

Technical Specification for Geotechnical Investigations

Appendix-1

SCHEDULE OF ITEMS

FOR

GEOTECHNICAL

INVESTIGATION



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SCHEDULE OF ITEMS

Sl. No.	Description of work	Quantity (Q)	UoM	Unit Rate (R)	Total Rate (T = RXQ)	Total GST (G =GST% of T)	Final Rate (G+T)
1	Making Bore Holes as per Technical Specifications at various locations in all types of soil, performing Standard Penetration Tests as per specifications, collection of soil and water samples complete including storing, transporting of sample to laboratory, back-filling of boreholes all complete as per specifications and as directed by the Engineer in charge.						
(a)	From natural ground level to 5 m	150	No				
(b)	From 5 m to 15 m	50	No				

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Sl. No.	Description of work	Quantity (Q)	UoM	Unit Rate (R)	Total Rate (T = RXQ)	Total GST (G =GST% of T)	Final Rate (G+T)
2	Making boreholes for Core drilling in rock strata using double tube core barrel using Nx size diamond bit and collection of rock cores and water samples, keeping record of core recovery, RQD, conducting SPT if core recovery is less than 20%, keeping cores in wooden samples including storing, transportation of samples to laboratory, backfilling of bore holes all complete as per specifications and as per the direction of Engineer.						
(a)	From natural ground level to 15 m	150	No				
(b)	From 5 m to 15 m	50	No				

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Sl. No.	Description of work	Quantity (Q)	UoM	Unit Rate (R)	Total Rate (T = RXQ)	Total GST (G =GST% of T)	Final Rate (G+T)
3	Conducting Electrical Resistivity test as per IS: 3043 at specified location as shown in reference drawing and /or directed by Engineer.	200	No				
4	Plate Load tests at various trial pit locations including providing and erecting equipment, supporting beams, kentledge, jacks and instruments and removing same and clearing site after test all complete as per specification and direction of Engineer. Pits shall be paid separately as per item 6						
(a)	Ordinary Plate Load Test	25	No				

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Sl. No.	Description of work	Quantity (Q)	UoM	Unit Rate (R)	Total Rate (T = RXQ)	Total GST (G =GST% of T)	Final Rate (G+T)
5	<p>Making Trial Pits of specified size at various location up to 2.0 m depth in all type of soil which can be excavated with pickaxe/crow bar, including sheeting or shoring the sides for the purpose of stability dewatering and maintaining the pit dry at all times, collecting disturbed/undisturbed samples at 1.0 m interval, conducting in-situ density etc., testing by pocket penetrometer, collecting water samples and transporting all soil and water sample to laboratory, backfilling of the pits all complete as per the specification and direction of the Engineer in charge. Trial pits shall be backfilled and compacted with the excavated soil.</p>	25	No				

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Sl. No.	Description of work	Quantity (Q)	UoM	Unit Rate (R)	Total Rate (T = RXQ)	Total GST (G =GST% of T)	Final Rate (G+T)
6	<p>Making Trial Pits of specified size at various location up to 2.0 m depth in all type of weathered rock which can be excavated with pickaxe/crow bar, including sheeting or shoring the sides for the purpose of stability dewatering and maintaining the pit dry at all times, collecting disturbed/undisturbed samples at 1.0 m interval, conducting in-situ density etc., testing by pocket penetrometer, collecting water samples and transporting all soil and water sample to laboratory, backfilling of the pits all complete as per the specification and direction of the Engineer in charge. Trial pits shall be backfilled and compacted with the excavated soil.</p>	25	No				

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Sl. No.	Description of work	Quantity (Q)	UoM	Unit Rate (R)	Total Rate (T = RXQ)	Total GST (G =GST% of T)	Final Rate (G+T)
7	Conducting CBR tests as per specification, at specified location as shown in reference drawing and	50	No				
8	Conducting various Laboratory Tests on soil samples at an approved laboratory including preparation of soil sample to determine the following properties-	1	LS				
(a)	Bulk Density and Moisture Content						
(b)	Sieve Analysis						
(c)	Hydrometer Analysis						
(d)	Liquid Limit, Plastic Limit, Shrinkage Limit and Plasticity Index						
(e)	Specific Gravity						
(f)	Standard Proctor Compaction Test						

