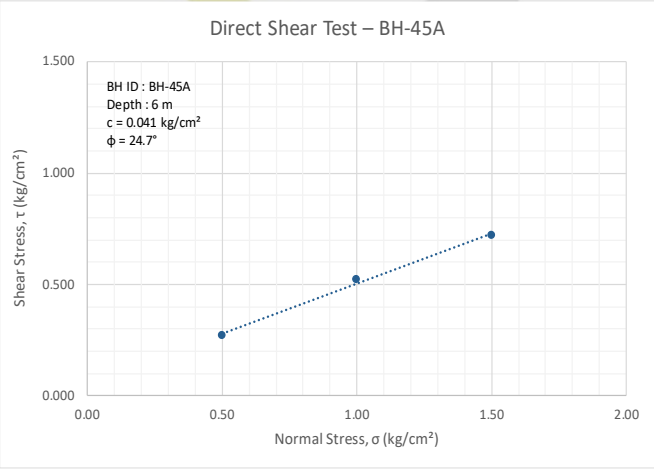
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

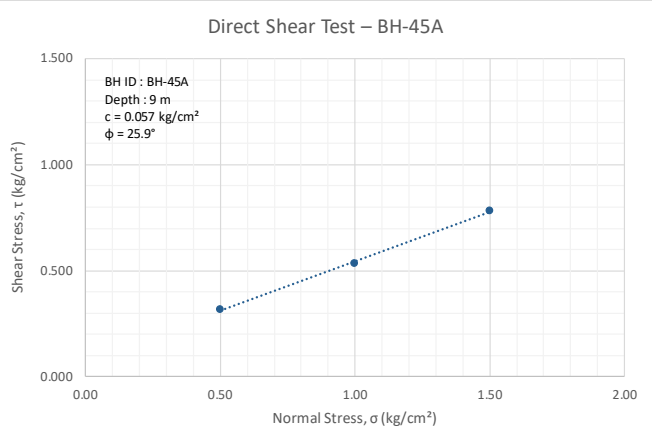

Grain Size Distribution Curve
BH-45A_0.00m
BH-45A_1.50m
BH-45A_3.00m
BH-45A_4.50m
BH-45A_7.50m
BH-45A_9.00m
BH-45A_10.50m
Percent Finer (%)
Particle Size (mm)

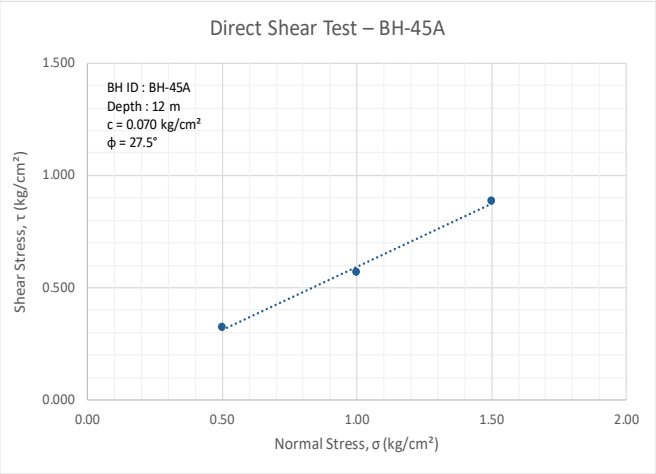

Grain Size Distribution Curve
BH-45A_13.50m
BH-45A_15.00m
BH-45A_16.50m
BH-45A_18.00m
BH-45A_19.50m
BH-45A_21.00m
BH-45A_22.50m
Percent Finer (%)
Particle Size (mm)

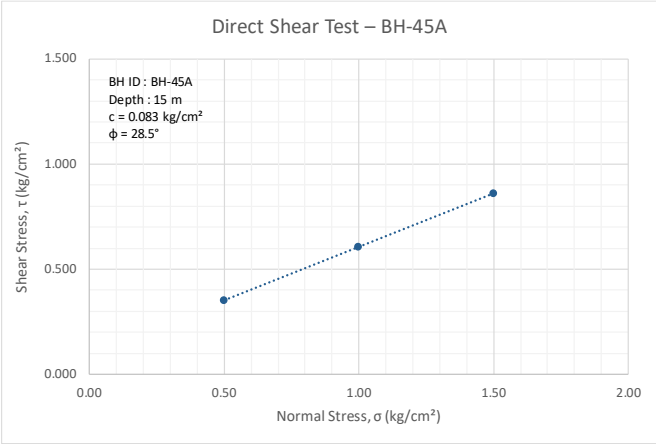

Grain Size Distribution Curve
BH-45A_24.00m
BH-45A_25.50m
BH-45A_27.00m
BH-45A_28.50m
BH-45A_30.00m
Percent Finer (%)
Particle Size (mm)

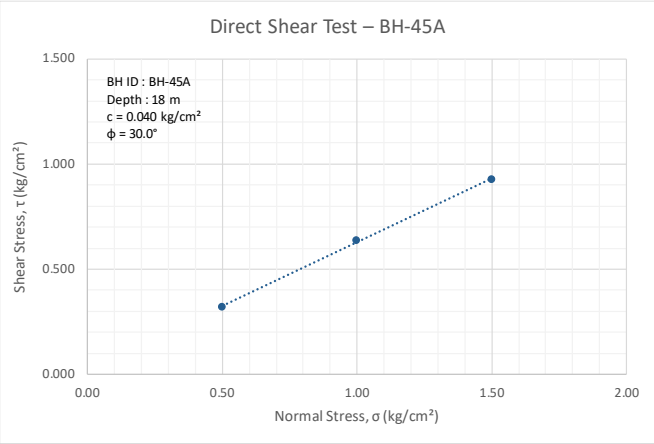

Direct Shear Test – BH-45A
BH ID : BH-45A
Depth : 3 m
c = 0.023 kg/cm²
ϕ = 21.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

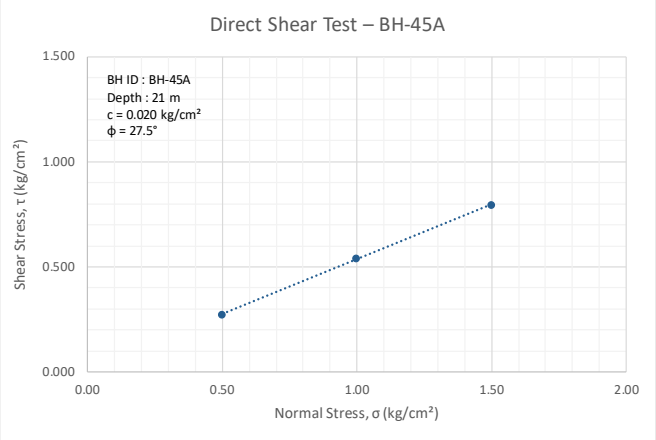

Direct Shear Test – BH-45A
BH ID : BH-45A
Depth : 6 m
c = 0.041 kg/cm²
ϕ = 24.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

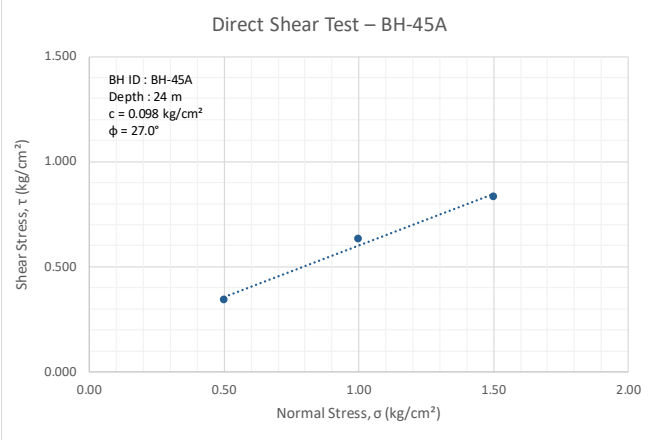

Direct Shear Test – BH-45A
BH ID : BH-45A
Depth : 9 m
c = 0.057 kg/cm²
ϕ = 25.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

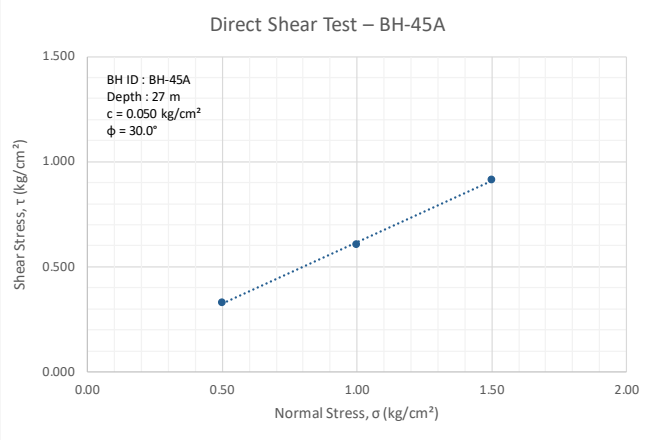

Direct Shear Test – BH-45A
BH ID : BH-45A
Depth : 12 m
c = 0.070 kg/cm²
ϕ = 27.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

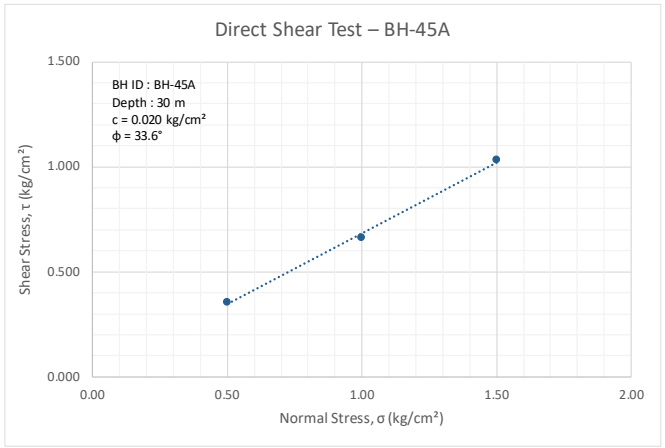

Direct Shear Test – BH-45A
BH ID : BH-45A
Depth : 15 m
c = 0.083 kg/cm²
ϕ = 28.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-45A
BH ID : BH-45A
Depth : 18 m
c = 0.040 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-45A
BH ID : BH-45A
Depth : 21 m
c = 0.020 kg/cm²
ϕ = 27.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-45A
BH ID : BH-45A
Depth : 24 m
c = 0.098 kg/cm²
ϕ = 27.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-45A
BH ID : BH-45A
Depth : 27 m
c = 0.050 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

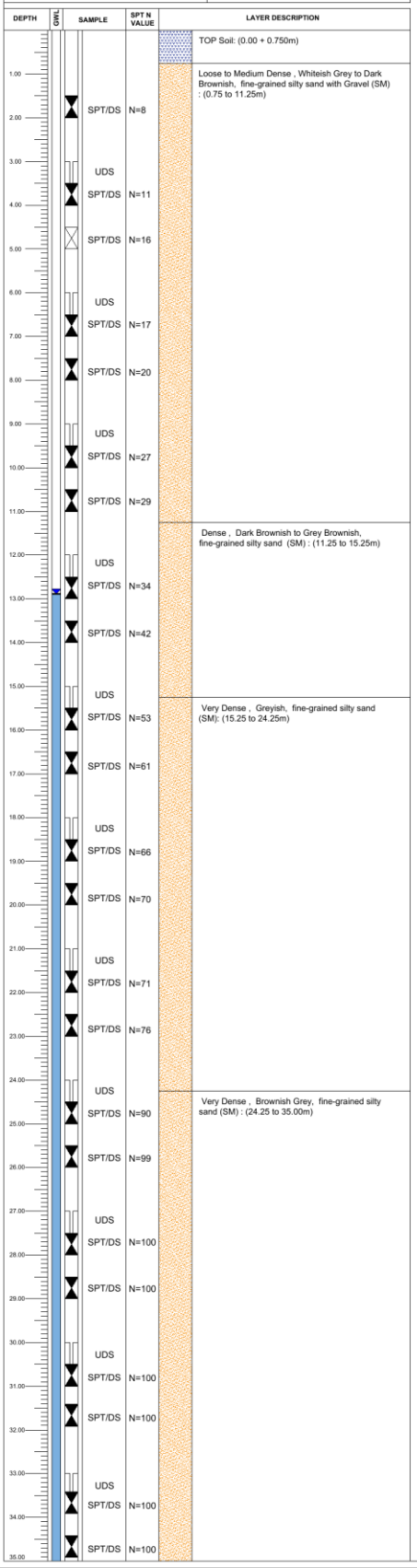

Direct Shear Test – BH-45A
BH ID : BH-45A
Depth : 30 m
c = 0.020 kg/cm²
ϕ = 33.6°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Noida Sector-142 to Botanical Garden (4+000 km TO 5+000 km)

BH ID : BH-46 | **Chainage** : 5+122 KM

Groundwater Level : 12.90 M | **Location** : Lat. 28.535689 , Long. 77.35423



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

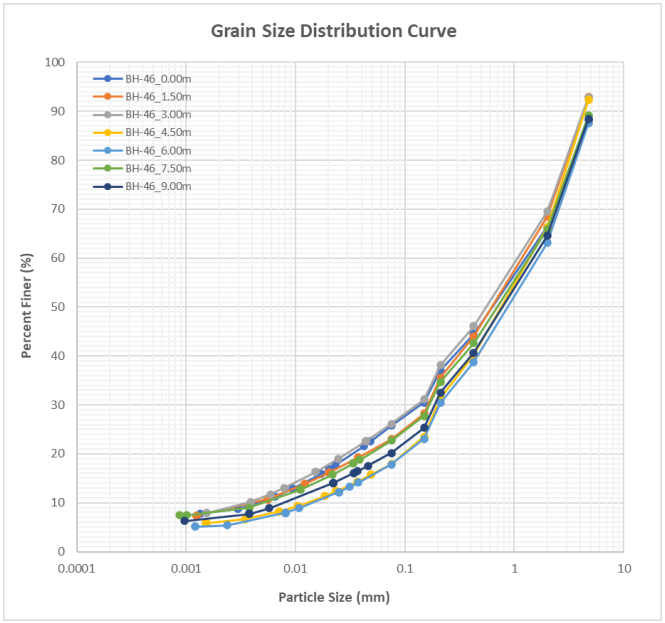
Soil

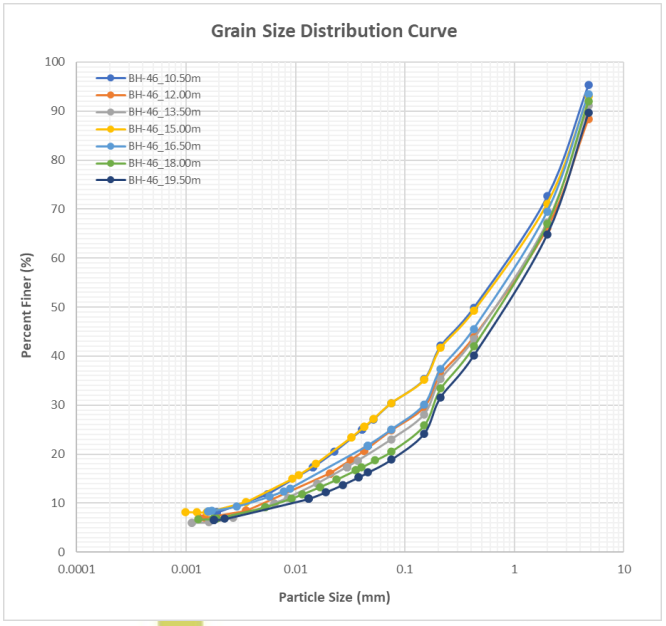
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

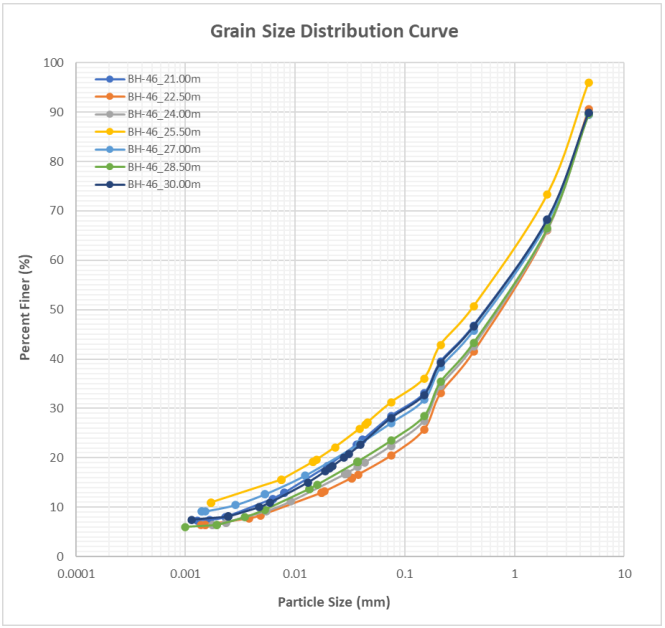
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-46	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	5+122	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	35.00	**Start Date:**	15-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	200.4	**End Date:**	16-01-2026
Project Code:	158_R06_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	12.90	**Location:**	Lat. 28.535689 Long. 77.35423

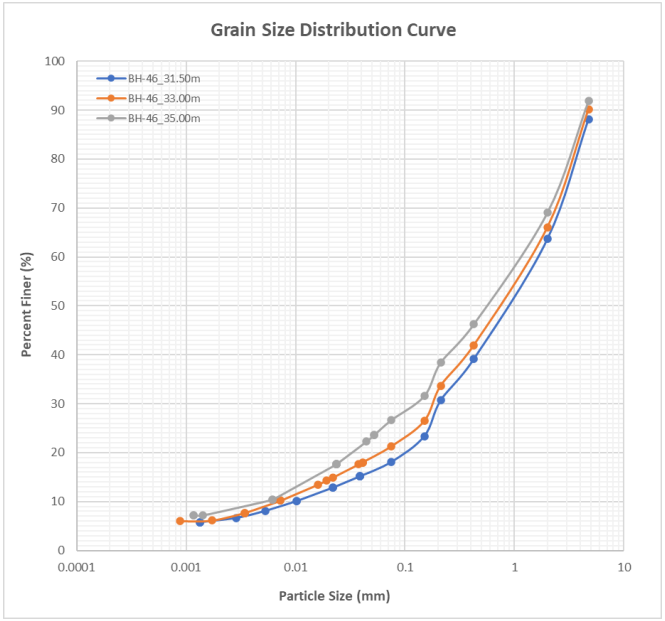
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Loose to Medium Dense , Whiteish Grey to Dark Brownish, fine-grained silty sand with Gravel (SM)	3	3	5	8	11	7.1	56.0	14.6	8.4	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							7.2	66.7	17.6	8.5	23	NP	NP	7.61	1.83	1.70	2.68	F	0.02	22.00	UU	31	19	-	-	-
3.50	SPT/DS		3	5	6	11	12	-																			
4.50	SPT/DS		5	7	9	16	16	7.7	59.8	11.8	6.1	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	DS							12.5	61.2	12.5	5.3	28	NP	NP	12.15	-	-	2.66	F	0.04	25	-	-	-	-	-	-
6.50	SPT/DS		6	8	9	17	16	-																			
7.50	SPT/DS		7	9	11	20	18	10.9	57.4	14.5	8.2	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	DS							11.5	59.3	13.1	7.1	27	NP	NP	13.06	-	-	2.60	F	0.06	26	-	-	-	-	-	-
9.50	SPT/DS		7	12	15	27	23	-																			
10.50	SPT/DS		9	12	17	29	24	4.7	50.1	22.1	8.3	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	DS	Dense , Dark Brownish to Grey Brownish, fine-grained silty sand (SM)						11.6	56.1	17.3	7.5	21	NP	NP	12.73	-	-	2.68	F	0.08	28	-	-	-	-	-	-
12.50	SPT/DS		11	15	19	34	26	-																			
13.50	SPT/DS		13	19	23	42	23	8.9	56.6	16.5	6.5	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS							7.0	50.8	21.6	8.8	26	NP	NP	12.56	-	-	2.64	F	0.09	29	-	-	-	-	-	-
15.50	SPT/DS	Very Dense , Greyish, fine-grained silty sand (SM)	18	24	29	53	26	-																			
16.50	SPT/DS		21	27	34	61	28	6.5	54.4	16.3	8.7	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS							8.0	58.0	13.5	7.0	28	NP	NP	14.28	-	-	2.66	F	0.03	30	-	-	-	-	-	-
18.50	SPT/DS		24	30	36	66	29	-																			
19.50	SPT/DS		23	31	39	70	30	10.4	59.9	12.2	6.7	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS							10.3	53.2	20.7	7.7	21	NP	NP	12.36	-	-	2.70	F	0.01	31	-	-	-	-	-	-
21.50	SPT/DS		27	32	39	71	30	-																			
22.50	SPT/DS		31	36	40	76	31	9.5	58.5	13.6	6.8	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							10.3	57.4	15.8	6.6	29	NP	NP	13.19	-	-	2.64	F	0.05	32	-	-	-	-	-	-
24.50	SPT/DS	Very Dense , Brownish Grey, fine-grained silty sand (SM)	35	42	48	90	35	-																			
25.50	SPT/DS		37	49	50	99	37	4.0	49.4	19.8	11.4	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							10.5	54.2	17.3	9.7	27	NP	NP	14.17	-	-	2.64	F	0.03	34	-	-	-	-	-	-
27.50	SPT/DS		41	47	(50/4cm)	100	36	-																			
28.50	SPT/DS		45	(50/8cm)	-	100	36	10.4	56.7	17.0	6.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							10.1	53.4	20.1	7.9	23	NP	NP	15.21	-	-	2.69	F	0.01	33	-	-	-	-	-	-
30.50	SPT/DS		48	(50/6cm)	-	100	35	-																			
31.50	SPT/DS		(50/12cm)	-	-	100	34	11.8	60.9	11.8	6.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33.00	DS							9.8	58.0	14.8	6.5	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
33.50	SPT/DS		(50/10cm)	-	-	100	33	-																			
35.00	SPT/DS		(50/6cm)	-	-	100	32	8.2	53.8	18.7	8.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

