PRELIMINARY DESIGN OF STRUCTURES FOR BUS RAPID TRANSIT SYSTEM (BRTS), KARACHI
(Yellow Line)

GEOTECHNICAL INVESTIGATIONS
BILL OF QUANTITIES

Sr. No.	Description	Unit	Qty.	Rate (Rs.)	Amount (Rs.)
A.	**FIELD INVESTIGATIONS**				
A1	Mobilization and demobilization of at least four (4) straight rotary/heavy percussion drilling rigs at site including setting-up & shifting from one investigation point to another. The equipment should be sufficient to meet the time schedule. Minimum permissible diameter of borehole is 300 mm for percussion method and 101 mm for straight rotary method.	L.S.	Job		
A2	Execution of: ***i) Four (4)*** boreholes up to a maximum depth of 40 m at Malir River Bridge, ***ii) Four (4)*** boreholes up to a maximum depth of 30 m at four Intersection locations, ***iii) Fourteen (14)*** boreholes up to a maximum depth of 10 m at fourteen Station locations, ***iv) Four (4)*** boreholes up to a maximum depth of 10 m at two Depot locations, in overburden soils below NSL or up to rock strike level, whichever is met earlier, by straight rotary/heavy percussion drilling method including backfilling of boreholes to their original position by cement-sand-bentonite mix.	L.M.	400		
A3	Continuous core drilling (NX size in general) in bedrock up to a minimum depth of 3 m below rock strike level, including preservation of core samples in core boxes, waxing of core samples, photography of rock cores and transportation of core samples to the laboratory.	L.M.	60		
A4	Performance of Standard Penetration Tests (SPTs) in boreholes along with collection of SPT samples at 1 m interval in general, or as necessary, including their labelling, packing, storage & transportation to an approved testing laboratory.	No.	380		
A5	Collection of undistrubed soil samples from boreholes through Shelby/Denison/Pitcher samplers, including their waxing, labelling, packing, storage & transportation to an approved testing laboratory.	No.	20		
A6	Excavation of eighteen (18) testpits up to a maximum depth of 2 m or up-to subgrade, whichever is met earlier, along the Yellow Line route, including exposing of road/pavement layers and backfilling of pits to original condition including 1 ft thick P.C.C. (1:2:4) pad at top of each pit for level surfacing.	L.M.	36		
A7	Performance of field density tests by sand replacement method in testpits generally @ 2-3 tests/pit at selected horizons in existing pavement layers (i.e. in Water Bound Mecadam/ Aggregate Base Course, Sub-Base and Sub-grade), including determination of in-situ bulk and dry density and collection of small disturbed samples in moisture tins for moisture content determination in laboratory by oven drying method as well as labelling,packing, storage & transportation to an approved testing laboratory.	No.	50		
A8	Collection of composite bulk samples (from Water Bound Mecadam/ Aggregate Base Course, Sub-Base and Sub-grade) from ten (10) testpits including their labelling, packing, storage & transportation to an approved laboratory.	No.	15		
A9	Collection of water samples (if encountered) from boreholes/testpits including their labelling, packing, storage & transportation to an approved testing laboratory.	No.	6		
	Sub-Total A	**Rs.**			

Establishment of coordinates and ground elevations of all the boreholes & testpits using **TOTAL STATION** are included in the scope of work. The coordinates should be provided with reference to a permanent local bench mark.

All the undisturbed soil samples shall be stored and tranported as per ASTM standards. The area and clearance ratios of the sampling tubes should be as per ASTM requirements.

Preferred method of drilling (for Sandy/Silty/Clayey soil & Rock) is straight rotary drilling. Percussion boring will be allowed only in case of presence of cobbles/grevals/any other hard strata.

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BILL OF QUANTITIES

Sr. No.	Description	Unit	Qty.	Rate	Amount
B.	**LABORATORY TESTING**			(Rs.)	(Rs.)
B1	Sieve analysis	No.	60		
B2	Hydrometer analysis	No.	20		
B3	Liquid & plastic limits	No.	20		
B4	Bulk & Dry density	No.	20		
B5	Natural Moisture Content (NMC)	No.	20		
B6	Consolidation with Swell Potential Measurements	No.	5		
B7	Direct Shear (Soil Sample)	No.	5		
B8	Unconfined Compression (Soil Sample)	No.	10		
B9	Unconfined Compression (Rock Sample)	No.	10		
B10	Modified AASHTO Compaction	No.	15		
B11	3-Point Soaked CBR	No.	15		
B12	Sulphate content of soil	No.	6		
B13	Chloride content of soil	No.	6		
B14	Organic matter content of soil	No.	6		
B15	Complete chemical analysis of water samples i/c TDS, Cl, SO4 & pH	No.	6		
	Sub- Total B			**Rs.**	
C	Preparation and submission of Detailed Geotechnical Investigations report (5 copies) including recommendations for foundation design and road works.	L.S.	Job		

Name of Laboratory:

Total (A+B+C)=	**Rs.**	