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Sl. No.	Description of work	Quantity (Q)	UoM	Unit Rate (R)	Total Rate (T = RXQ)	Total GST (G =GST% of T)	Final Rate (G+T)
(g)	Swell Pressure and Free Swell Index (samples up to 6m depth below GL)						
(h)	Relative Density (for sand)						
(i)	Unconfined Compressive Test						
(j)	Tri-axial Shear Test						
	i) Unconsolidated Undrained Test						
	ii) Consolidated Undrained Test with Pore Water Pressure Measurement						
	iii) Consolidated Drained Test						
(k)	Direct Shear Test						
(l)	California Bearing Ratio (CBR)						

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Sl. No.	Description of work	Quantity (Q)	UoM	Unit Rate (R)	Total Rate (T = RXQ)	Total GST (G =GST% of T)	Final Rate (G+T)
(m)	Chemical Analysis of soil as per specification						
(n)	Consolidation test						
9	Chemical Test on water samples for Carbonate, Sulphate, Chloride, pH value, organic matter, and turbidity complete as per specification. If found	10	No				
10	Laboratory Test on rock samples as per specification for determining the following properties-	1	Ls				
(a)	Moisture Content, Porosity and Density						
(b)	Specific Gravity						
(c)	Hardness						

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Sl. No.	Description of work	Quantity (Q)	UoM	Unit Rate (R)	Total Rate (T = RXQ)	Total GST (G =GST% of T)	Final Rate (G+T)
(d)	Slake Durability Index						
(e)	Unconfined Compressive Strength (both saturated and in- situ water content)						
(f)	Point Load Strength Index						
(g)	Deformability Test (both saturated and dry samples)						
11	Submitting Report (three copies of draft and ten copies of final including electronic versions) with all field and laboratory test records, photographs of rock samples, rock cores, rock exposures, geological features, pits, graphs, charts, recommendations complete as specified.	1	LS				

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Sl. No.	Description of work	Quantity (Q)	UoM	Unit Rate (R)	Total Rate (T = RXQ)	Total GST (G =GST% of T)	Final Rate (G+T)
TOTAL EVALUATED BID VALUE (TEBV) (in figures) (Sum of Final Rate of all line items)							
TOTAL EVALUATED BID VALUE (TEBV) (in words) (Sum of Final Rate of all line items)							

Notes:

- (a) The bidder shall furnish the unit rate without fail.
(b) In Phase I & Phase II the depth of boring, number of samples, number of laboratory tests, etc. is tentative and may change depending upon the soil / actual site condition.
(c) Total amount will be worked out based on the 'Actual Quantity'.

The quantity of test locations defined in sl nos 1,2,5 & 6 are indicative and as per the map enclosed. The actual quantity of test locations will be determined at site as per actual site conditions and as certified by the authorized representative of the Owner.

The variation in quantities of items under sl nos 1,2,5 & 6 shall be to a maximum of +/- 10%.

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ANNEXURE-A

Sample for record:

Summary of Laboratory Test Results - Rock Core Samples

BORE HOLE NO.	
DEPTH	
CORE PIECE NO.	
MOISTURE CONTENT	
SPECIFIC GRAVITY	
HARDNESS	
POROSITY	
DRY DENSITY	
SLAKE DURABILITY	
POINT LOAD STRENGTH INDEX	
DEFORMABILITY (DRY /SATURATED)	
UNCONFINED COMPRESSIVE STRENGTH (INSITU/SATURATED)	
CORE DESCRIPTION	
REMARKS	

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ANNEXURE-B

Sample for record

Boreholes

LOCATION	BH NO.	CO-ORDINATE (M)			TERMINATING DEPTH	DEPTH OF WATER TABLE	TOP OF ROCK BELOW
		EASTING	NORTHING	G.L.	(M)	(M)	EGL (M)

Sample for Borelog:

CLIENT: BORE HOLE NUMBER: TIME:					DIA. OF HOLE:RL: TYPE OF BORE / DRILL:							
DESCRIPTION OF STRATA	SYMBOL	THICKNESS (M)		COLLECTION OF SAMPLES		SPT 'N' VALUE	ROCK DRILLING		CORE RECOVERY (%)	RQD (%)	Qu (KN/M ²) VANE SHEAR TEST	REMARK
		FROM (M)	TO (M)	TYPE	DEPTH		FROM (M)	TO (M)				