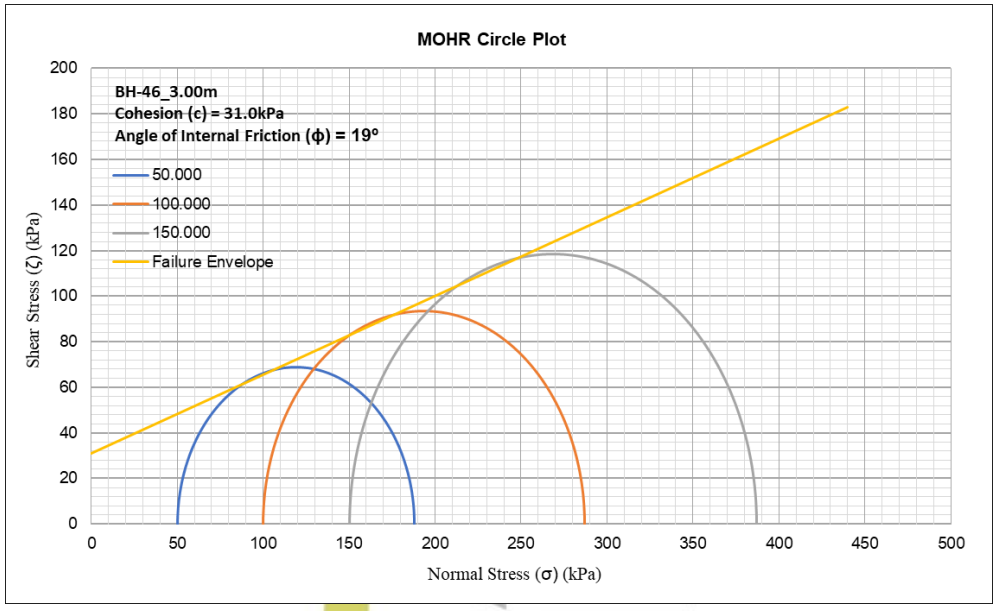
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

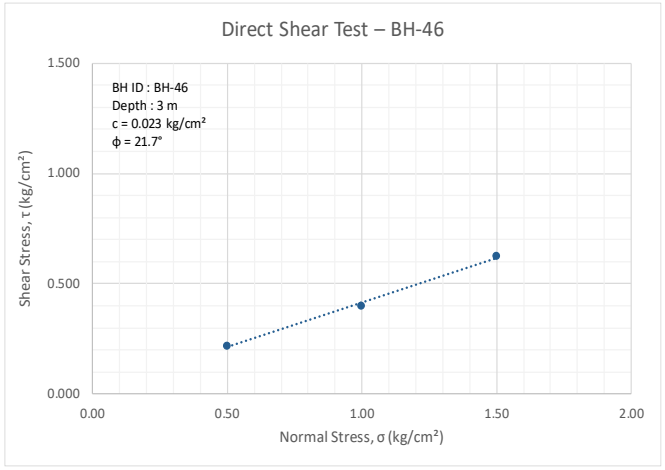

Grain Size Distribution Curve
BH-46_0.00m
BH-46_1.50m
BH-46_3.00m
BH-46_4.50m
BH-46_6.00m
BH-46_7.50m
BH-46_9.00m
Percent Finer (%)
Particle Size (mm)

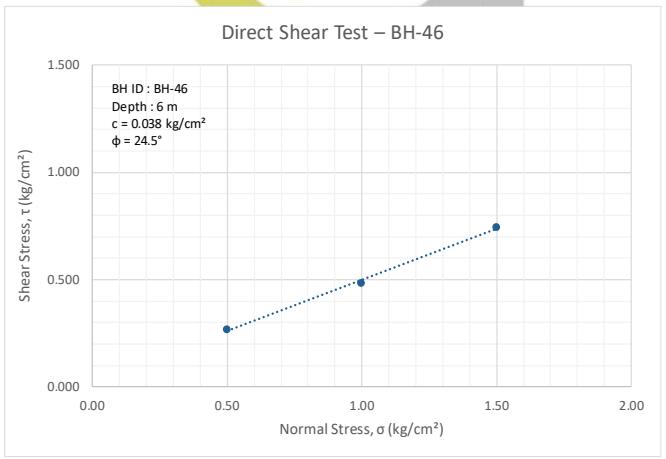

Grain Size Distribution Curve
BH-46_10.50m
BH-46_12.00m
BH-46_13.50m
BH-46_15.00m
BH-46_16.50m
BH-46_18.00m
BH-46_19.50m
Percent Finer (%)
Particle Size (mm)

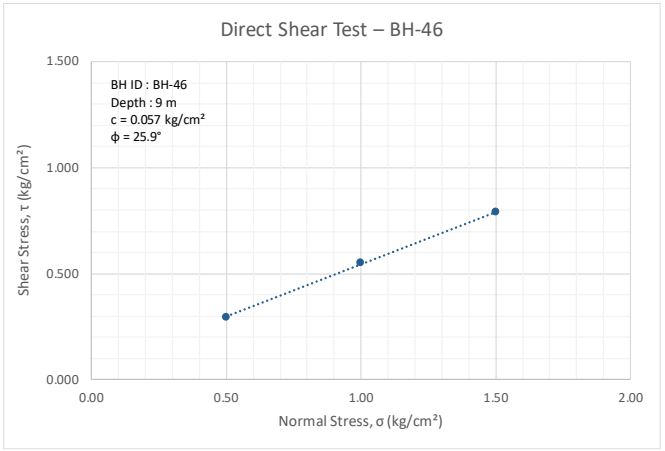

Grain Size Distribution Curve
BH-46_21.00m
BH-46_22.50m
BH-46_24.00m
BH-46_25.50m
BH-46_27.00m
BH-46_28.50m
BH-46_30.00m
Percent Finer (%)
Particle Size (mm)

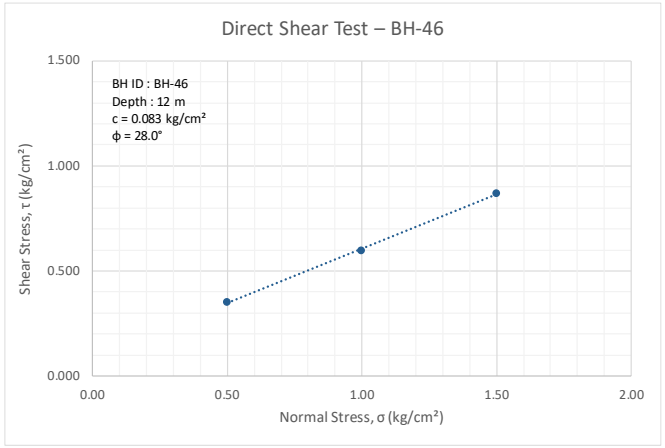

Grain Size Distribution Curve
BH-46_31.50m
BH-46_33.00m
BH-46_35.00m
Percent Finer (%)
Particle Size (mm)

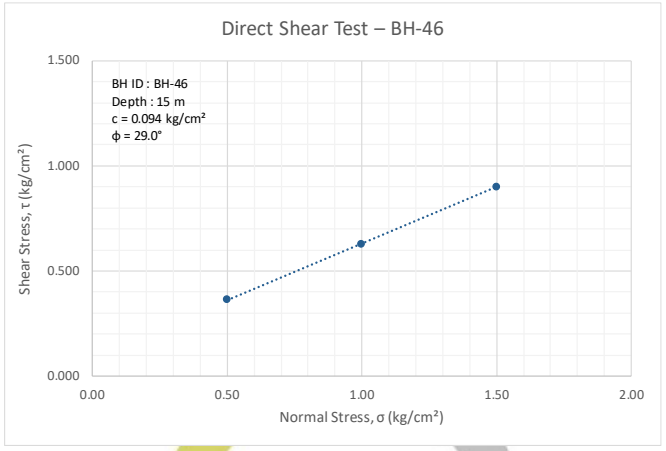

MOHR Circle Plot
BH-46_3.00m
Cohesion (c) = 31.0kPa
Angle of Internal Friction (ϕ) = 19°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)
0
20
40
60
80
100
120
140
160
180
200
0
50
100
150
200
250
300
350
400
450
500

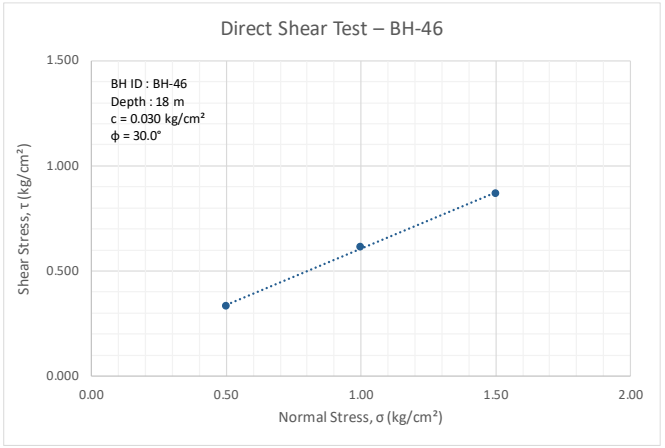

Direct Shear Test – BH-46
BH ID : BH-46
Depth : 3 m
c = 0.023 kg/cm²
ϕ = 21.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

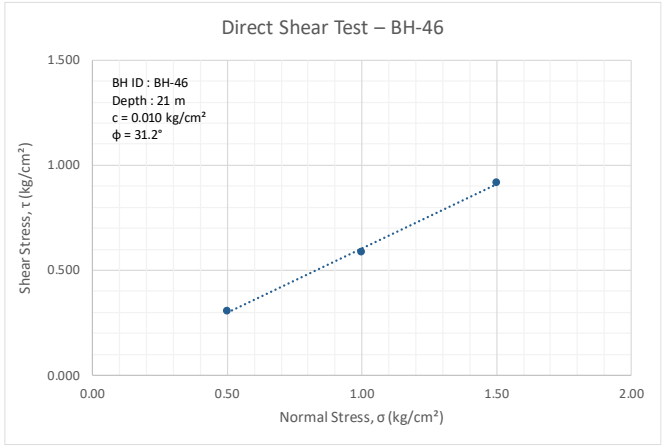

Direct Shear Test – BH-46
BH ID : BH-46
Depth : 6 m
c = 0.038 kg/cm²
ϕ = 24.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

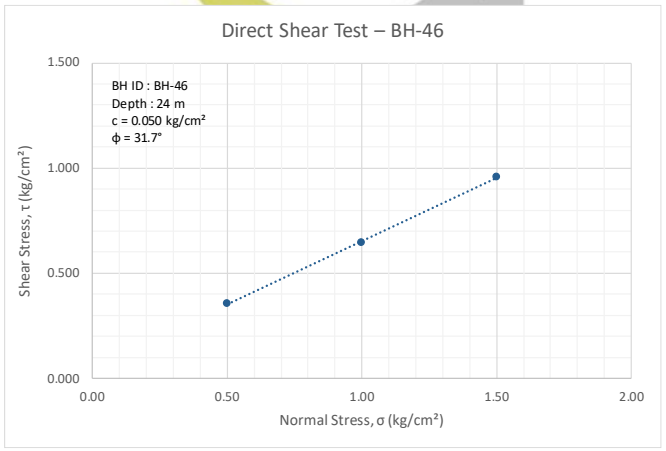

Direct Shear Test – BH-46
BH ID : BH-46
Depth : 9 m
c = 0.057 kg/cm²
ϕ = 25.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

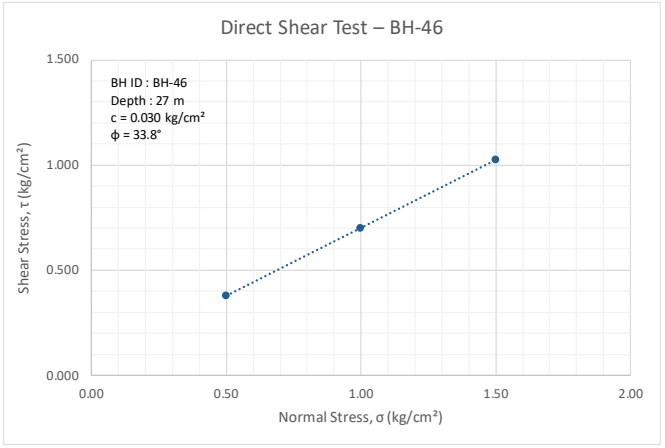

Direct Shear Test – BH-46
BH ID : BH-46
Depth : 12 m
c = 0.083 kg/cm²
ϕ = 28.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

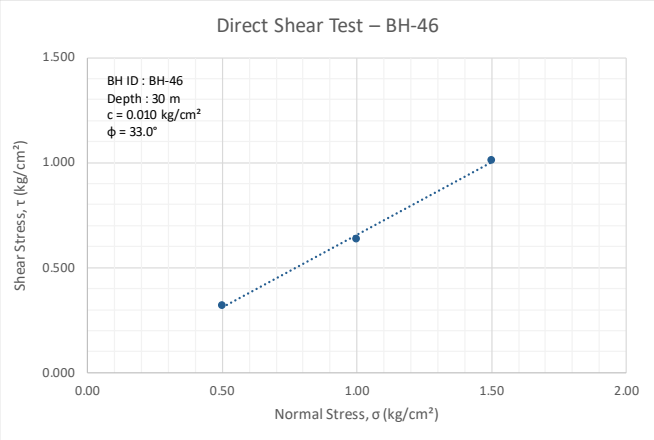

Direct Shear Test – BH-46
BH ID : BH-46
Depth : 15 m
c = 0.094 kg/cm²
ϕ = 29.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-46
BH ID : BH-46
Depth : 18 m
c = 0.030 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-46
BH ID : BH-46
Depth : 21 m
c = 0.010 kg/cm²
ϕ = 31.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-46
BH ID : BH-46
Depth : 24 m
c = 0.050 kg/cm²
ϕ = 31.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-46
BH ID : BH-46
Depth : 27 m
c = 0.030 kg/cm²
ϕ = 33.8°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

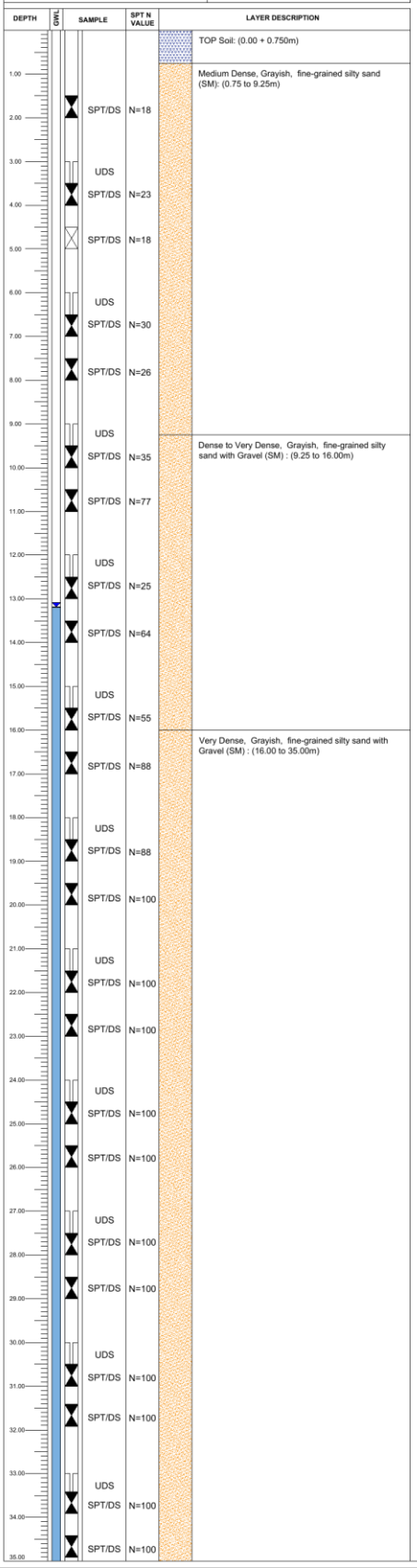

Direct Shear Test – BH-46
BH ID : BH-46
Depth : 30 m
c = 0.010 kg/cm²
ϕ = 33.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Noida Sector-142 to Botanical Garden (4+000 km TO 5+000 km)

BH ID : BH-48 | **Chainage** : 5+393 KM

Groundwater Level : 13.20 M | **Location** : Lat. 28.534638, Long. 77.356794



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

Soil

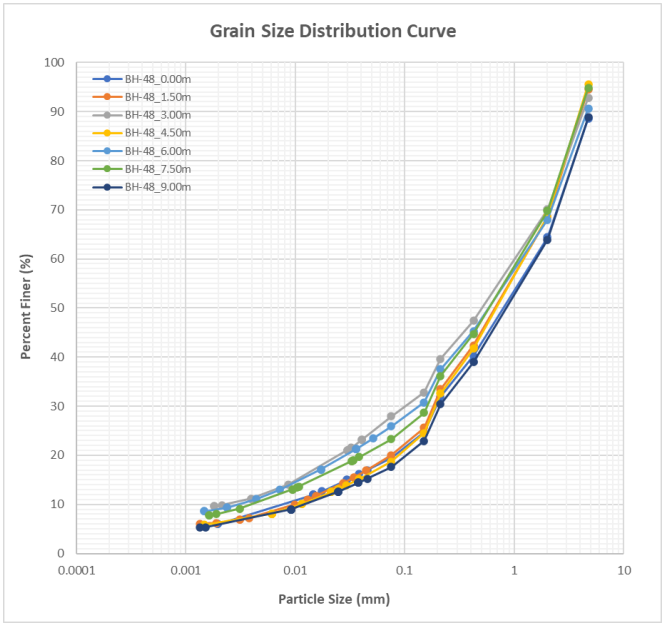
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

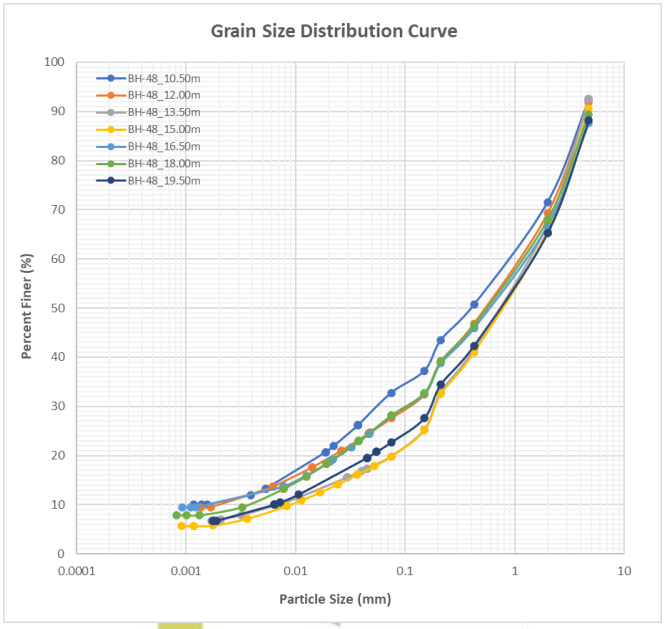
GOMA ENGINEERING AND CONSULTANCY
Quality we put forward

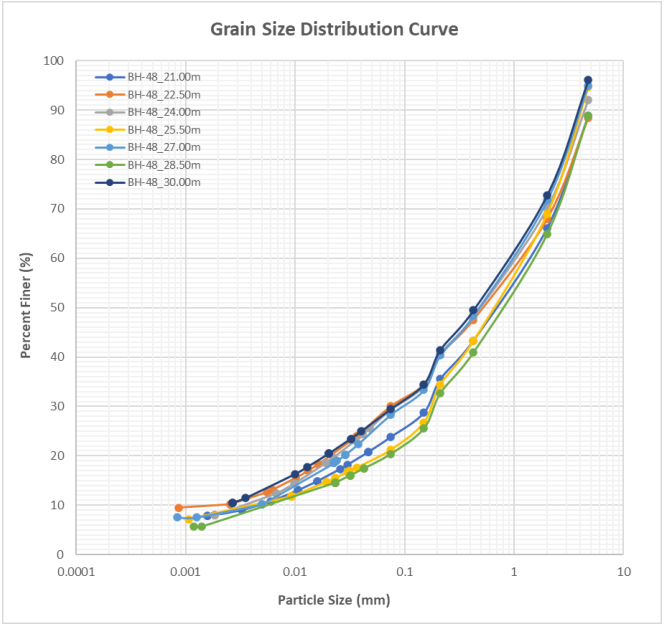
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-48	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	5+393	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	35.00	**Start Date:**	08-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	203.6	**End Date:**	09-01-2026
Project Code:	158_R06_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	13.20	**Location:**	Lat. 28.534638 Long. 77.356794

