

TENDER NO.DMRC/20/II-288/GEO/CHANDIGARH

DELHI METRO RAIL CORPORATION

(A JOINT VENTURE OF GOVT. OF INDIA AND GOVT. OF DELHI)

GEOTECHNICAL INVESTIGATION WORK

FOR

DETAILED PROJECT REPORT (DPR)

FOR

**PROPOSED PHASE - I OF CHANDIGARH
METRO RAIL PROJECT**



**दिल्ली मेट्रो रेल कॉरपोरेशन लिमिटेड
DELHI METRO RAIL CORPORATION LTD.**

METRO BHAWAN, FIRE BRIGADE LANE,
BARAKHAMBA ROAD, NEW DELHI – 110 001

NOTICE INVITING TENDER

TENDER NO.DMRC/20/II-288/GEO/10

New Delhi
June 20, 2011

1.1 GENERAL

Delhi Metro Rail Corporation (DMRC) invites sealed limited tender in the enclosed proforma, for the following works of the proposed work of Detailed Project Report (DPR) for Phase – I of Metro Rail Project,

Description of Work	Earnest Money Deposit (EMD)	Period of Completion	Last date for submission of quotations
Geo – Technical Investigation work for the Detailed Project Report (DPR) the proposed Phase-I of Chandigarh Metro Rail Project (Approx 33 km)	33000	3.0months	As per para 1.2.4 below

1.2 POINTS TO BE NOTED

1.2.1 Works envisaged under this contract are required to be completed in all respects within the period of completion mentioned above.

1.2.2 The tender should contain all technical details as required for the consideration of tender.

1.2.3 Tender document consists of following sections:

- i) Notice Inviting Tender
- ii) Instructions to Tenderer
- iii) Scope of Work and Technical Specification
- iv) Special Conditions of Contract
- v) Bill of Quantities
- vi) Approximate corridor and barricade drawing.

The cost of the Tender document is **Rs.5,200/- inclusive of 4% DVAT**, which has to be paid in the form of DD at the time of submission of offer along with EMD.

1.2.4 Completed Tender should be submitted to the office of ED/Civil, DMRC/New Delhi, Metro Bhawan, 13, Fire Brigade lane, Barakhamba Road, New Delhi – 110001, Telefax No. 011-23418412 by **30.06.2011 at 15.00 Hrs. Tender will be opened on the same date by 15.30 Hrs.**

1.2.5 DMRC reserves the right to accept or reject the tender offer or award the work to more than one agency without assigning any reasons. Tenderer shall not have any cause of action or claim against the DMRC for rejection of his proposal.

Sd.

ED/Civil
Delhi Metro Rail Corporation

SECTION 1

INSTRUCTIONS TO TENDERER

1.0 INTRODUCTION

- 1.1 DMRC Limited hereinafter called the 'Employer' for works in accordance with this tender invites tender for GT investigation work for the DPR of the proposed Phase-I of Chandigarh Metro Rail Project (Approx 33 km). The tender papers consist of the following sections in the tender document:

Notice Inviting Tender (NIT)
Instructions to Tenderer (ITT)
Scope of work
Technical Specifications
Special conditions of Contract (SCC)
Bill of Quantities.

- 1.2 Tenders shall be prepared and submitted in accordance with the instructions given herein.

- 1.3 Relevant address for correspondence relating to this tender is given below:

ED/Civil, DMRC, Metro Bhawan, 7th Floor, Fire Brigade Lane, Barakhamba Road, New Delhi – 110 001, Tele/Fax : 011 23418412.

- 1.4 Some essential data / requirements pertaining to this Tender are detailed below:

- a. Tender Security to be furnished by the Tenderer for the amount as mentioned in NIT in favour of DMRC Limited in the form of demand draft drawn on any Scheduled bank payable at New Delhi.
- b. Tender will be accepted in the office of ED/Civil DMRC, Metro Bhawan, 7th Floor, Fire Brigade Lane, Barakhamba Road, New Delhi – 110 001, Tele/Fax : 011 23418412.
- c. Tenders will be opened as per Time & Date given in para 1.2.4 of NIT and late or delayed tender will not be accepted under any circumstances.
- d. Period for which the tender is to be kept valid - **60 days** from the last date of submission of Tender.
- e. Period of commencement of work 7 days from the date of issue of "Letter of acceptance".
- f. Period of completion: **3.0months** from the date of issue of "Letter of acceptance. However progress of work to be furnished weekly from 2nd week.
- g. Applicant must not have been black listed or de-registered by any Government agency or Public Sector Undertaking during the last ten years for which an undertaking should be furnished.
- h. The following documents will be required to be submitted by the tenderer along with tender:
 - i) Original tender documents duly signed and stamped.
 - ii) Current accreditation certificate under Inter-national Standard Organisation/ Bureau of Indian Standards of laboratory.

- iii) List of GT instruments/computers proposed to be deployed on work along with their ownership in the name of firm.
- iv) List of staff proposed to be deployed on work.
- v) List of similar works already completed / in progress during last five financial years along with supporting/proving documents.

1.5 If any tenderer gives any wrong information or suppresses any material facts, the Employer/Engineer shall be free to reject such a tender at any stage and even cancel the Contract (after the acceptance of the tender) at the risk and cost of the tenderer.

1.6 Each tenderer, or any associate will be required to confirm and declare in the tender submittal that no agent, middleman or any intermediary has been, or will be, engaged to provide any services, or any other items of work related to the award and performance of this contract.

1.7 SITE VISIT

1.7.1 Any site information given in this tender document is for reference only. The tenderer is advised to visit and examine the Site of Works and its surroundings at his/their cost and obtain all information that may be necessary for preparing the tender and entering into a contract.