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ANNEXURE-C

Sample format of record: Trial Pit:

Trial Pit No.	Co-ordinate (M)		G.L.(M)	Depth (M)	DWT (M)
	Easting	Northing			

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ANNEXURE-D

Sample format of record:

Electrical Resistivity Tests Table – 1

Location	ERT No.	Co-ordinates (M)		Ground Level, (M)
		Easting	Northing	

Electrical Resistivity Tests Table – 2

Sl. No.	S (M)	(N - S)	(E - W)	Mean resistivity

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ANNEXURE-E

Sample format of record: Laboratory Rock Test Result

BH No.	Run No.	Depth (M)	Description	Bulk Density (gm/cm ³)	Dry Density (gm/cm ³)	Water Absorption (Natural)%	Porosity (%)	Specific gravity	Unconfined Compressive Strength (N/mm ²)		Coefficient of Softening	Point Load Index, (N/mm ²)	Slake Durability Index (%)
									Dry	Saturated			

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ANNEXURE-F

Sample format of record:

Standard Proctor Compaction & CBR Values

SL No.	Location	Sample No	Depth (M)	Description	Standard Proctor Compaction Test		CBR (%)		CBR (%)		Recommended CBR Value (%)
					OMC (%)	MDD (gm/cm ³)	Unsoaked Condition		Soaked Condition		
							2.50mm Penetration	5.00mm Penetration	2.50mm Penetration	5.00mm Penetration	

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ANNEXURE-G

Sample format of record:

Swelling Index & Swelling Pressure Test Results

Bore Hole No.	Sample No.	Depth (M)	Description	Swelling Index (%)	Swelling Pressure (N/mm ²)	Plasticity Index (%)

Pressure meter Tests Record Sheet

Sl. No.	Test Location No.	Test No.	Test depth below existing ground surface (M)	Corrected Limit pressure (N/mm ²)	Menard's Modulus of Deformation, Em (N/mm ²)

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ANNEXURE-H

Sample format of record:

Recommended Net Allowable Bearing Capacity

Borehole No.	Structure/ Building	NGL (M)	Depth of Foundation below NGL (M)	Founding Level (R.L. in M)	Recommended Net Allowable Bearing Capacity			
					Isolated / Strip		Raft	
					S = 25mm	S = 40mm	S = 40mm	S = 75mm

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ANNEXURE-I

Sample format of record: Field Permeability Test

Test Locations	Co-ordinates (M)			Type of Test	Depth of Test (M)
	Easting	Northing	G.L.		
				Falling Head	
				Double Packer	
				Double Packer	

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ANNEXURE-J

Sample format of record: Plate Load Test

Test No.	Depth (M)	Recommended SBC (kN/m ²)	Settlement at Safe Load (mm)	Young's Modulus N/mm ²	Subgrade Modulus for Plate, N/mm ³

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ANNEXURE-K

Sample format of record: **CHEMICAL TEST**

Chemical Test On Soil

BH No	Depth (M)	pH value	Sulphate(%)as		Chloride as Cl %	Nitrate as %	Carbonate as %	Organic Matter as %
			SO3	SO4				

Chemical Test On Water

BH No.	Depth (M)	pH value	Sulphate as mg/litr	Chloride as mg/litr	Carbonate as mg/litr	Nitrate as mg/litr	Organic matter as mg/litr	Turbidity (JTU)

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ANNEXURE-L

Sample format of record: Laboratory Test

Bore Hole	Sample Number	Depth (M)	Sample Description	Strength Test Results				Atterberg's Limits			Soil Classification	Grain Size									
				Bulk Dens.	Dry Density	Spec. Gravity	Nat. Mois.	Void Ratio	Pc/Pn	Shear		Cohesion	Friction	LL	PL	SL	Gravel	Sand	Silt	Clay	
				gms/cm ₃	gms/cm ₃		%		N/mm ²	N/mm ²	N/mm ²	Deg	%	%	%		%	%	%	%	