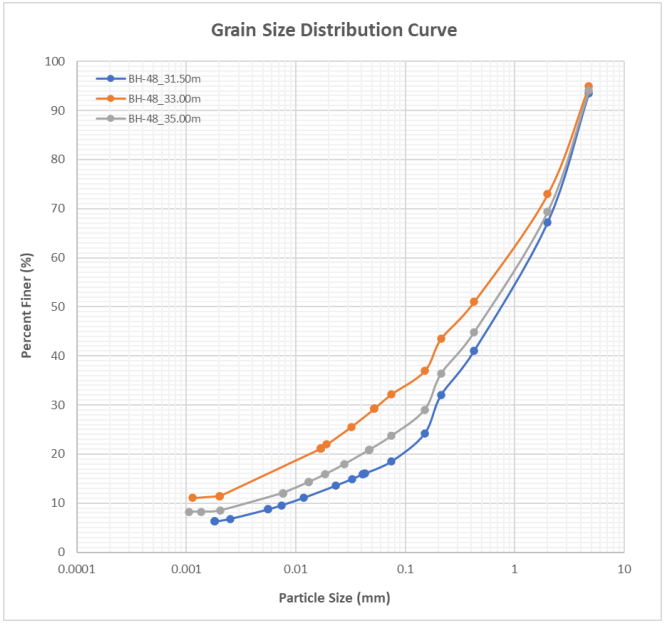
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [^{o}]	Type	Cohesion [kPa]	Angle of Friction [^{o}]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Medium Dense, Grayish, fine-grained silty sand (SM)	6	8	10	18	25	5.5	74.5	13.7	6.3	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							7.2	64.9	18.1	9.8	28	NP	NP	12.62	1.84	1.63	2.67	F	0.04	23	-	-	-	-	-	-
3.50	SPT/DS		4	8	15	23	25	-																			
4.50	SPT/DS		6	8	10	18	18	4.5	76.8	12.4	6.3	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							9.4	64.7	16.8	9.1	22	NP	NP	6.87	1.91	1.79	2.67	F	0.06	25	UU	13	26	-	-	-
6.50	SPT/DS		8	12	18	30	28	-																			
7.50	SPT/DS		6	10	16	26	24	5.2	71.6	15.1	8.1	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS							11.2	71.2	11.7	5.9	21	NP	NP	13.52	1.92	1.69	2.64	F	0.07	27	UU	16	25	-	-	-
9.50	SPT/DS	Dense to Very Dense, Grayish, fine-grained silty sand with Gravel (SM)	9	14	21	35	30	-																			
10.50	SPT/DS		16	31	46	77	63	7.6	59.7	22.2	10.6	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	DS							8.2	64.2	17.6	10.1	23	NP	NP	11.88	-	-	2.66	F	0.07	27	-	-	-	-	-	-
12.50	SPT/DS		10	10	15	25	19	-																			
13.50	SPT/DS		21	31	33	64	31	7.4	72.7	12.9	6.9	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS							9.5	70.6	13.8	6.0	21	NP	NP	13.98	-	-	2.66	F	0.07	29	-	-	-	-	-	-
15.50	SPT/DS		6	19	36	55	27	-																			
16.50	SPT/DS	Very Dense, Grayish, fine-grained silty sand with Gravel (SM)	18	37	51	88	37	12.4	59.5	17.5	10.6	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS							10.6	61.3	19.6	8.6	28	NP	NP	14.24	-	-	2.66	F	0.10	29	-	-	-	-	-	-
18.50	SPT/DS		19	35	53	88	36	-																			
19.50	SPT/DS		18	27	(50/13cm)	100	40	11.8	65.5	15.8	6.9	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS							11.1	65.1	15.7	8.2	24	NP	NP	13.56	-	-	2.69	F	0.03	30	-	-	-	-	-	-
21.50	SPT/DS		22	30	(50/12cm)	100	39	-																			
22.50	SPT/DS		17	32	(50/10cm)	100	38	11.5	58.5	20.0	10.0	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							7.9	62.7	21.2	8.2	23	NP	NP	12.55	-	-	2.61	F	0.00	31	-	-	-	-	-	-
24.50	SPT/DS		23	38	(50/9cm)	100	37	-																			
25.50	SPT/DS		16	44	(50/11cm)	100	37	5.3	73.5	12.7	8.5	21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							5.0	66.7	19.9	8.5	22	NP	NP	16.19	-	-	2.61	F	0.03	32	-	-	-	-	-	-
27.50	SPT/DS		22	47	(50/10cm)	100	36	-																			
28.50	SPT/DS		28	(50/13cm)	-	100	36	11.1	68.5	13.6	6.8	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							3.9	66.7	22.0	7.5	28	NP	NP	15.09	-	-	2.68	F	0.01	35	-	-	-	-	-	-
30.50	SPT/DS		33	(50/11cm)	-	100	35	-																			
31.50	SPT/DS		38	(50/8cm)	-	100	34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33.00	DS							5.1	62.7	20.7	11.5	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
33.50	SPT/DS		35	(50/7cm)	-	100	33	-																			
35.00	SPT/DS		40	(50/5cm)	-	100	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

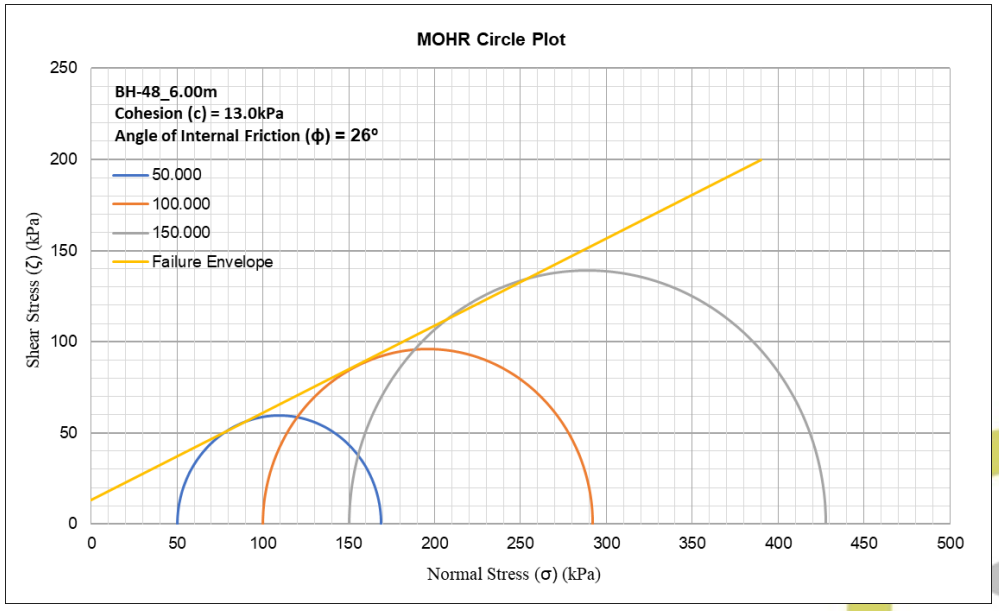
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

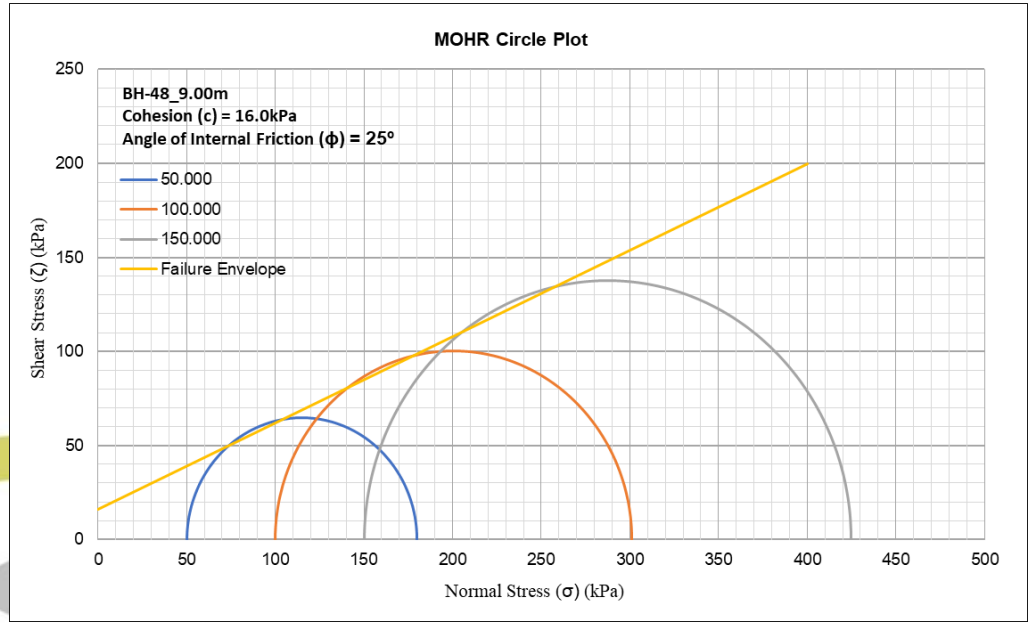

Grain Size Distribution Curve
BH-48_0.00m
BH-48_1.50m
BH-48_3.00m
BH-48_4.50m
BH-48_6.00m
BH-48_7.50m
BH-48_9.00m
Percent Finer (%)
Particle Size (mm)

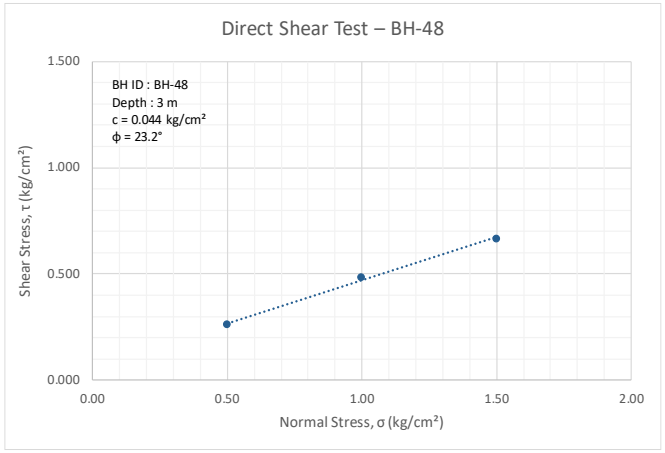

Grain Size Distribution Curve
BH-48_10.50m
BH-48_12.00m
BH-48_13.50m
BH-48_15.00m
BH-48_16.50m
BH-48_18.00m
BH-48_19.50m
Percent Finer (%)
Particle Size (mm)

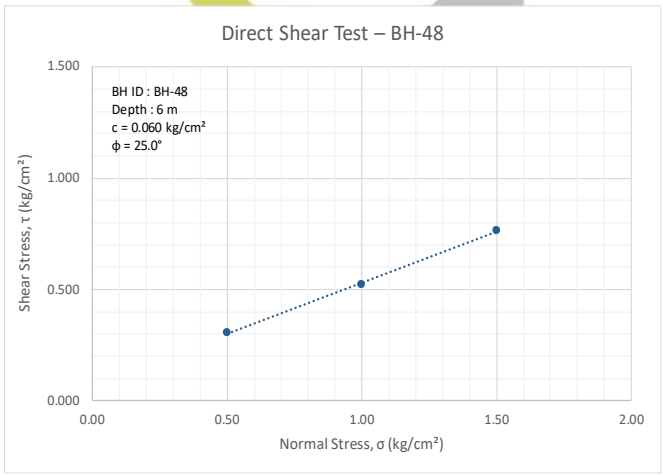

Grain Size Distribution Curve
BH-48_21.00m
BH-48_22.50m
BH-48_24.00m
BH-48_25.50m
BH-48_27.00m
BH-48_28.50m
BH-48_30.00m
Percent Finer (%)
Particle Size (mm)

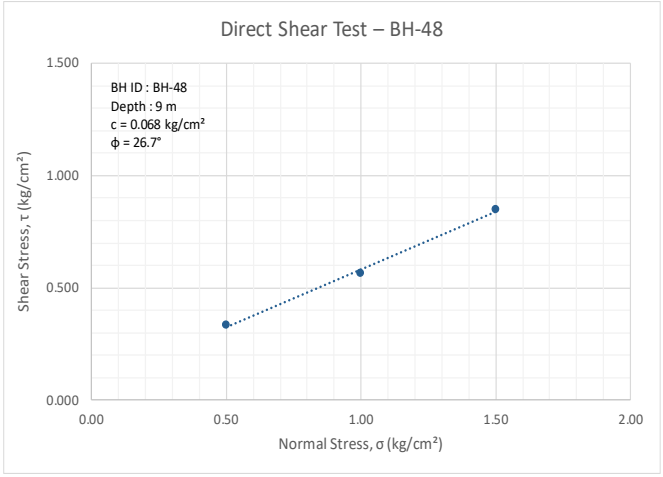

Grain Size Distribution Curve
BH-48_31.50m
BH-48_33.00m
BH-48_35.00m
Percent Finer (%)
Particle Size (mm)

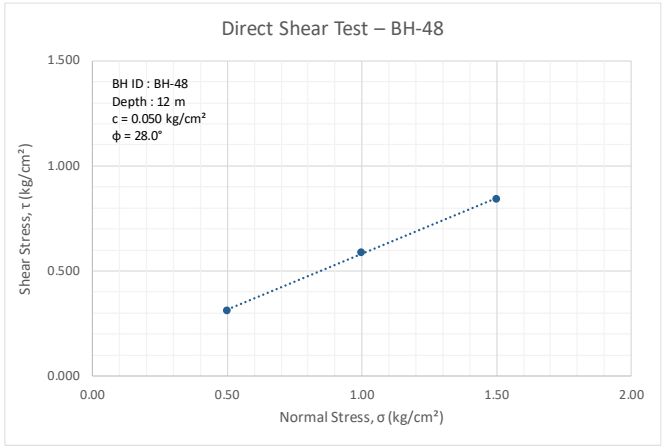

MOHR Circle Plot
BH-48_6.00m
Cohesion (c) = 13.0kPa
Angle of Internal Friction (ϕ) = 26°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)
0
50
100
150
200
250
300
350
400
450
500

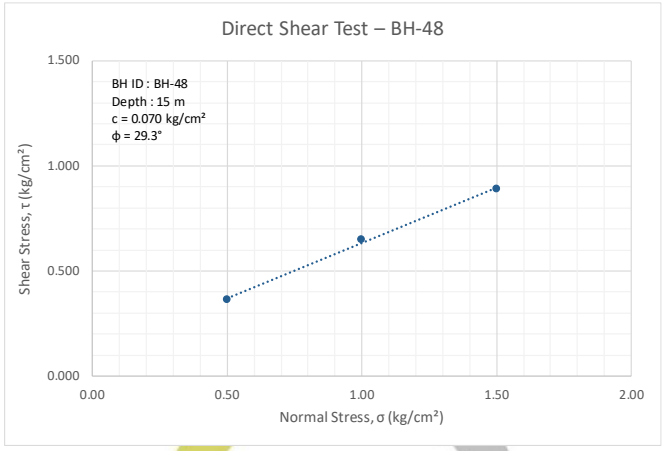

MOHR Circle Plot
BH-48_9.00m
Cohesion (c) = 16.0kPa
Angle of Internal Friction (ϕ) = 25°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)
0
50
100
150
200
250
300
350
400
450
500

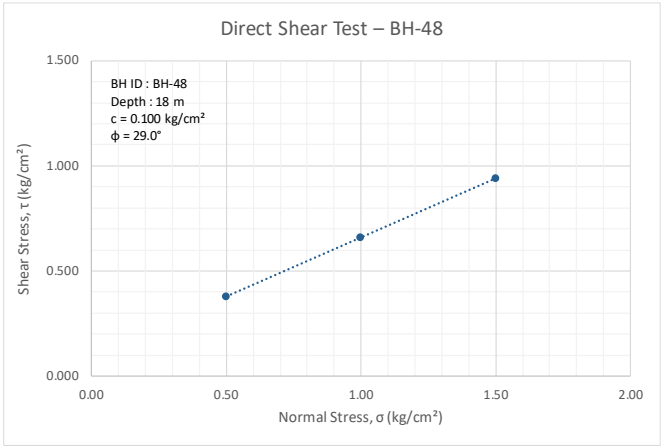

Direct Shear Test – BH-48
BH ID : BH-48
Depth : 3 m
c = 0.044 kg/cm²
ϕ = 23.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

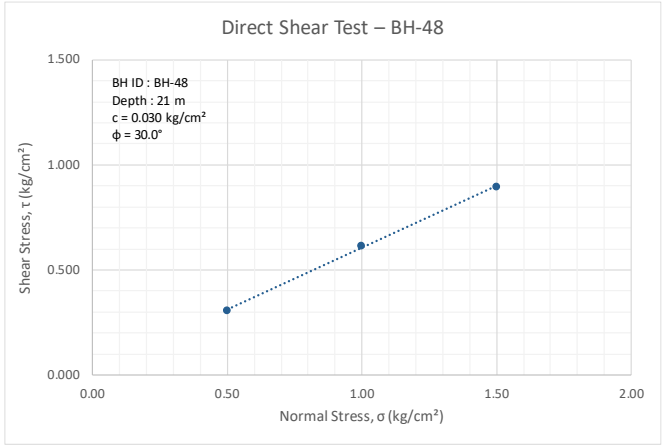

Direct Shear Test – BH-48
BH ID : BH-48
Depth : 6 m
c = 0.060 kg/cm²
ϕ = 25.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

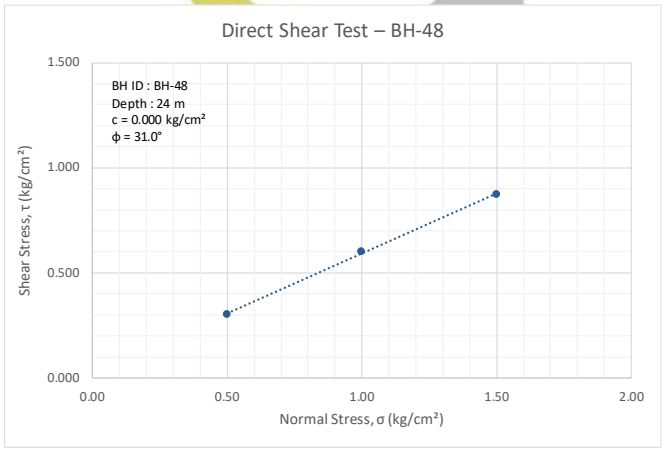

Direct Shear Test – BH-48
BH ID : BH-48
Depth : 9 m
c = 0.068 kg/cm²
ϕ = 26.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

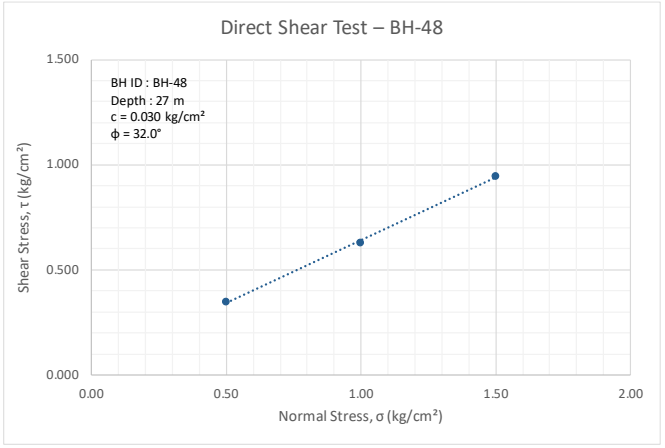

Direct Shear Test – BH-48
BH ID : BH-48
Depth : 12 m
c = 0.050 kg/cm²
ϕ = 28.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

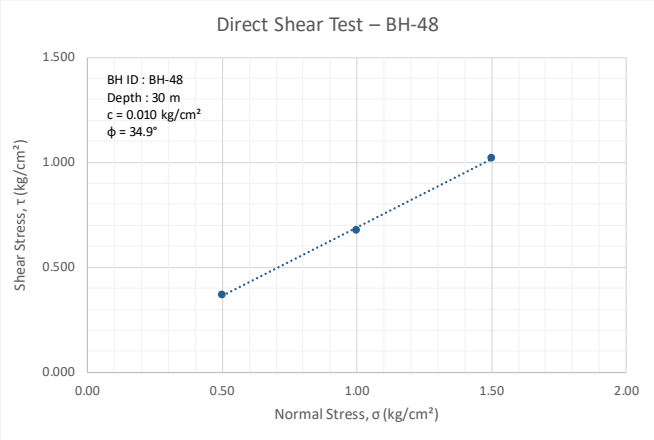

Direct Shear Test – BH-48
BH ID : BH-48
Depth : 15 m
c = 0.070 kg/cm²
ϕ = 29.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-48
BH ID : BH-48
Depth : 18 m
c = 0.100 kg/cm²
ϕ = 29.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-48
BH ID : BH-48
Depth : 21 m
c = 0.030 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-48
BH ID : BH-48
Depth : 24 m
c = 0.000 kg/cm²
ϕ = 31.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-48
BH ID : BH-48
Depth : 27 m
c = 0.030 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

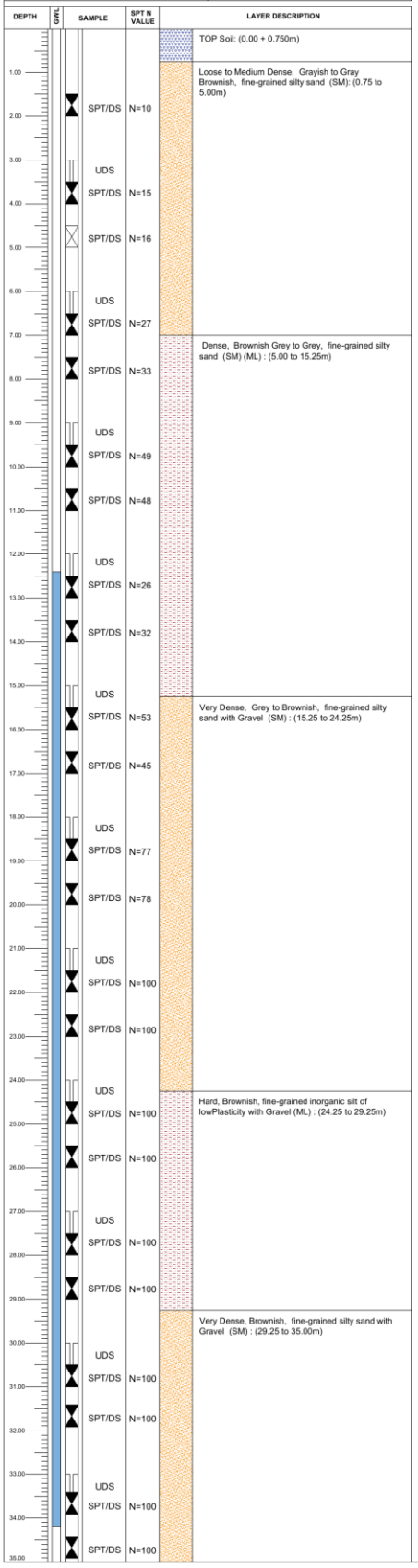

Direct Shear Test – BH-48
BH ID : BH-48
Depth : 30 m
c = 0.010 kg/cm²
ϕ = 34.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Noida Sector-142 to Botanical Garden (4+000 km TO 5+000 km)

BH ID : BH-49 | **Chainage** : 5+442 KM

Groundwater Level : 13.20 M | **Location** : Lat. 28.534481, Long. 77.35732



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

Soil

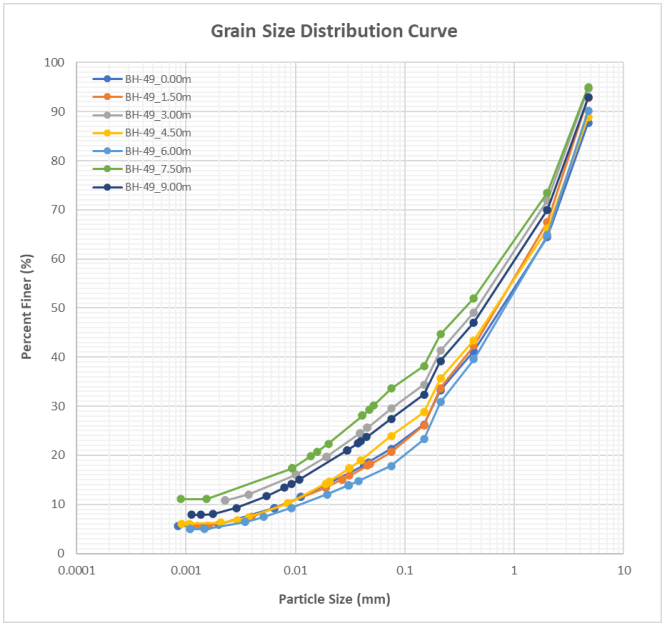
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

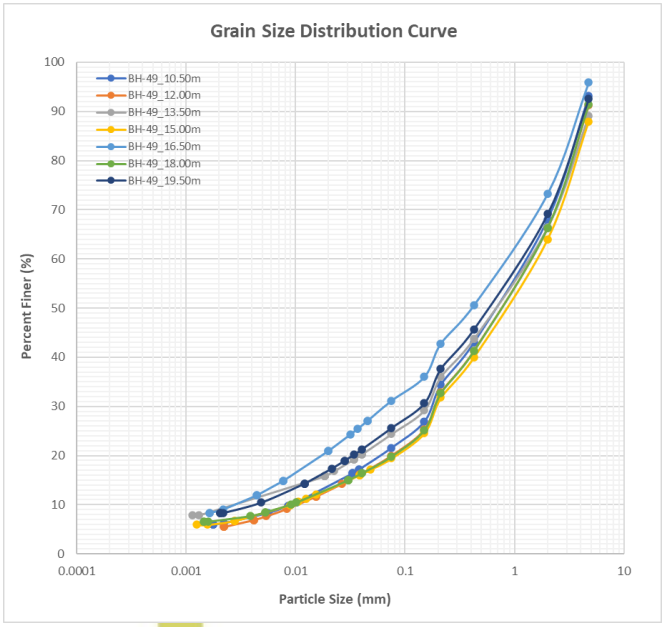
GOMA ENGINEERING AND CONSULTANCY
Quality we put forward

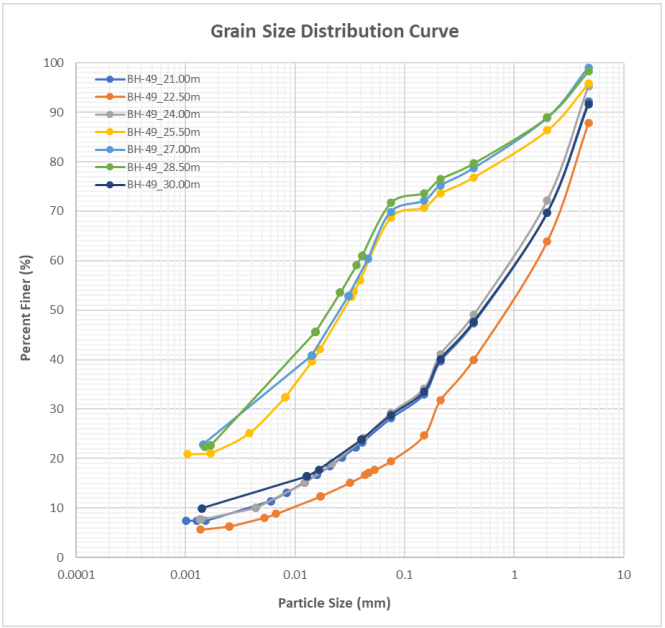
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-49	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	5+442	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	35.00	**Start Date:**	06-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	202.9	**End Date:**	07-01-2026
Project Code:	158_R06_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	13.30	**Location:**	Lat. 28.534481 Long. 77.35732

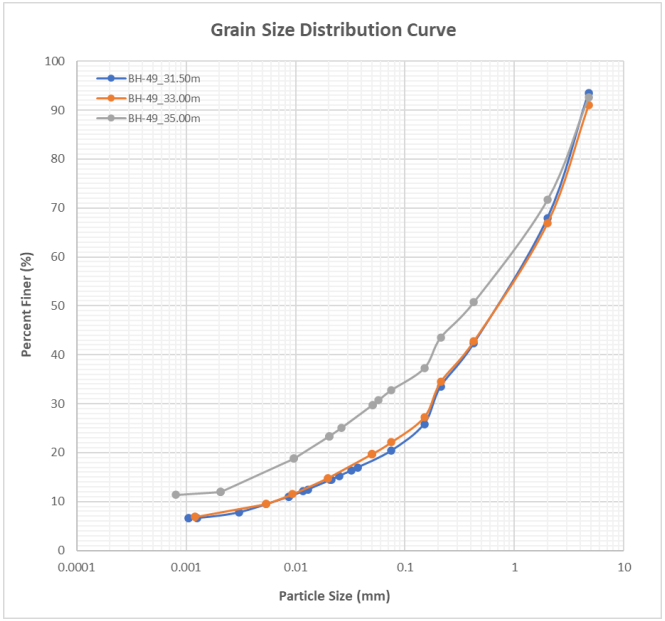
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [^{o}]	Type	Cohesion [kPa]	Angle of Friction [^{o}]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						-	-	-		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Loose to Medium Dense, Grayish to Gray Brownish, fine-grained silty sand (SM)	2	4	6	10	14	7.2	72.1	14.6	6.1	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							5.3	65.2	29.6	0.0	22	NP	NP	10.98	1.92	1.73	2.64	F	0.03	22	UU	12	26	-	-	-
3.50	SPT/DS		4	7	8	15	16	-																			
4.50	SPT/DS		6	7	9	16	16	11.1	65.0	17.7	6.3	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							9.8	72.3	12.3	5.5	27	NP	NP	12.65	1.79	1.59	2.61	F	0.05	25	-	-	-	-	-	-
6.50	SPT/DS		9	12	15	27	25	-																			
7.50	SPT/DS	Dense, Brownish Grey to Grey, fine-grained silty sand (SM)	12	14	19	33	30	5.0	61.3	21.6	12.0	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS							7.1	65.5	19.0	8.4	27	NP	NP	12.50	1.95	1.73	2.68	F	0.07	27	UU	14	25	-	-	-
9.50	SPT/DS		11	21	28	49	42	-																			
10.50	SPT/DS		16	22	26	48	39	6.9	71.6	15.4	6.1	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							8.8	71.2	15.5	4.5	23	NP	NP	13.88	1.97	1.73	2.69	F	0.03	28	-	-	-	-	-	-
12.50	SPT/DS		9	11	15	26	20	-																			
13.50	SPT/DS		10	12	20	32	19	10.9	64.7	15.2	9.1	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS							10.0	68.5	13.2	6.3	24	NP	NP	15.61	-	-	2.65	F	0.02	29	-	-	-	-	-	-
15.50	SPT/DS	Very Dense, Grey to Brownish, fine-grained silty sand with Gravel (SM)	15	25	28	53	26	-																			
16.50	SPT/DS		18	20	25	45	23	4.1	64.8	22.3	8.8	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS							8.6	71.6	12.9	6.9	27	NP	NP	14.27	2.02	1.77	2.60	F	0.00	30	-	-	-	-	-	-
18.50	SPT/DS		20	35	42	77	33	-																			
19.50	SPT/DS		25	33	45	78	33	7.4	66.9	18.5	7.1	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS							7.8	64.1	20.0	8.2	26	NP	NP	11.22	-	-	2.64	F	0.02	31	-	-	-	-	-	-
21.50	SPT/DS		35	(50/13cm)	-	100	39	-																			
22.50	SPT/DS		25	(50/12cm)	-	100	38	12.2	68.9	13.5	6.0	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							4.7	66.0	20.8	8.5	29	NP	NP	12.31	-	-	2.61	F	0.00	32	-	-	-	-	-	-
24.50	SPT/DS	Hard, Brownish, fine-grained inorganic silt of lowPlasticity with Gravel (ML)	30	(50/10cm)	-	100	37	-																			
25.50	SPT/DS		25	(50/11cm)	-	100	37	4.2	27.1	46.9	21.9	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							1.0	29.1	44.6	25.4	24	NP	NP	16.17	-	-	2.62	F	0.05	29	-	-	-	-	-	-
27.50	SPT/DS		(50/13cm)	-	-	100	36	-																			
28.50	SPT/DS		(50/12cm)	-	-	100	36	1.8	26.5	47.3	24.4	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS	Very Dense, Brownish, fine-grained silty sand with Gravel (SM)						8.3	62.9	17.8	11.0	25	NP	NP	13.02	-	-	2.69	F	0.04	33	-	-	-	-	-	-
30.50	SPT/DS		(50/10cm)	-	-	100	35	-																			
31.50	SPT/DS		(50/12cm)	-	-	100	34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33.00	DS							9.0	68.9	14.4	7.8	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
33.50	SPT/DS		49	(50/7cm)	-	100	33	-																			
35.00	SPT/DS		(50/11cm)	-	-	100	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

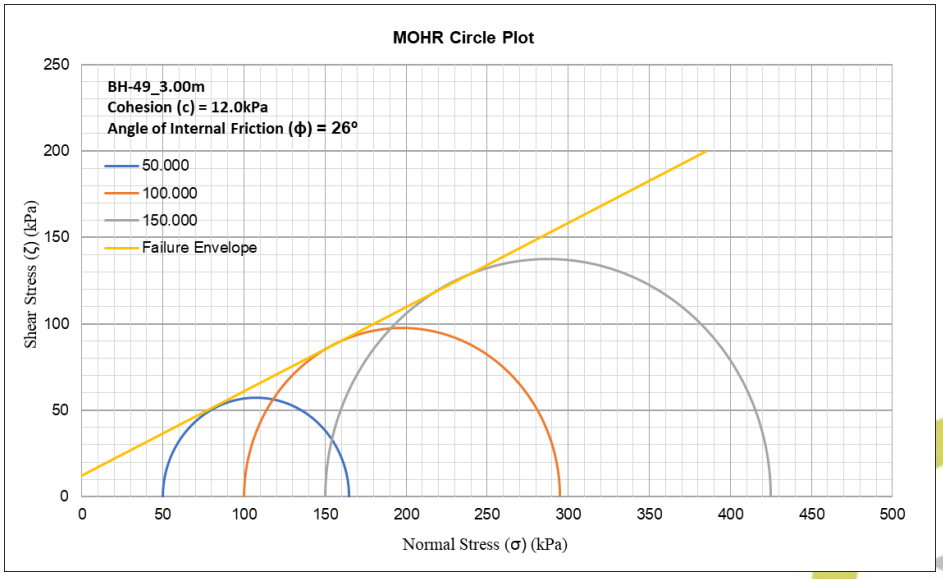
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

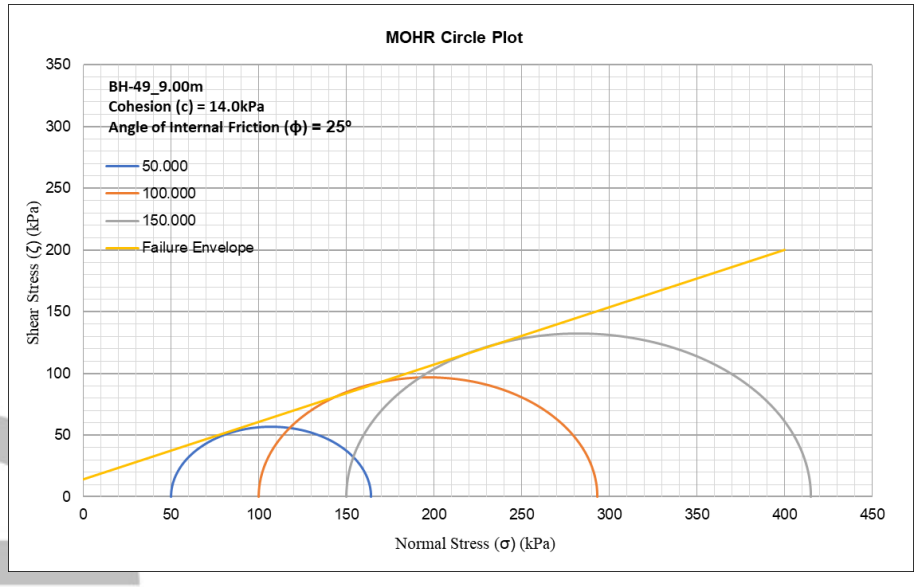

Grain Size Distribution Curve
BH-49_0.00m
BH-49_1.50m
BH-49_3.00m
BH-49_4.50m
BH-49_6.00m
BH-49_7.50m
BH-49_9.00m
Percent Finer (%)
Particle Size (mm)

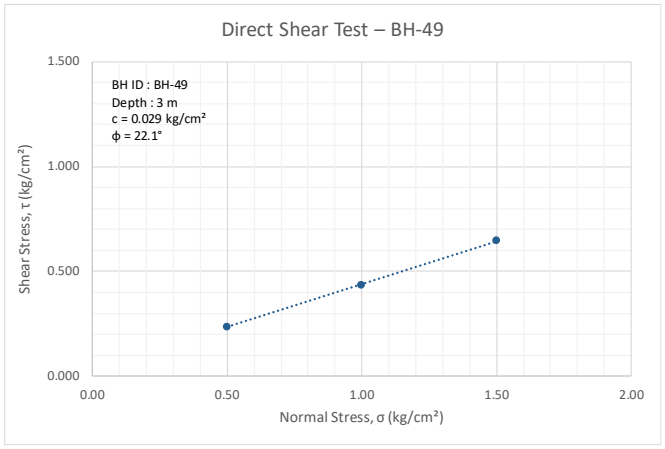

Grain Size Distribution Curve
BH-49_10.50m
BH-49_12.00m
BH-49_13.50m
BH-49_15.00m
BH-49_16.50m
BH-49_18.00m
BH-49_19.50m
Percent Finer (%)
Particle Size (mm)

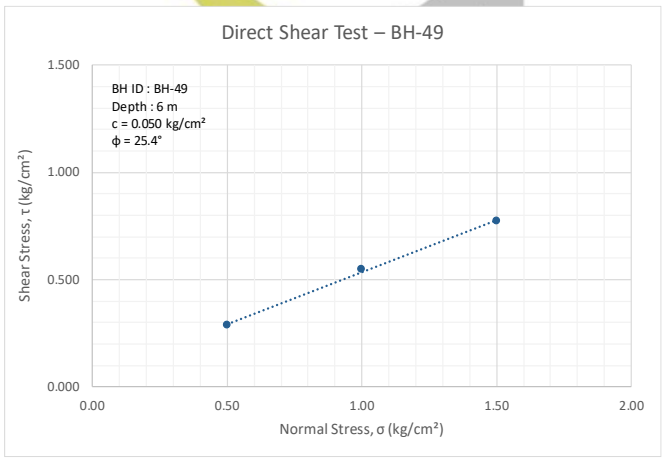

Grain Size Distribution Curve
BH-49_21.00m
BH-49_22.50m
BH-49_24.00m
BH-49_25.50m
BH-49_27.00m
BH-49_28.50m
BH-49_30.00m
Percent Finer (%)
Particle Size (mm)

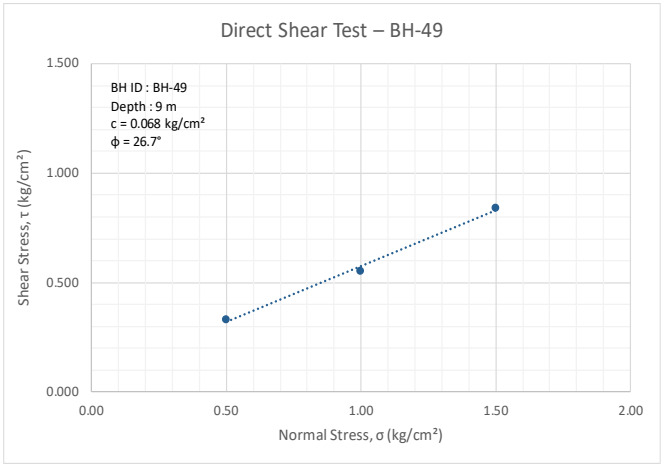

Grain Size Distribution Curve
BH-49_31.50m
BH-49_33.00m
BH-49_35.00m
Percent Finer (%)
Particle Size (mm)

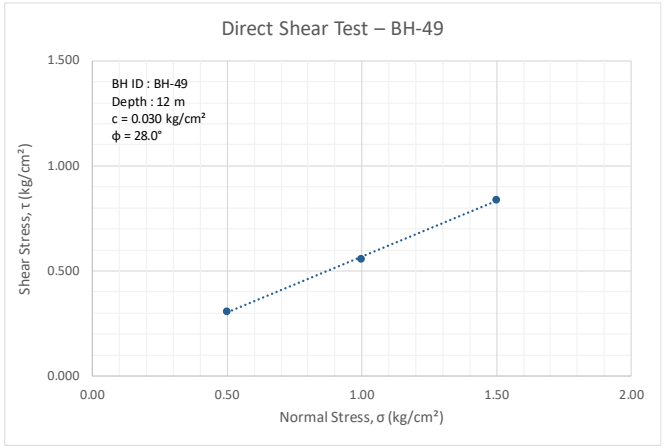

MOHR Circle Plot
BH-49_3.00m
Cohesion (c) = 12.0kPa
Angle of Internal Friction (ϕ) = 26°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

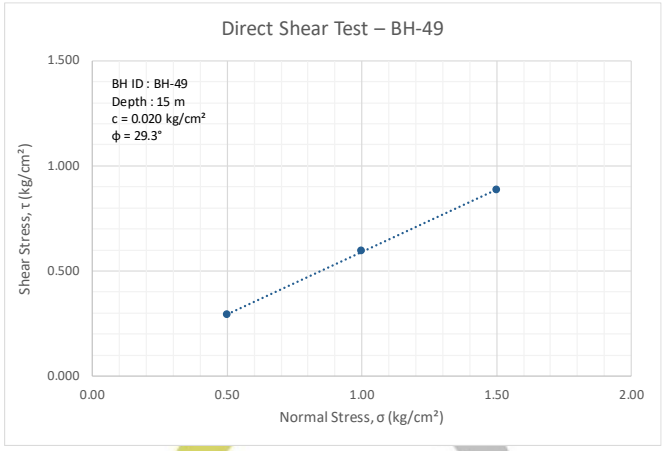

MOHR Circle Plot
BH-49_9.00m
Cohesion (c) = 14.0kPa
Angle of Internal Friction (ϕ) = 25°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

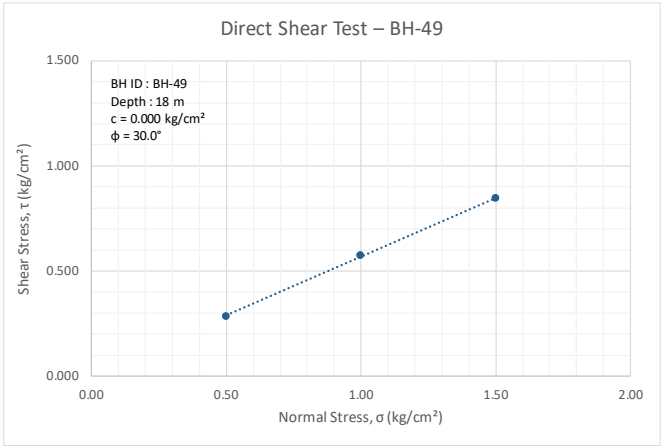

Direct Shear Test – BH-49
BH ID : BH-49
Depth : 3 m
c = 0.029 kg/cm²
ϕ = 22.1°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

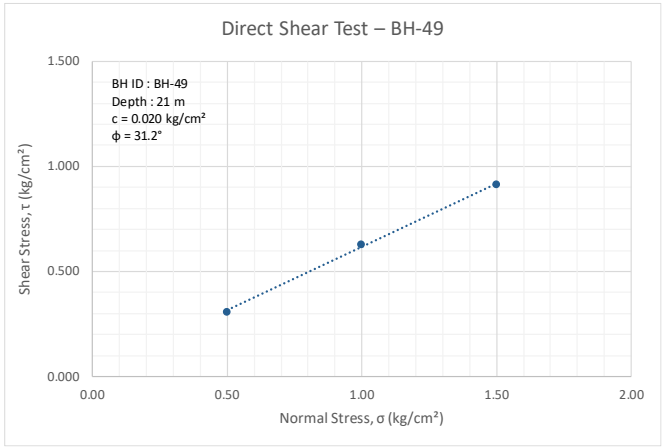

Direct Shear Test – BH-49
BH ID : BH-49
Depth : 6 m
c = 0.050 kg/cm²
ϕ = 25.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

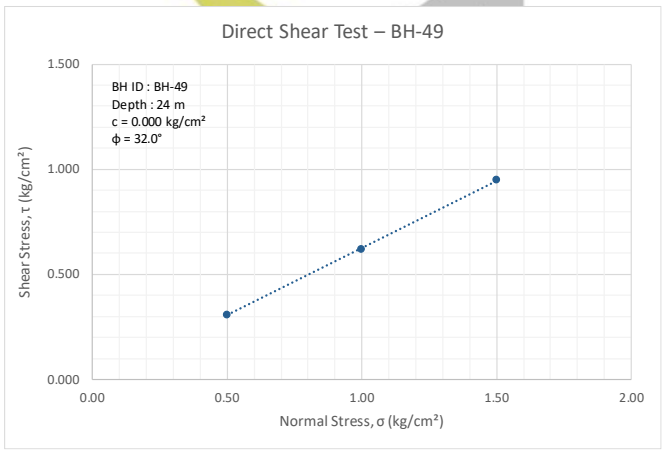

Direct Shear Test – BH-49
BH ID : BH-49
Depth : 9 m
c = 0.068 kg/cm²
ϕ = 26.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

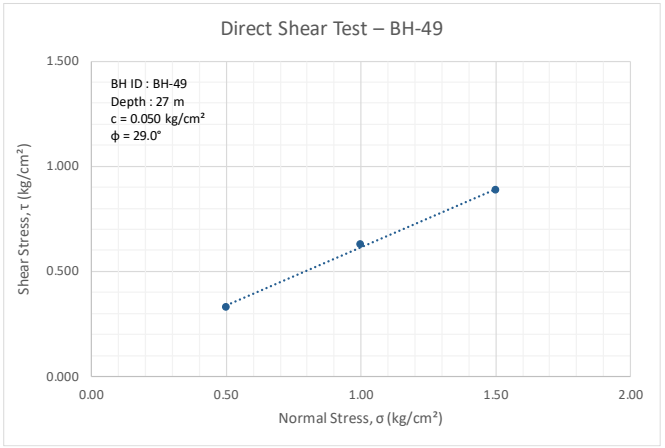

Direct Shear Test – BH-49
BH ID : BH-49
Depth : 12 m
c = 0.030 kg/cm²
ϕ = 28.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