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ANNEXURE-M

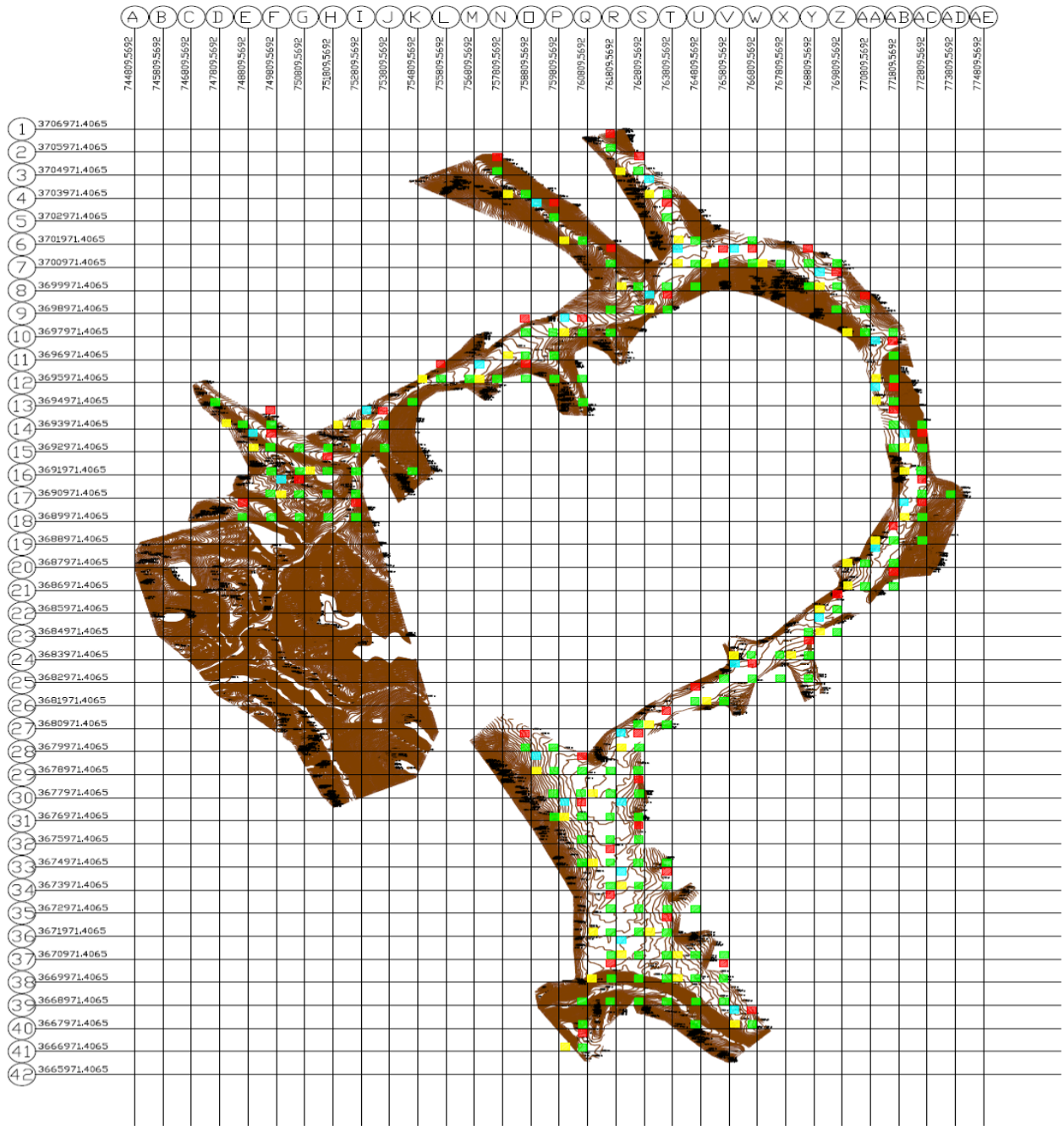
Contour Map for Locations:

Attached Contour map for BH and CBR locations are indicative only. Final locations will be decided at the site by the Engineer In charge as per site conditions such that test locations fall within the same grid square.

The map has been prepared in a grid of 1km x 1km.

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■	BH 5m	150 No's
■	BH 15m	50 No's
■	CBR Test	50 No's
■	Plate Load Test	25 No's

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