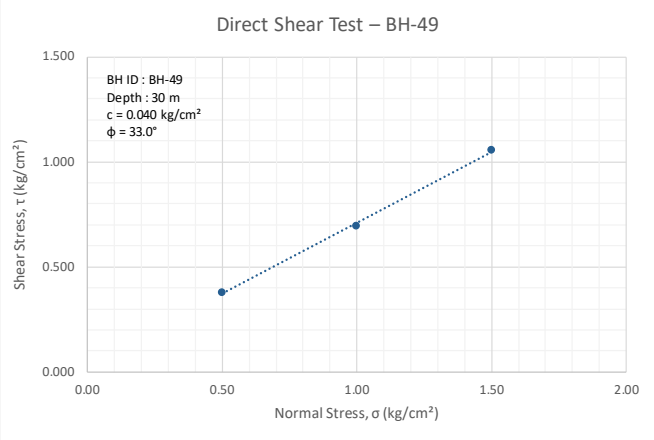

Direct Shear Test – BH-49
BH ID : BH-49
Depth : 15 m
c = 0.020 kg/cm²
ϕ = 29.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-49
BH ID : BH-49
Depth : 18 m
c = 0.000 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-49
BH ID : BH-49
Depth : 21 m
c = 0.020 kg/cm²
ϕ = 31.2°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-49
BH ID : BH-49
Depth : 24 m
c = 0.000 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-49
BH ID : BH-49
Depth : 27 m
c = 0.050 kg/cm²
ϕ = 29.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

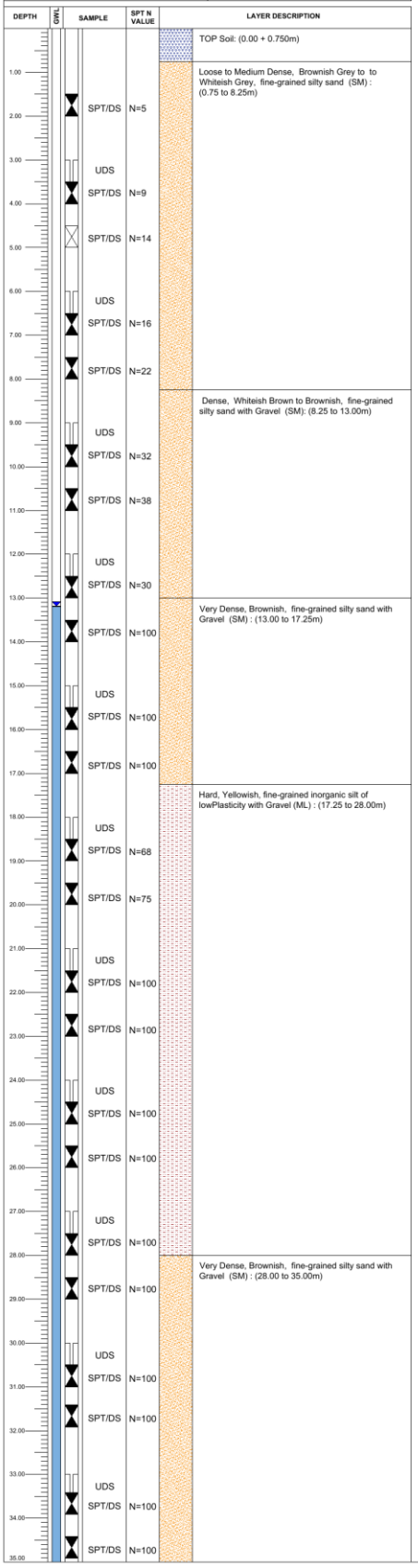

Direct Shear Test – BH-49
BH ID : BH-49
Depth : 30 m
c = 0.040 kg/cm²
ϕ = 33.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Noida Sector-142 to Botanical Garden (4+000 km TO 5+000 km)

BH ID : BH-50 | **Chainage** : 5+532 KM

Groundwater Level : 13.20 M | **Location** : Lat. 28.533921, Long. 77.35797



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

Soil

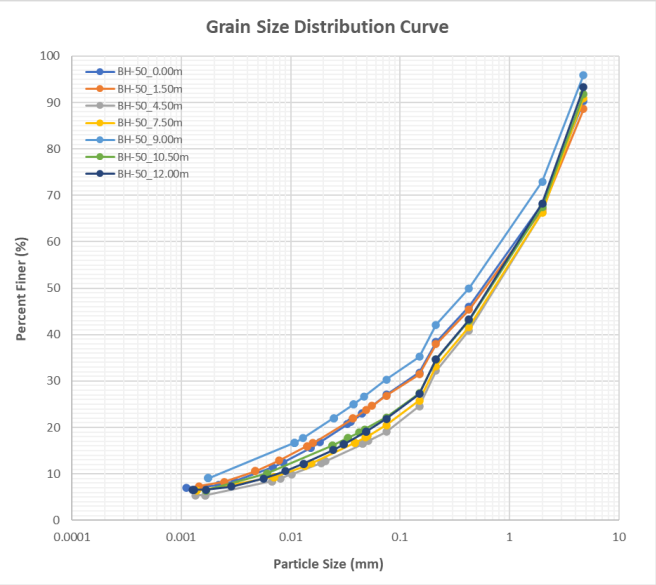
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

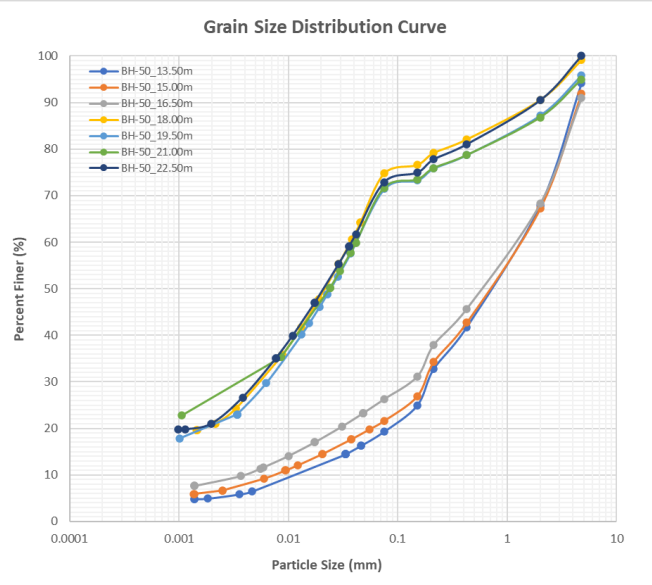
GOMA ENGINEERING AND CONSULTANCY
Quality we put forward

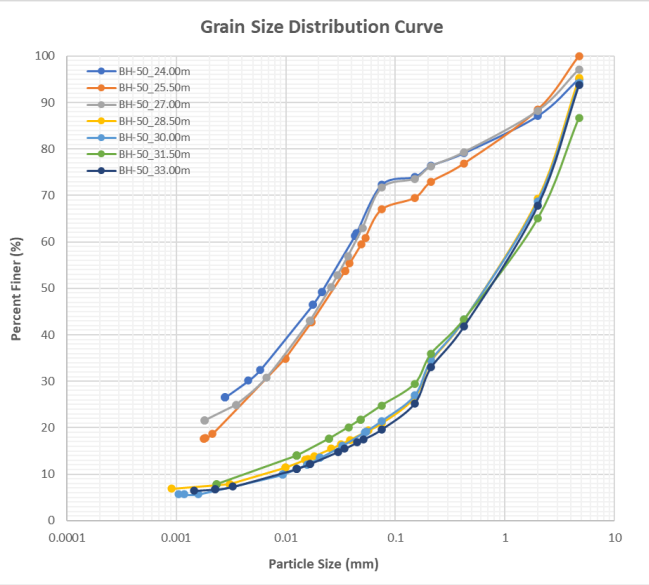
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-50	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	5+532	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	35.00	**Start Date:**	06-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	203.1	**End Date:**	07-01-2026
Project Code:	158_R06_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	14.20	**Location:**	Lat. 28.533921 Long. 77.35797

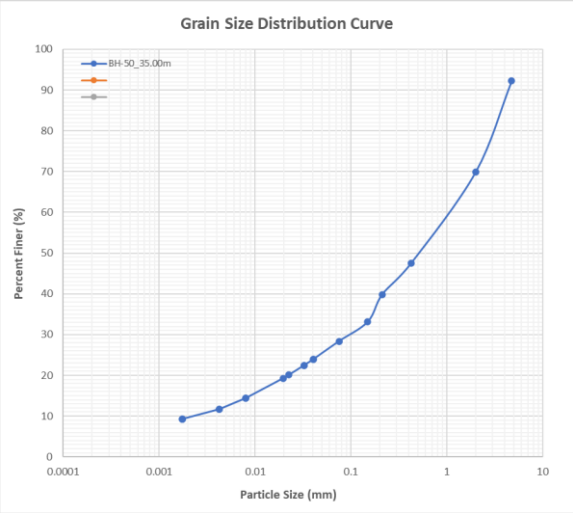
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [°]	Type	Cohesion [kPa]	Angle of Friction [°]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Loose to Medium Dense, Brownish Grey to to Whiteish Grey, fine-grained silty sand (SM)	2	2	3	5	7	11.4	61.8	18.9	7.9	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							-	-	-	-	25	NP	NP	9.24	1.93	1.77	2.68	F	0.02	21	UU	12	27	-	-	-
3.50	SPT/DS		2	3	6	9	10	-																			
4.50	SPT/DS		4	6	8	14	14	8.2	72.7	13.3	5.8	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							-	-	-	-	21	NP	NP	11.03	1.94	1.75	2.66	F	0.04	25	UU	0.9	28	-	-	-
6.50	SPT/DS		6	7	9	16	15	-																			
7.50	SPT/DS		7	10	12	22	20	9.0	70.5	13.5	7.0	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS	Dense, Whiteish Brown to Brownish, fine-grained silty sand with Gravel (SM)						4.1	65.6	20.8	9.6	26	NP	NP	12.24	1.82	1.63	2.62	F	0.07	27	-	-	-	-	-	-
9.50	SPT/DS		11	14	18	32	27	-																			
10.50	SPT/DS		12	17	21	38	31	8.2	69.7	15.2	6.9	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							6.7	71.4	15.0	6.8	24	NP	NP	13.17	1.89	1.67	2.60	F	0.03	28	-	-	-	-	-	-
12.50	SPT/DS		14	15	15	30	23	-																			
13.50	SPT/DS	Very Dense, Brownish, fine-grained silty sand with Gravel (SM)	20	50	-	100	44	5.9	74.8	14.3	5.1	21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS							8.1	70.3	15.2	6.4	29	NP	NP	15.11	-	-	2.70	F	0.04	29	-	-	-	-	-	-
15.50	SPT/DS		(60/13cm)	-	-	100	42	-																			
16.50	SPT/DS		35	(50/10cm)	-	100	42	9.0	64.7	17.9	8.5	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	UDS	Hard, Yellowish, fine-grained inorganic silt of lowPlasticity with Gravel (ML)						0.9	24.3	54.0	20.8	26	NP	NP	13.72	1.91	1.68	2.62	F	0.10	27	-	-	-	-	-	-
18.50	SPT/DS		20	28	40	68	30	-																			
19.50	SPT/DS		23	32	43	75	32	4.2	24.4	50.7	20.8	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	UDS							5.1	23.2	45.2	26.6	23	NP	NP	15.22	2.03	1.76	2.67	F	0.06	28	-	-	-	-	-	-
21.50	SPT/DS		36	(50/3cm)	-	100	39	-																			
22.50	SPT/DS		43	(50/6cm)	-	100	38	0.0	27.1	51.8	21.1	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	UDS							5.0	22.8	47.6	24.7	27	NP	NP	16.14	2.1	1.81	2.65	F	0.12	28	-	-	-	-	-	-
24.50	SPT/DS		37	(50/14cm)	-	100	37	-																			
25.50	SPT/DS		35	(50/7cm)	-	100	37	0.0	33.0	48.7	18.3	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	UDS							2.8	25.5	49.7	22.0	24	NP	NP	11.88	2.02	1.81	2.68	F	0.07	30	-	-	-	-	-	-
27.50	SPT/DS		(56/12cm)	-	-	100	36	-																			
28.50	SPT/DS	Very Dense, Brownish, fine-grained silty sand with Gravel (SM)	44	(50/7cm)	-	100	36	4.8	74.3	13.4	7.5	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	UDS							5.8	72.7	15.3	6.2	28	NP	NP	12.67	2.06	1.83	2.68	F	0.02	32	-	-	-	-	-	-
30.50	SPT/DS		(50/9cm)	-	-	100	35	-																			
31.50	SPT/DS		(50/13cm)	-	-	100	34	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
33.00	DS							6.3	74.1	13.0	6.7	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
33.50	SPT/DS		(50/9cm)	-	-	100	33	-																			
35.00	SPT/DS		(50/13cm)	-	-	100	31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

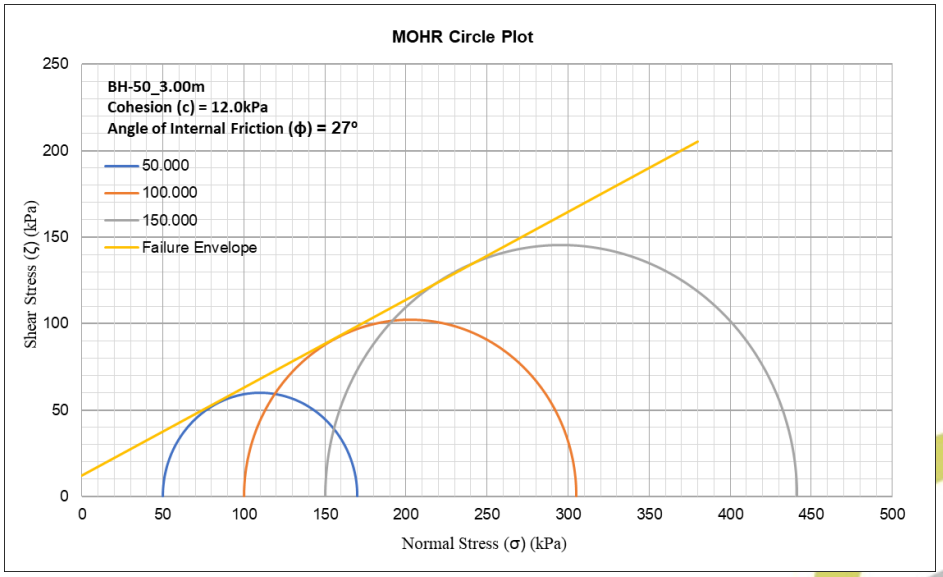
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

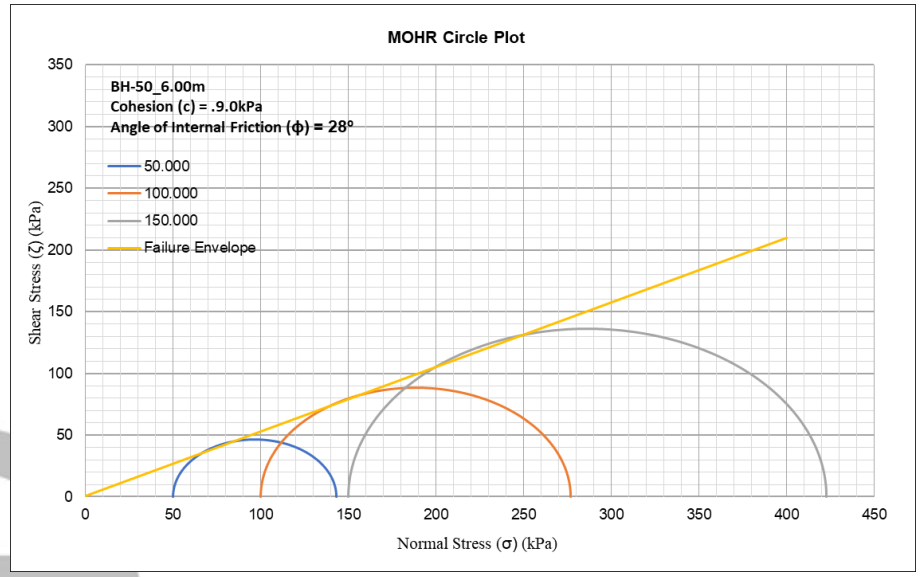

Grain Size Distribution Curve
BH-50_0.00m
BH-50_1.50m
BH-50_4.50m
BH-50_7.50m
BH-50_9.00m
BH-50_10.50m
BH-50_12.00m
Percent Finer (%)
Particle Size (mm)

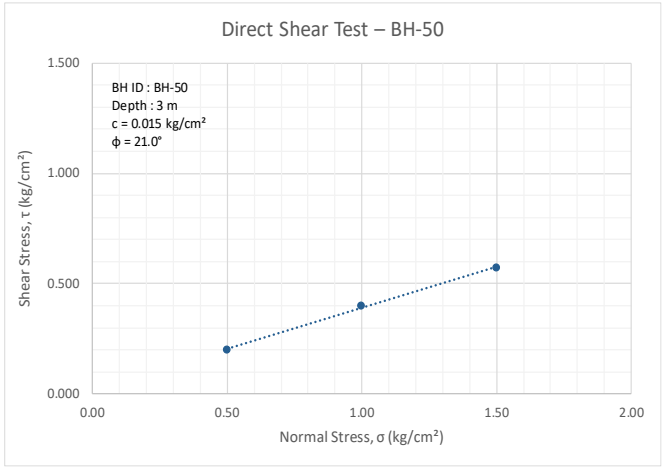

Grain Size Distribution Curve
BH-50_13.50m
BH-50_15.00m
BH-50_16.50m
BH-50_18.00m
BH-50_19.50m
BH-50_21.00m
BH-50_22.50m
Percent Finer (%)
Particle Size (mm)

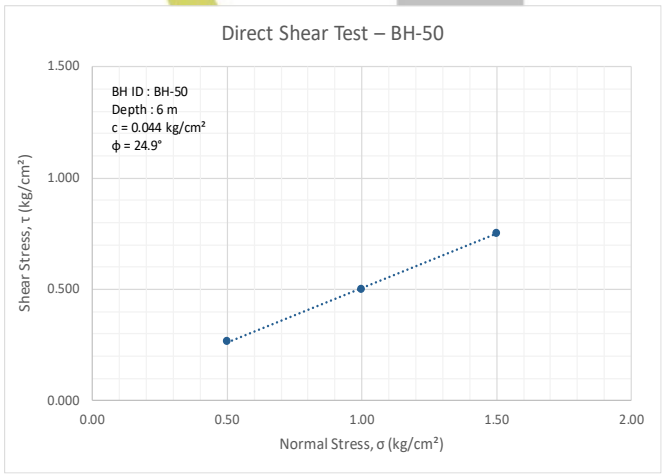

Grain Size Distribution Curve
BH-50_24.00m
BH-50_25.50m
BH-50_27.00m
BH-50_28.50m
BH-50_30.00m
BH-50_31.50m
BH-50_33.00m
Percent Finer (%)
Particle Size (mm)

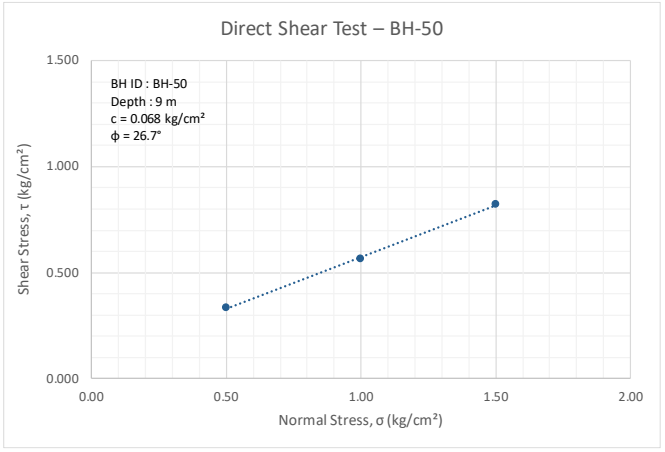

Grain Size Distribution Curve
BH-50_35.00m
Percent Finer (%)
Particle Size (mm)

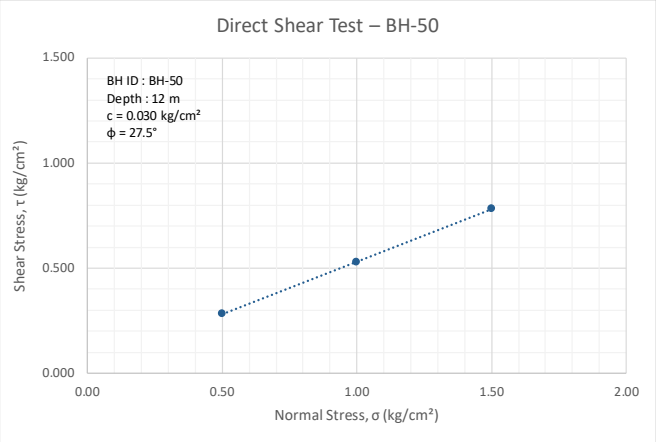

MOHR Circle Plot
BH-50_3.00m
Cohesion (c) = 12.0kPa
Angle of Internal Friction (ϕ) = 27°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

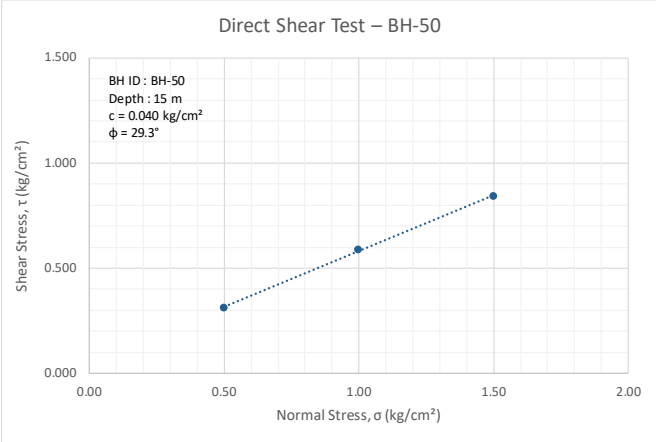

MOHR Circle Plot
BH-50_6.00m
Cohesion (c) = .9.0kPa
Angle of Internal Friction (ϕ) = 28°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

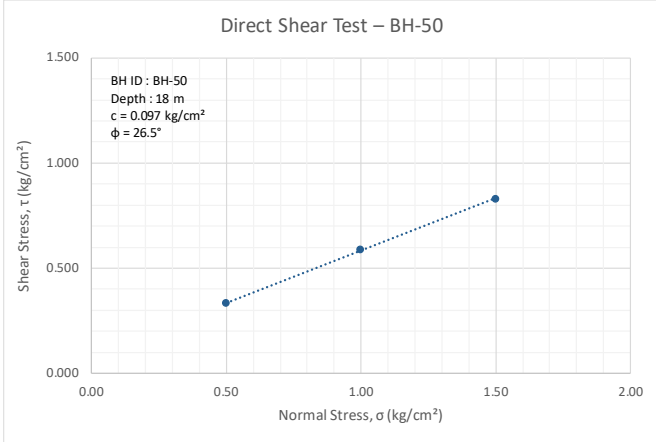

Direct Shear Test – BH-50
BH ID : BH-50
Depth : 3 m
c = 0.015 kg/cm²
ϕ = 21.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

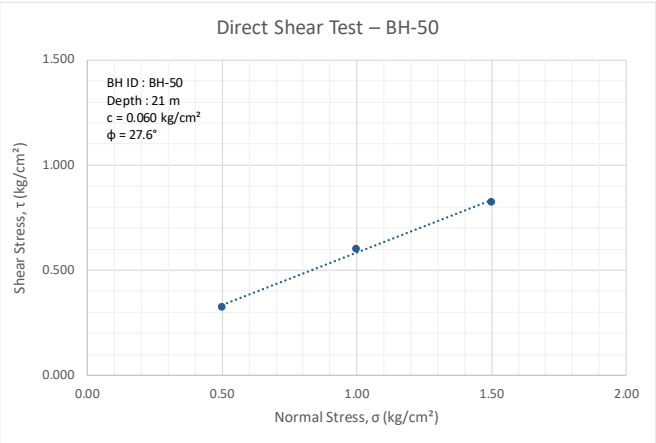

Direct Shear Test – BH-50
BH ID : BH-50
Depth : 6 m
c = 0.044 kg/cm²
ϕ = 24.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

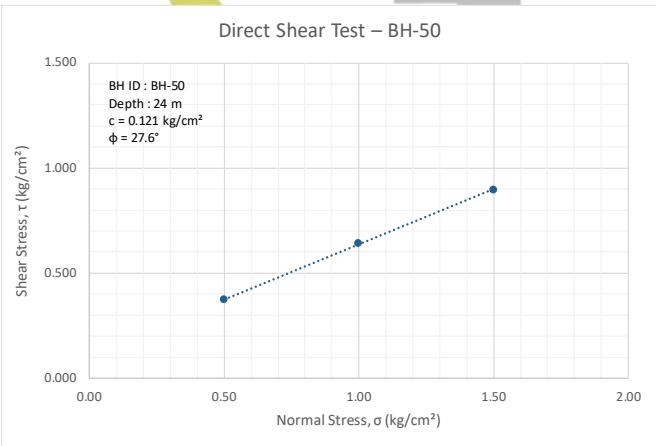

Direct Shear Test – BH-50
BH ID : BH-50
Depth : 9 m
c = 0.068 kg/cm²
ϕ = 26.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

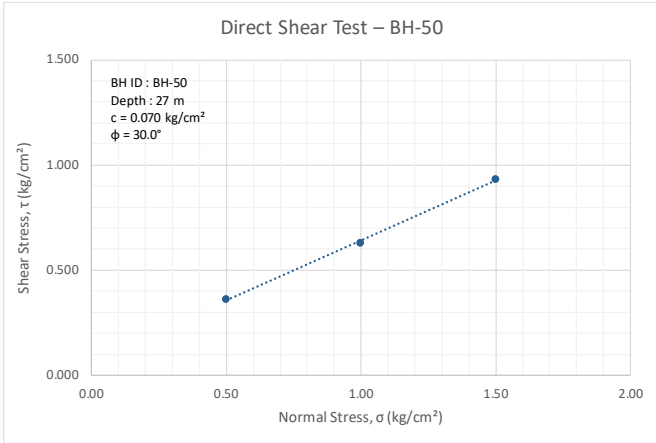

Direct Shear Test – BH-50
BH ID : BH-50
Depth : 12 m
c = 0.030 kg/cm²
ϕ = 27.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

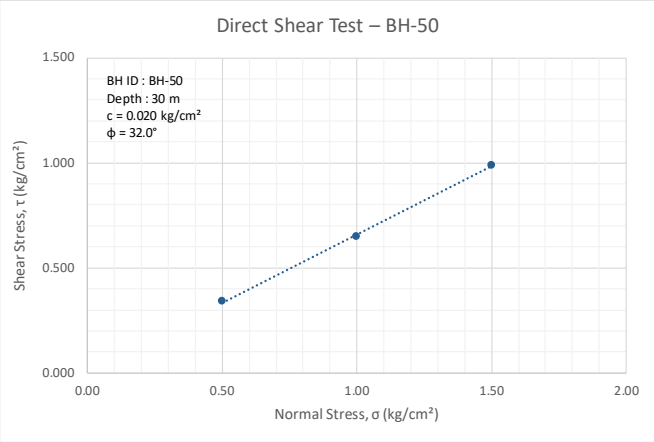

Direct Shear Test – BH-50
BH ID : BH-50
Depth : 15 m
c = 0.040 kg/cm²
ϕ = 29.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-50
BH ID : BH-50
Depth : 18 m
c = 0.097 kg/cm²
ϕ = 26.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

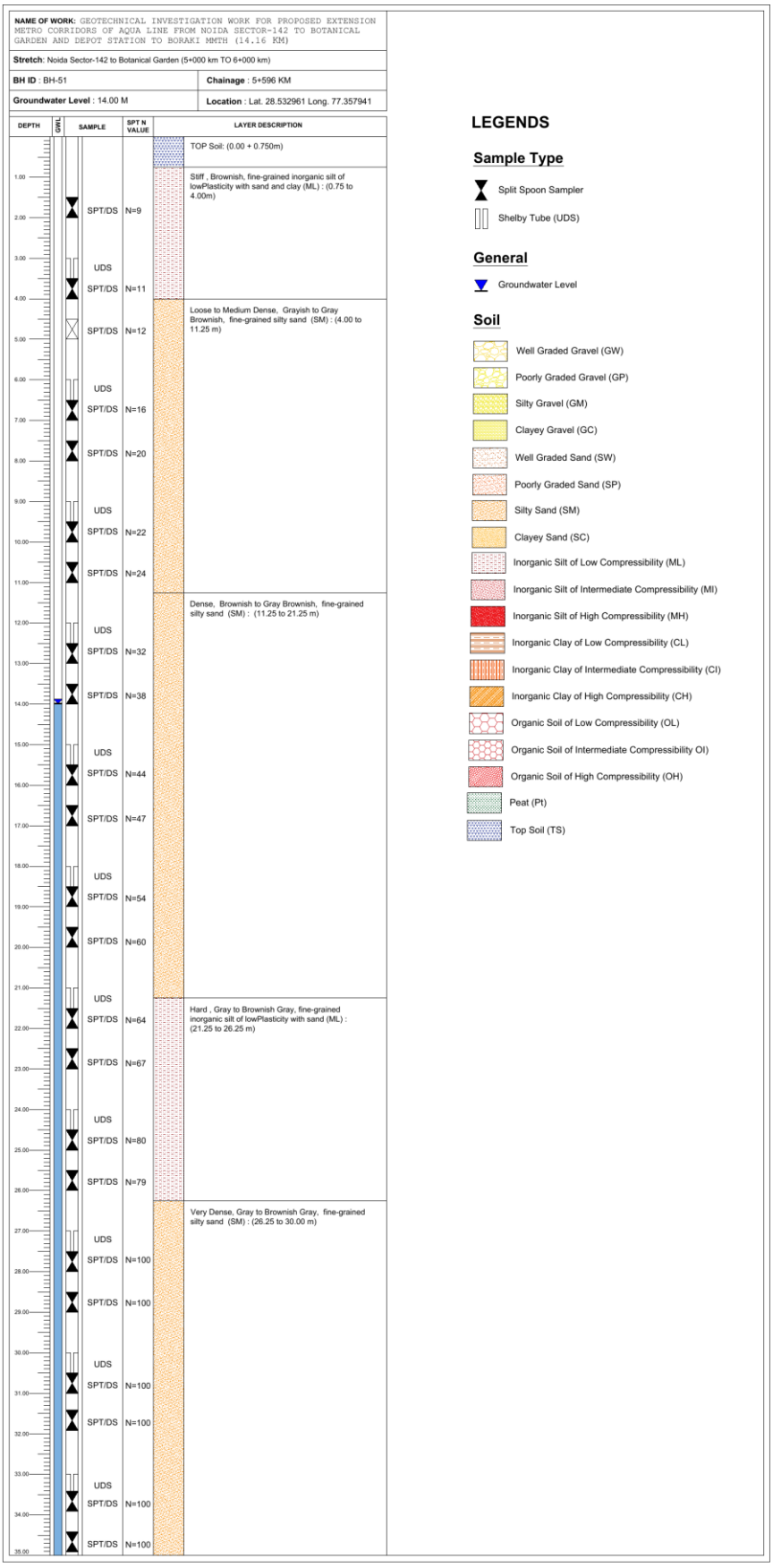

Direct Shear Test – BH-50
BH ID : BH-50
Depth : 21 m
c = 0.060 kg/cm²
ϕ = 27.6°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-50
BH ID : BH-50
Depth : 24 m
c = 0.121 kg/cm²
ϕ = 27.6°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-50
BH ID : BH-50
Depth : 27 m
c = 0.070 kg/cm²
ϕ = 30.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-50
BH ID : BH-50
Depth : 30 m
c = 0.020 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

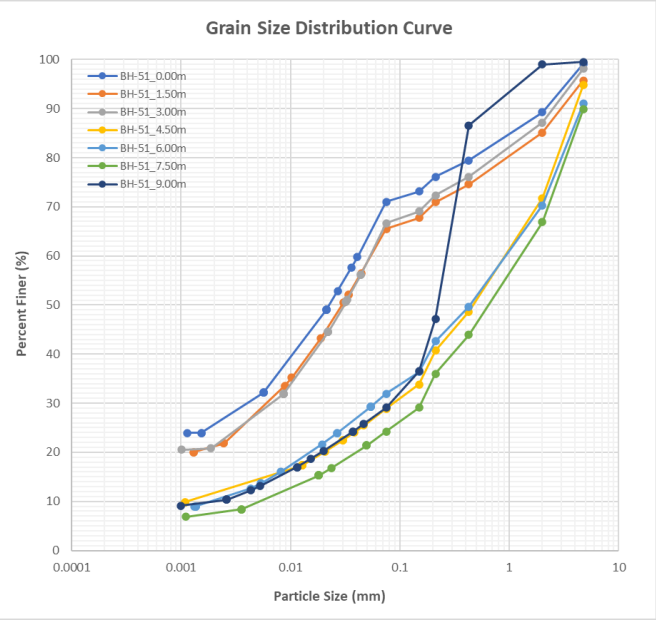
C.7. Zone 7: CH: 5+530 km to 6+490 km (BH-51 to BH-60)

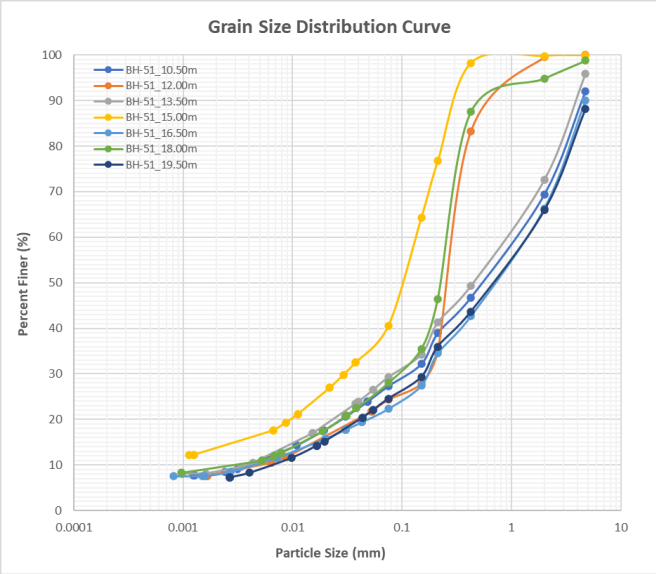


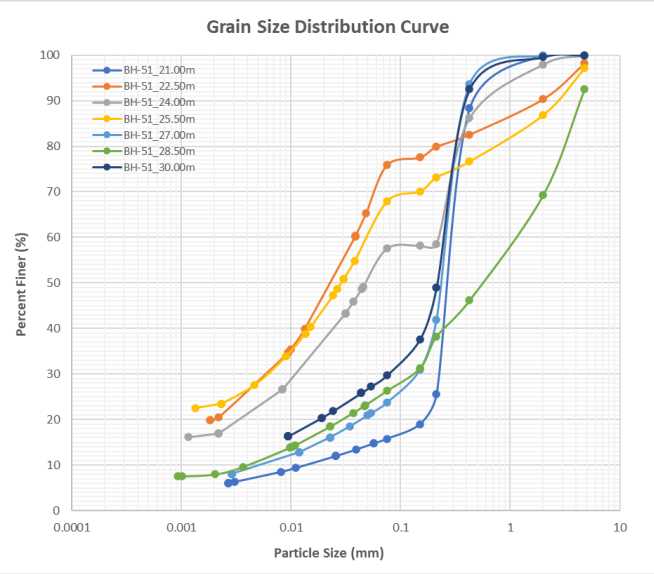
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-51	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	5+596	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	35.00	**Start Date:**	16-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	198.1	**End Date:**	17-01-2026
Project Code:	158_R07_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	14.00	**Location:**	Lat: 28.532961, Long: 77.357941

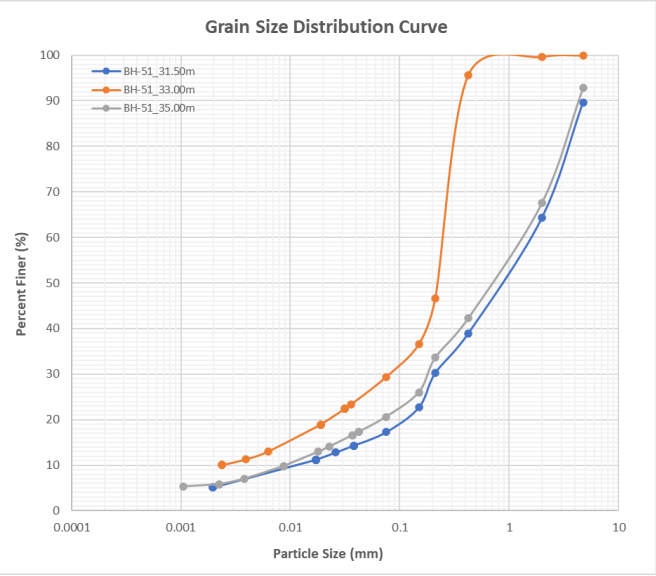
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [^{o}]	Type	Cohesion [kPa]	Angle of Friction [^{o}]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						0.9	28.0	45.4	25.6	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Stiff , Brownish, fine-grained inorganic silt of lowPlasticity with sand and clay (ML)	3	4	5	9	13	4.3	30.2	44.3	21.3	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							1.9	31.5	45.3	21.3	27	NP	NP	9.67	1.88	1.71	2.695	F	0.02	23	UU	16	26	-	-	-
3.50	SPT/DS		4	5	6	11	12	-																			
4.50	SPT/DS	Loose to Medium Dense,Grayish to Gray Brownish,fine-grained silty sand(SM)	4	6	6	12	12	5.2	65.9	17.2	11.7	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							9.0	59.0	21.8	10.2	21	NP	NP	11.64	1.89	1.69	2.698	F	0.04	25	UU	12	28	-	-	-
6.50	SPT/DS		7	7	9	16	15	-																			
7.50	SPT/DS		7	9	11	20	18	10.2	65.6	16.6	7.6	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	DS							0.5	70.4	19.1	10.1	24	NP	NP	12.30	-	-	2.63	F	0.06	26	-	-	-	-	-	-
9.50	SPT/DS		6	9	13	22	19	-																			
10.50	SPT/DS		8	11	13	24	20	7.9	64.7	19.2	8.1	21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	DS	Dense,Brownish to Gray Brownish,fine-grained silty sand(SM)						0.0	75.7	16.3	8.0	23	NP	NP	11.42	-	-	2.64	F	0.50	27	-	-	-	-	-	-
12.50	SPT/DS		10	14	18	32	24	-																			
13.50	SPT/DS		12	17	21	38	27	4.1	66.7	20.7	8.5	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS							0.1	59.4	26.9	13.7	27	NP	NP	13.24	-	-	2.64	F	0.70	28	-	-	-	-	-	-
15.50	SPT/DS		15	20	24	44	22	-																			
16.50	SPT/DS		17	21	26	47	23	9.9	67.8	14.3	8.0	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS							1.2	70.7	18.6	9.5	28	NP	NP	10.78	-	-	2.65	F	0.08	29	-	-	-	-	-	-
18.50	SPT/DS		20	24	30	54	25	-																			
19.50	SPT/DS		22	27	33	60	27	11.8	63.6	24.6	8.6	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS							0.0	84.2	15.8	0.0	25	NP	NP	12.50	-	-	2.60	F	0.09	30	-	-	-	-	-	-
21.50	SPT/DS	Hard , Gray to Brownish Gray, fine-grained inorganic silt of lowPlasticity with sand (ML)	25	30	34	64	27	-																			
22.50	SPT/DS		24	31	36	67	28	1.8	22.3	55.7	20.2	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							0.1	42.3	40.7	16.9	27	NP	NP	14.11	-	-	2.64	F	0.10	28	-	-	-	-	-	-
24.50	SPT/DS		30	35	45	80	31	-																			
25.50	SPT/DS		32	37	42	79	30	2.8	29.3	44.8	23.1	28	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS	Very Dense, Gray to Brownish Gray,fine-grained silty sand(SM)						0.0	76.3	15.8	7.9	26	NP	NP	15.22	-	-	2.67	F	0.00	31	-	-	-	-	-	-
27.50	SPT/DS		38	45	(50/4cm)	100	36	-																			
28.50	SPT/DS		42	(50/6cm)	-	100	35	7.5	66.2	18.4	8.0	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							0.0	70.3	17.5	12.2	26	NP	NP	12.26	-	-	2.66	F	0.12	33	-	-	-	-	-	-
30.50	SPT/DS		45	(50/4cm)	-	100	34	-																			
31.50	SPT/DS		48	(50/3cm)	-	100	33	10.3	72.4	12.1	5.2	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
33.00	DS							0.0	70.7	22.8	6.5	27	NP	NP	11.56	-	-	2.65	-	-	-	-	-	-	-	-	-
33.50	SPT/DS		(50/10cm)	-	-	100	32	-																			
35.00	SPT/DS		(50/8cm)	-	-	100	30	7.2	72.2	14.9	5.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

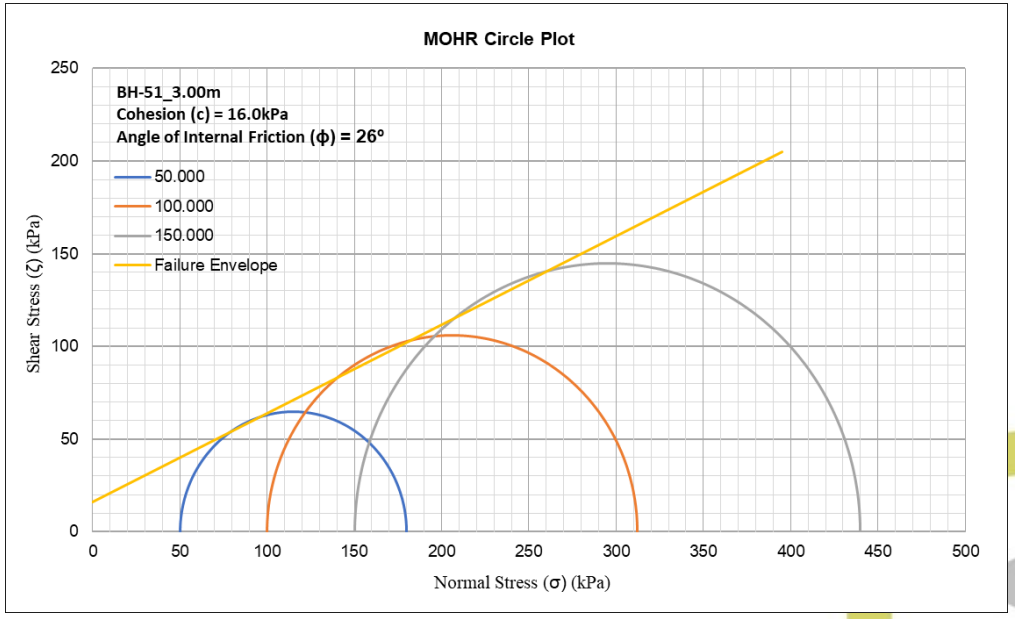
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

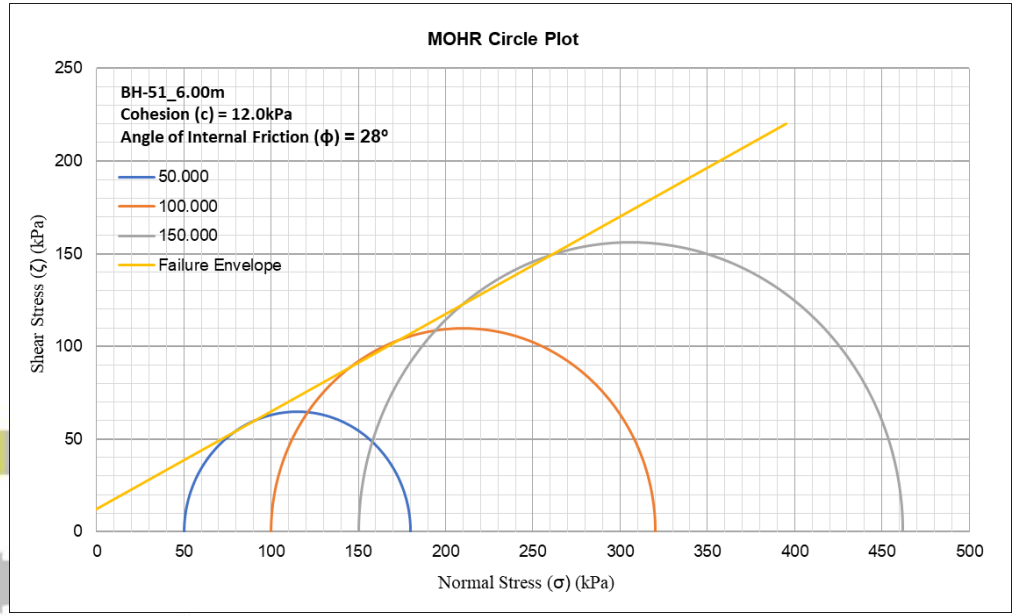

Grain Size Distribution Curve
BH-51_0.00m
BH-51_1.50m
BH-51_3.00m
BH-51_4.50m
BH-51_6.00m
BH-51_7.50m
BH-51_9.00m
Percent Finer (%)
Particle Size (mm)

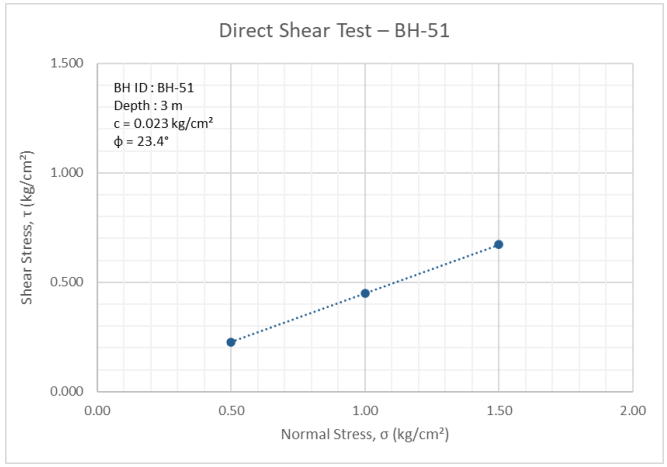

Grain Size Distribution Curve
BH-51_10.50m
BH-51_12.00m
BH-51_13.50m
BH-51_15.00m
BH-51_16.50m
BH-51_18.00m
BH-51_19.50m
Percent Finer (%)
Particle Size (mm)

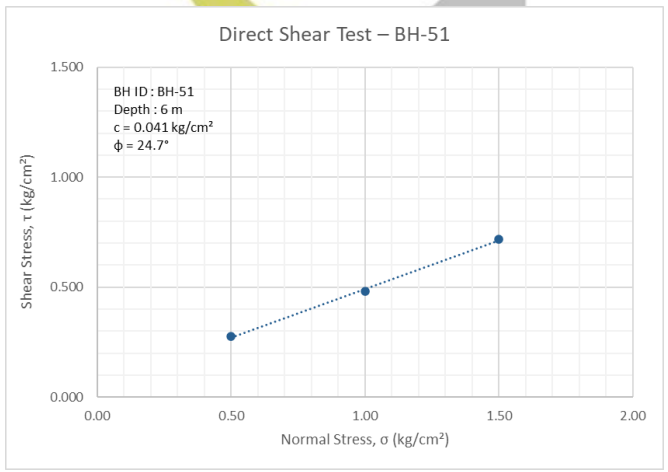

Grain Size Distribution Curve
BH-51_21.00m
BH-51_22.50m
BH-51_24.00m
BH-51_25.50m
BH-51_27.00m
BH-51_28.50m
BH-51_30.00m
Percent Finer (%)
Particle Size (mm)

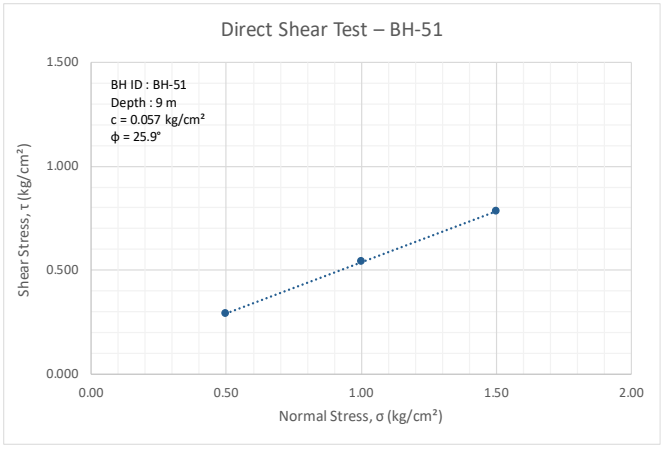

Grain Size Distribution Curve
BH-51_31.50m
BH-51_33.00m
BH-51_35.00m
Percent Finer (%)
Particle Size (mm)

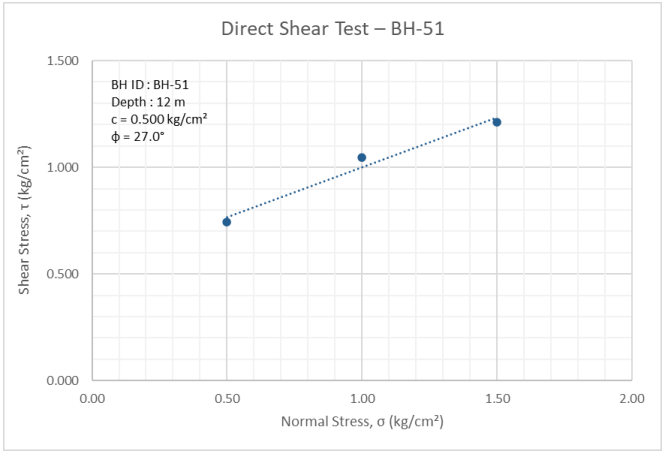

MOHR Circle Plot
BH-51_3.00m
Cohesion (c) = 16.0kPa
Angle of Internal Friction (ϕ) = 26°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)
0
50
100
150
200
250
300
350
400
450
500

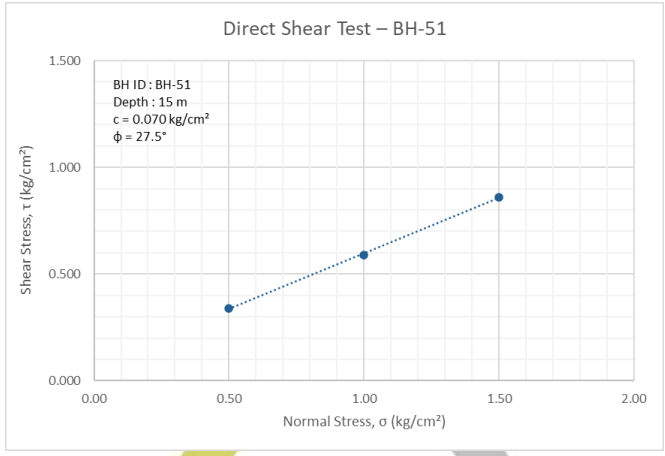

MOHR Circle Plot
BH-51_6.00m
Cohesion (c) = 12.0kPa
Angle of Internal Friction (ϕ) = 28°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)
0
50
100
150
200
250
300
350
400
450
500

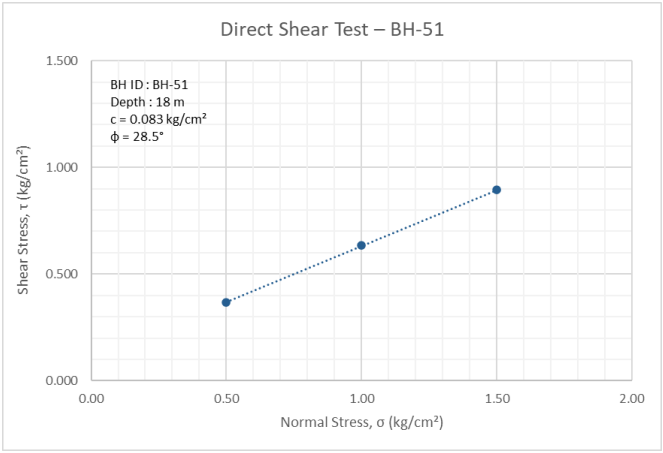

Direct Shear Test – BH-51
BH ID : BH-51
Depth : 3 m
c = 0.023 kg/cm²
ϕ = 23.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

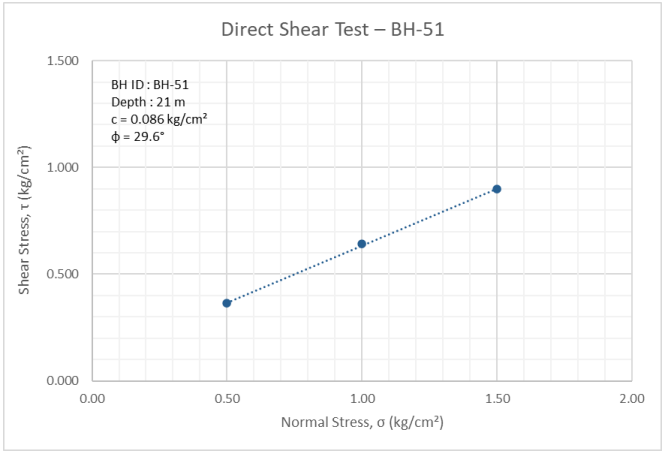

Direct Shear Test – BH-51
BH ID : BH-51
Depth : 6 m
c = 0.041 kg/cm²
ϕ = 24.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

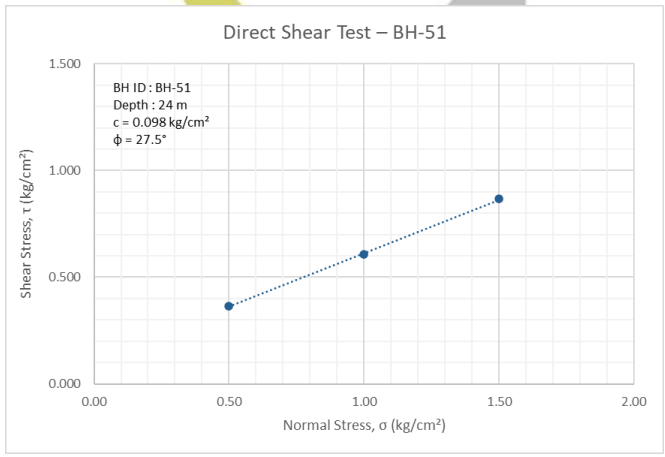

Direct Shear Test – BH-51
BH ID : BH-51
Depth : 9 m
c = 0.057 kg/cm²
ϕ = 25.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

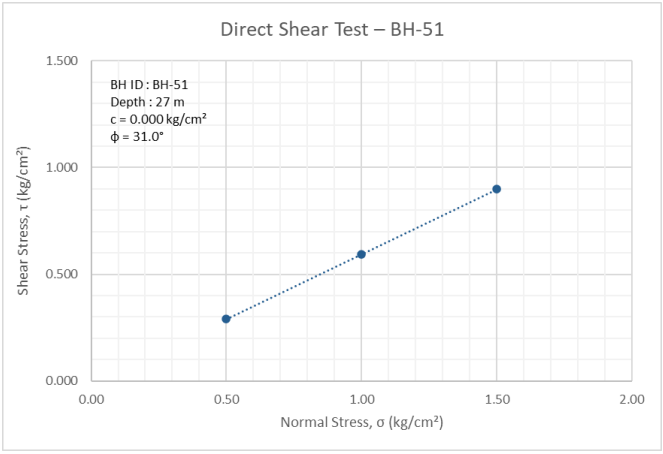

Direct Shear Test – BH-51
BH ID : BH-51
Depth : 12 m
c = 0.500 kg/cm²
ϕ = 27.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

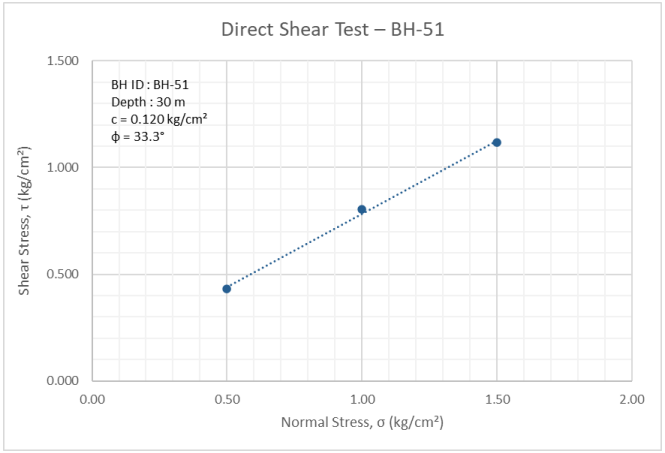

Direct Shear Test – BH-51
BH ID : BH-51
Depth : 15 m
c = 0.070 kg/cm²
ϕ = 27.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-51
BH ID : BH-51
Depth : 18 m
c = 0.083 kg/cm²
ϕ = 28.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-51
BH ID : BH-51
Depth : 21 m
c = 0.086 kg/cm²
ϕ = 29.6°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-51
BH ID : BH-51
Depth : 24 m
c = 0.098 kg/cm²
ϕ = 27.5°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-51
BH ID : BH-51
Depth : 27 m
c = 0.000 kg/cm²
ϕ = 31.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

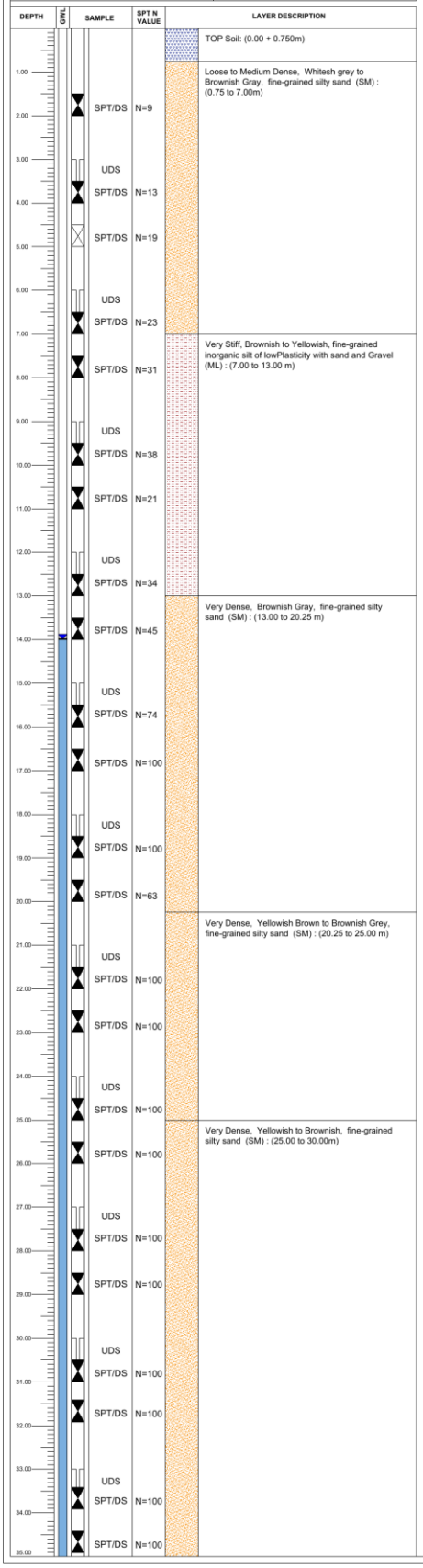

Direct Shear Test – BH-51
BH ID : BH-51
Depth : 30 m
c = 0.120 kg/cm²
ϕ = 33.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00

NAME OF WORK: GEOTECHNICAL INVESTIGATION WORK FOR PROPOSED EXTENSION METRO CORRIDORS OF AQUA LINE FROM NOIDA SECTOR-142 TO BOTANICAL GARDEN AND DEPOT STATION TO BORAKI MMTH (14.16 KM)

Stretch: Noida Sector-142 to Botanical Garden (5+000 km TO 6+000 km)

BH ID : BH-52 | **Chainage** : 5+718 KM

Groundwater Level : 14.00 M | **Location** : Lat. 28.53284 Long. 77.359405



LEGENDS

Sample Type

- Split Spoon Sampler
- Shelby Tube (UDS)

General

- Groundwater Level

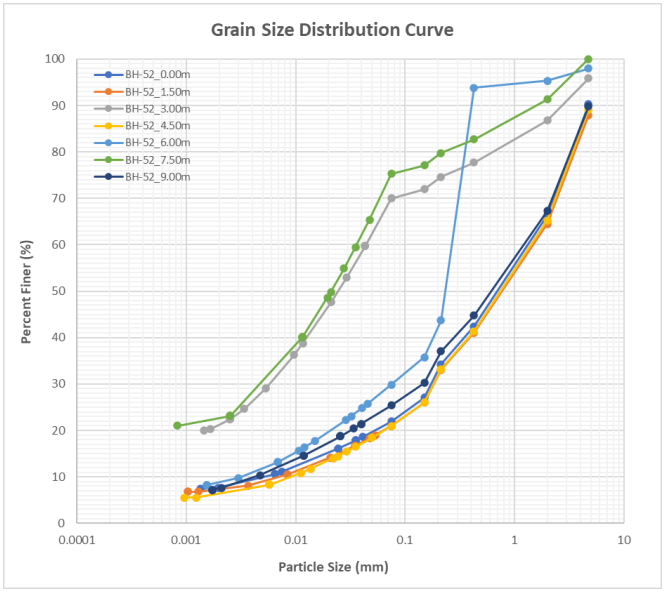
Soil

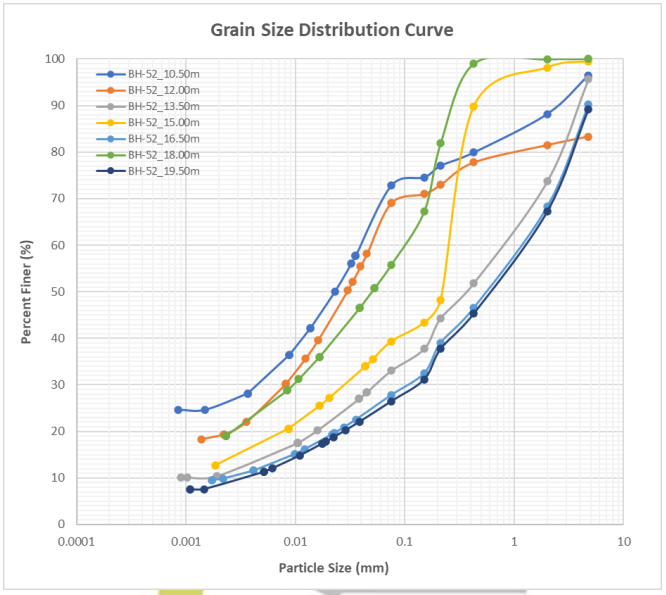
- Well Graded Gravel (GW)
- Poorly Graded Gravel (GP)
- Silty Gravel (GM)
- Clayey Gravel (GC)
- Well Graded Sand (SW)
- Poorly Graded Sand (SP)
- Silty Sand (SM)
- Clayey Sand (SC)
- Inorganic Silt of Low Compressibility (ML)
- Inorganic Silt of Intermediate Compressibility (MI)
- Inorganic Silt of High Compressibility (MH)
- Inorganic Clay of Low Compressibility (CL)
- Inorganic Clay of Intermediate Compressibility (CI)
- Inorganic Clay of High Compressibility (CH)
- Organic Soil of Low Compressibility (OL)
- Organic Soil of Intermediate Compressibility OI)
- Organic Soil of High Compressibility (OH)
- Peat (Pt)
- Top Soil (TS)

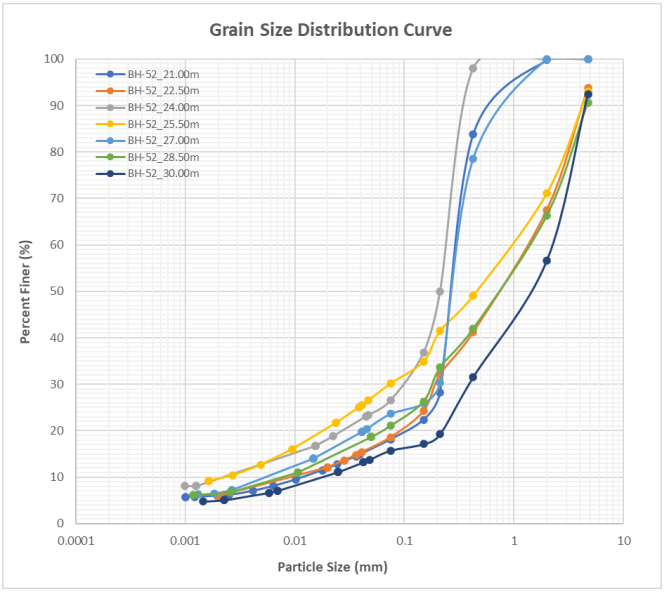
Project		Borehole Details		Drilling Details	
Name of Work:	Geotechnical Investigation work for Proposed Extension Metro Corridors of Aqua Line from Noida Sector-142 to Botanical Garden and Depot Station to Boraki MMTH (14.16 km) (E Tender No. NMRC/Civil/Geo. Inv./366/2025)	**BH ID:**	BH-52	**Contractor:**	Goma Engineering & Consultancy
		Chainage [km]:	5+718	**Method of Drilling:**	Rotary Drilling
Client:	Noida Metro Rail Corporation (NMRC) Limited	**Depth [m]:**	35.00	**Start Date:**	03-01-2026
Stretch:	Noida Sector-142 to Botanical Garden	**Elevation [m]:**	200.1	**End Date:**	05-01-2026
Project Code:	158_R07_Noida Sector-142 to Botanical Garden_0-372 km TO 12+130 km	**Water table Level [m]:**	14.00	**Location:**	Lat: 28.53284, Long: 77.359405

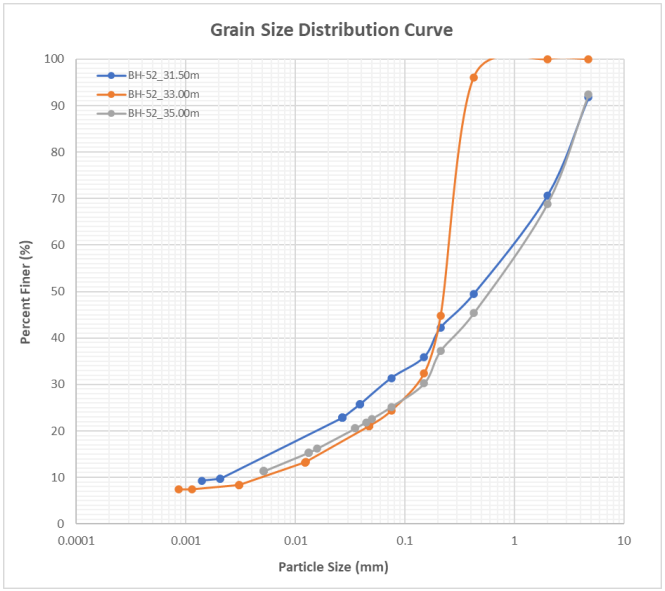
Depth [m]	Sample Type	Descriptions	SPT Test Results					Soil Particles				Atterberg Limits			Physical Characteristics				Direct Shear Test			Triaxial Comp Test			Consolidation Test		
			N1 (Seating Drive)	N2 (First Drive)	N3 (Second Drive)	Observed SPT	N (Correct N)	Gravel [%]	Sand [%]	Silt [%]	Clay [%]	Liquid Limit [%]	Plastic Limit [%]	Plasticity Index [%]	Moisture Content [%]	Bulk Density [gm/cm^3]	Dry Density [gm/cm^3]	Specific Gravity	Type	Cohesion [kg/cm^2]	Angle of Friction [^{o}]	Type	Cohesion [kPa]	Angle of Friction [^{o}]	Swelling Index	Consolidation Index	Preconsolidation Pressure [kg/cm^2]
0.00	DS	Top Soil						9.8	68.3	14.2	7.7	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
1.50	SPT/DS	Loose to Medium Dense, Whitesh grey to Brownish Gray, fine-grained silty sand (SM)	2	4	5	9	13	12.1	66.9	13.6	7.4	25	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
3.00	UDS							4.2	25.8	48.8	21.2	26	NP	NP	9.26	1.9	1.74	2.61	F	0.03	22	UU	11	27	-	-	-
3.50	SPT/DS		5	6	7	13	14	-																			
4.50	SPT/DS		7	9	10	19	19	10.9	68.2	14.5	6.4	21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
6.00	UDS							2.0	68.1	21.0	8.8	28	NP	NP	10.26	1.85	1.67	2.63	F	0.06	25	-	-	-	-	-	-
6.50	SPT/DS		8	10	13	23	22	-																			
7.50	SPT/DS	Very Stiff, Brownish to Yellowish, fine-grained inorganic silt of lowPlasticity with sand and Gravel (ML)	12	15	16	31	28	0.0	24.7	52.6	22.7	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
9.00	UDS							10.2	64.4	17.9	7.5	28	NP	NP	12.81	1.94	1.72	2.67	F	0.09	26	UU	12	26	-	-	-
9.50	SPT/DS		14	18	20	38	32	-																			
10.50	SPT/DS		6	9	12	21	17	3.5	23.7	47.0	25.8	29	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
12.00	UDS							16.6	14.3	50.0	19.1	26	NP	NP	14.56	1.85	1.61	2.66	F	0.06	28	-	-	-	-	-	-
12.50	SPT/DS		12	16	18	34	26	-																			
13.50	SPT/DS	Very Dense, Brownish Gray, fine-grained silty sand (SM)	18	21	24	45	32	4.4	62.6	22.5	10.6	24	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
15.00	DS							0.5	60.2	26.2	13.1	26	NP	NP	9.66	-	-	2.70	F	0.09	29	-	-	-	-	-	-
15.50	SPT/DS		23	34	40	74	32	-																			
16.50	SPT/DS		(60/10cm)	-	-	100	40	9.8	62.4	18.1	9.8	23	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
18.00	DS							0.0	44.2	41.3	14.5	24	NP	NP	11.53	-	-	2.62	F	0.00	30	-	-	-	-	-	-
18.50	SPT/DS		21	42	(50/6cm)	100	39	-																			
19.50	SPT/DS		20	24	39	63	27	10.7	62.8	18.0	8.5	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
21.00	DS	Very Dense, Yellowish Brown to Brownish Grey, fine-grained silty sand (SM)						0.0	81.9	12.1	6.1	22	NP	NP	12.23	-	-	2.65	F	0.02	30	-	-	-	-	-	-
21.50	SPT/DS		45	50	-	100	38	-																			
22.50	SPT/DS		40	(50/9cm)	-	100	37	6.2	75.2	12.7	5.9	21	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
24.00	DS							0.0	73.4	16.9	9.7	26	NP	NP	14.18	-	-	2.65	F	0.11	31	-	-	-	-	-	-
24.50	SPT/DS		46	(50/8cm)	-	100	36	-																			
25.50	SPT/DS	Very Dense, Yellowish to Brownish, fine-grained silty sand (SM)	44	50	-	100	36	6.9	62.9	20.4	9.7	27	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
27.00	DS							0.0	76.4	17.0	6.7	26	NP	NP	13.22	-	-	2.64	F	0.03	32	-	-	-	-	-	-
27.50	SPT/DS		(52/5cm)	-	-	100	35	-																			
28.50	SPT/DS		47	50	-	100	35	9.4	69.5	14.5	6.6	22	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
30.00	DS							7.6	76.7	10.8	5.0	24	NP	NP	15.66	-	-	2.66	F	0.05	34	-	-	-	-	-	-
30.50	SPT/DS		48	(50/9cm)	-	100	33	-																			
31.50	SPT/DS		42	(48/7cm)	-	100	33	8.3	60.3	21.7	9.7	26	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
33.00	DS							0.0	75.7	16.4	8.0	23	NP	NP	12.26	-	-	2.61	-	-	-	-	-	-	-	-	-
33.50	SPT/DS		46	50	-	100	31	-																			
35.00	SPT/DS		(50/4cm)	-	-	100	29	7.6	67.2	25.2	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

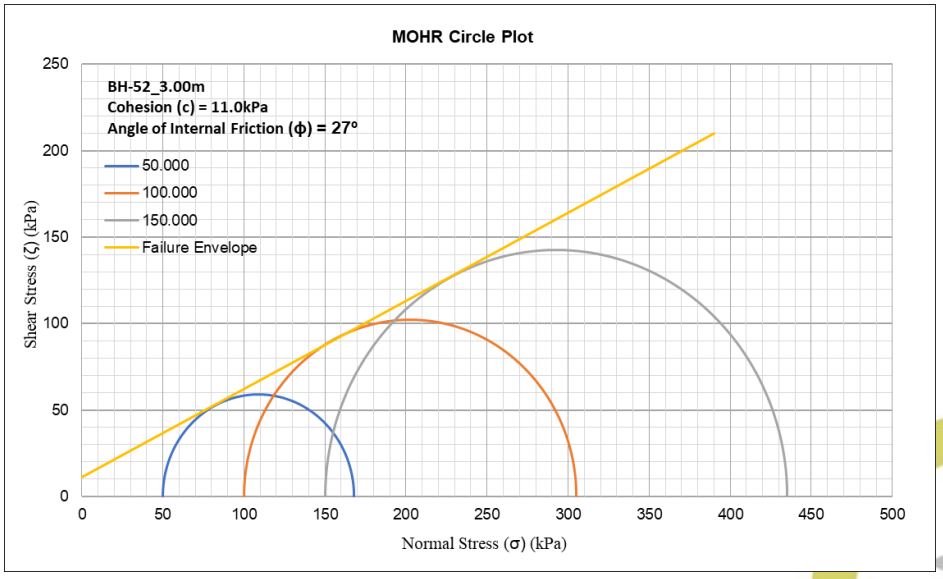
Notations: UDS = Undisturbed Sample, DS = Disturbed Sample, RC = Rock Core, F = Fast, S = Slow, UU = Unconsolidated Undrained Tri-axial compression Test, NP = Non Plastic.

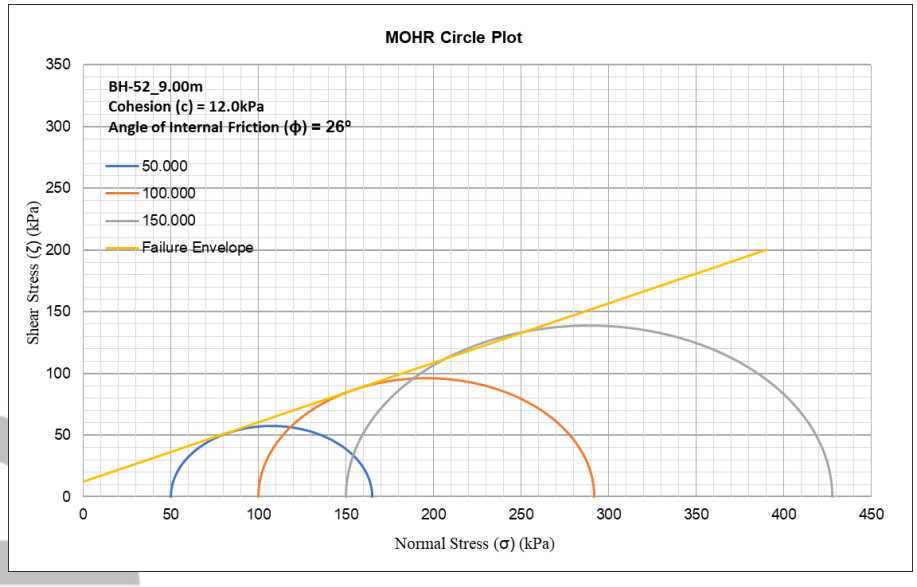

Grain Size Distribution Curve
Percent Finer (%)
Particle Size (mm)
BH-52_0.00m
BH-52_1.50m
BH-52_3.00m
BH-52_4.50m
BH-52_6.00m
BH-52_7.50m
BH-52_9.00m

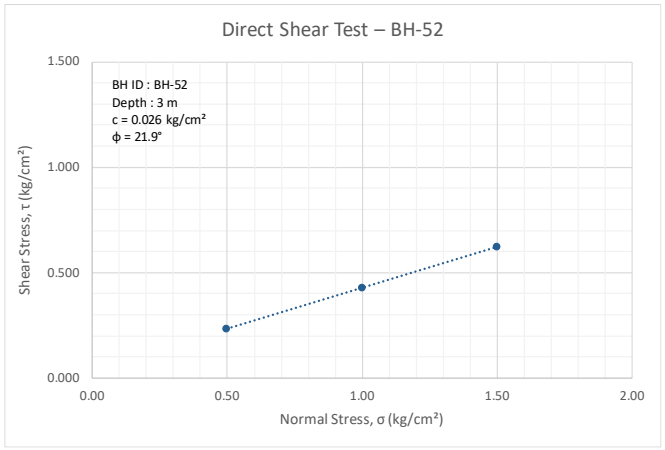

Grain Size Distribution Curve
Percent Finer (%)
Particle Size (mm)
BH-52_10.50m
BH-52_12.00m
BH-52_13.50m
BH-52_15.00m
BH-52_16.50m
BH-52_18.00m
BH-52_19.50m

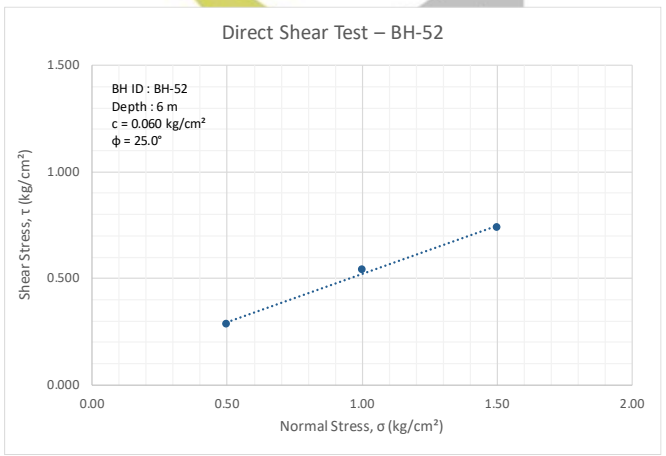

Grain Size Distribution Curve
Percent Finer (%)
Particle Size (mm)
BH-52_21.00m
BH-52_22.50m
BH-52_24.00m
BH-52_25.50m
BH-52_27.00m
BH-52_28.50m
BH-52_30.00m

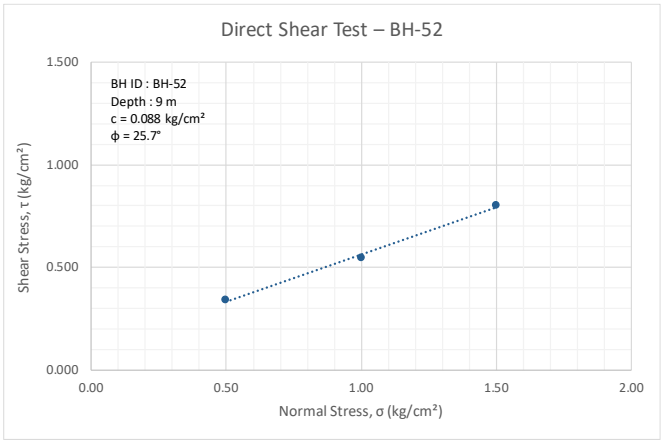

Grain Size Distribution Curve
Percent Finer (%)
Particle Size (mm)
BH-52_31.50m
BH-52_33.00m
BH-52_35.00m

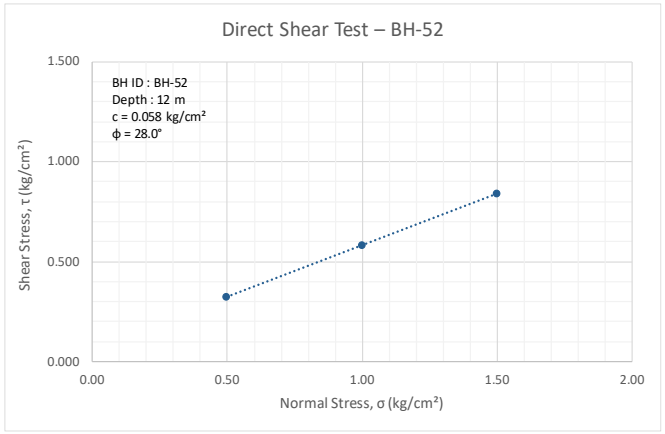

MOHR Circle Plot
BH-52_3.00m
Cohesion (c) = 11.0kPa
Angle of Internal Friction (ϕ) = 27°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

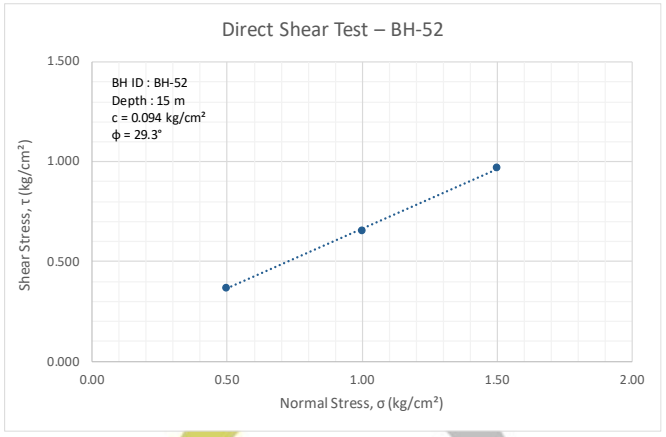

MOHR Circle Plot
BH-52_9.00m
Cohesion (c) = 12.0kPa
Angle of Internal Friction (ϕ) = 26°
50.000
100.000
150.000
Failure Envelope
Shear Stress (ζ) (kPa)
Normal Stress (σ) (kPa)

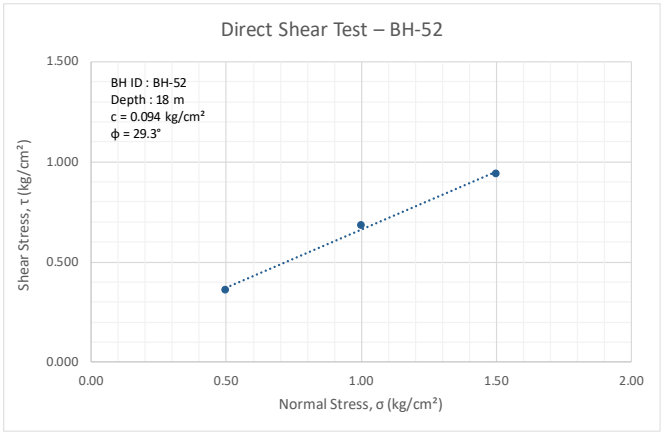

Direct Shear Test – BH-52
BH ID : BH-52
Depth : 3 m
c = 0.026 kg/cm²
ϕ = 21.9°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

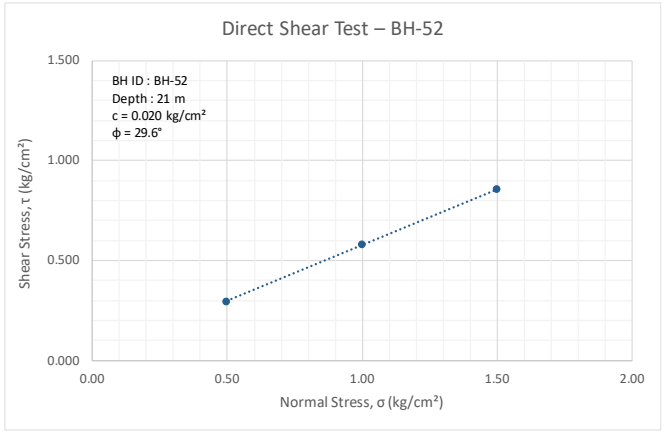

Direct Shear Test – BH-52
BH ID : BH-52
Depth : 6 m
c = 0.060 kg/cm²
ϕ = 25.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

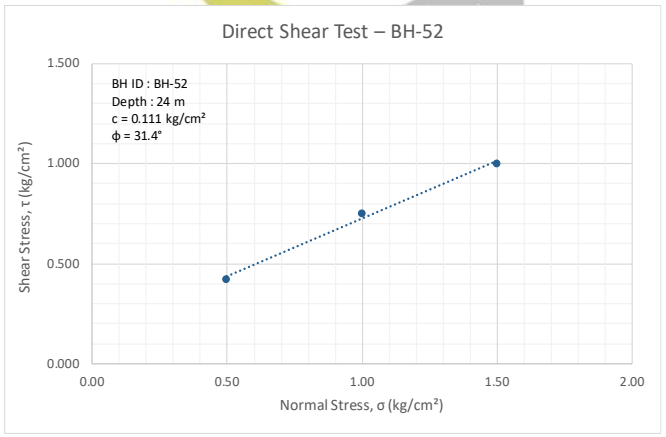

Direct Shear Test – BH-52
BH ID : BH-52
Depth : 9 m
c = 0.088 kg/cm²
ϕ = 25.7°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)

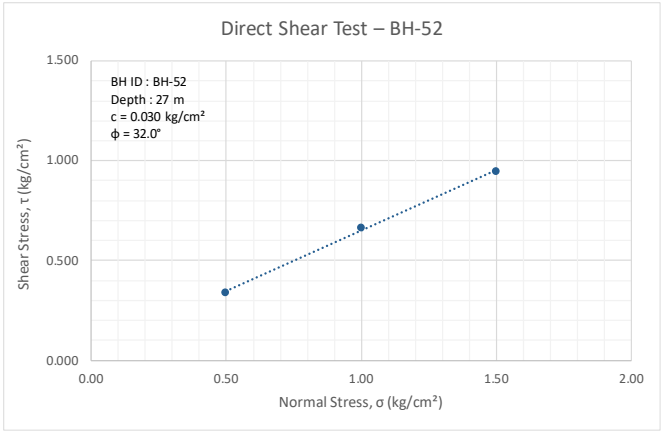

Direct Shear Test – BH-52
BH ID : BH-52
Depth : 12 m
c = 0.058 kg/cm²
ϕ = 28.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00

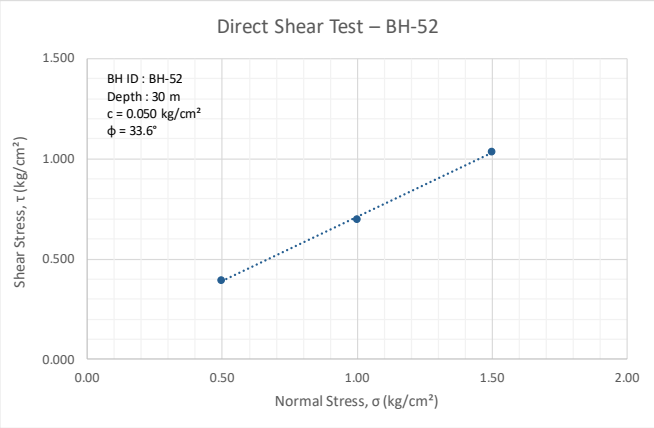

Direct Shear Test – BH-52
BH ID : BH-52
Depth : 15 m
c = 0.094 kg/cm²
ϕ = 29.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-52
BH ID : BH-52
Depth : 18 m
c = 0.094 kg/cm²
ϕ = 29.3°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-52
BH ID : BH-52
Depth : 21 m
c = 0.020 kg/cm²
ϕ = 29.6°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-52
BH ID : BH-52
Depth : 24 m
c = 0.111 kg/cm²
ϕ = 31.4°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-52
BH ID : BH-52
Depth : 27 m
c = 0.030 kg/cm²
ϕ = 32.0°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
0.000
0.500
1.000
1.500
0.00
0.50
1.00
1.50
2.00


Direct Shear Test – BH-52
BH ID : BH-52
Depth : 30 m
c = 0.050 kg/cm²
ϕ = 33.6°
Shear Stress, τ (kg/cm²)
Normal Stress, σ (kg/cm²)
1.500
1.000
0.500
0.000
0.00
0.50
1.00
1.50
2.00