1.7.2 The agency shall be deemed to have inspected the site and its surroundings beforehand and taken into account all relevant factors pertaining to the site in the preparation and submission of the Tender.

1.8 CONTENTS OF TENDER DOCUMENTS.

1.8.1 The tenderer is expected to examine carefully all the contents of the tender documents including instructions, conditions, terms, specifications and drawings and take them fully into account before submitting his offer. Failure to comply with the requirements as detailed in these documents shall be at the tenderer's own risk. Tenders which are not responsive to the requirements of the tender documents will be rejected.

1.9 CLARIFICATION ON TENDER DOCUMENTS.

1.9.1 While all efforts have been made to avoid errors in drafting of the tender documents, the tenderer is advised to check the same carefully. No claim on account of any errors detected in the tender documents shall be entertained.

1.10 AMENDMENT TO TENDER DOCUMENTS.

1.10.1 At any time prior to the deadline for the submission of tenders, the Engineer may, for any reason, whether at his own initiative or in response to a clarification or query raised by a prospective tenderer, modify the tender documents by an amendment.

The said amendment in the form of an addendum will be sent to all prospective tenderer who have received the tender documents, to reach them at least 2 days prior to the deadline for the submission of tenders. This communication will be in writing and the same shall be binding upon them. Prospective tenderer should promptly acknowledge receipt thereof by telefax to the Engineer.

In order to afford prospective tenderer reasonable time for preparing their tenders after taking into account such amendments, the Engineer or the Employer may, at his discretion, extend the deadline for submission of tenders.

1.11 LANGUAGE OF TENDER

1.11.1 The tender submitted by the tenderer and all correspondence and documents relating to the tender exchange between the tenderer and the Employer/Engineer shall be in the English language.

1.12 TENDER PRICES

1.12.1 The tenderer is required to quote for all the items as per tender documents

1.12.2 The rate for each item shall be reasonable and not unbalanced. If the Engineer comes across any unbalanced rates, he may require the tenderer to furnish detailed analysis to justify the same. Should the tenderer fail to comply with this, his tender shall be liable to be rejected by the employer, who may award the contract to any other tenderer.

1.12.3 The tenderer shall keep the contents of his tender and rates quoted by him confidential.

1.13 CURRENCIES OF THE TENDER

Tender prices shall be quoted in Indian Rupees only.

1.14 TENDER VALIDITY

The tender shall remain valid and open for acceptance for a period of as specified in para 1.4 (d)

1.15 TENDER SECURITY

1.15.1 The tenderer shall furnish, tender security as specified in para 1.4 (a) above.

1.15.2 The tender security shall be in the form of demand draft drawn on any Scheduled bank payable at New Delhi.

1.15.3 Any tender not accompanied by an acceptable tender security will be summarily rejected by the Employer/Engineer as non-responsive.

1.15.4 The tender security of the unsuccessful tenderer shall be returned upon the executing the Contract Agreement by successful tenderer. The tender security of successful tenderer shall be retained as per clause 4.16.

1.15.5 Tender Security will be forfeited in the following cases

- a. If the Tenderer withdraws / modifies his tender during the period of tender validity
- b. If the tenderer does not accept the correction of his tender in pursuance to clause 1.22
- c. If the tenderer after award of work, does not start the work within the stipulated time period as per letter of award

1.15.6 No interest will be payable by the Employer on the tender security amount/performance security cited above

1.16 Signing of the Tenders

1.16.1 Entries to be filled in by the Tenderer shall be typed or written in indelible ink. Each page of the documents should be signed in full at the bottom by the person submitting the Tender along with the date of signing.

1.16.2 The person signing/initiating the documents shall be one who is duly authorised in writing by or for and on behalf of the Tenderer and/or by a statutory Attorney of the Tenderer. Such authority in writing in favour of the person signing the tender and/or

notarised certified copy of the Power of Attorney as the case may be, shall be enclosed along with the tender.

- 1.16.3 The complete tender shall be without alterations, overwriting, interlineations except those to accord with instructions issued by the Employer, or as necessary to correct errors made by the tenderer. All amendments/corrections shall be initialed by the person or persons signing the tender.

1.17 SUBMISSION OF TENDERS

- 1.17.1 Tenders must be delivered at the place and time as indicated in para 1.4 (b) above duly superscribing on top the Tender Number, Name of work and the word **“DO NOT OPEN BEFORE 15.30 HRS ON 30.06.2011”**. The Employer/Engineer may, at his discretion, extend this date for the submission of tender by amending the Tender Documents. If such nominated date for submission of tender is subsequently declared as a Public Holiday by the Employer, the next official working day shall be deemed as the date for submission of tender.
- 1.17.2 Tenders shall be submitted in time to the designated office of DMRC Ltd. The Engineer/Employer cannot take any cognizance and shall not be responsible for delay in transit.
- 1.17.3 Tenders sent telegraphically or through other means of transmission (telefax etc.) which cannot be delivered in a sealed envelope shall be treated as defective, invalid and shall stand rejected.

1.18 LATE TENDERS

Any tender received in the nominated office of DMRC Ltd. after the prescribed time for submission of tenders herein will be returned unopened to the tenderer.

1.18.1 TENDER OPENING

- 1.18.2 The employer or his authorised representative will open the tenders in the presence of tenderer or their representatives who choose to attend on the date and time indicated in para 1.4 (c) above in the office of ED/Civil, DMRC, Metro Bhawan, 7th Floor, Fire Brigade Lane, Barakhamba Road, New Delhi – 110 001, Tele/Fax : 011 23418412. If such nominated date for opening of tender is subsequently declared as a Public Holiday, the next official working day shall be deemed as the date of opening of Tender.
- 1.18.3 The Employer/Engineer will examine the tenders to determine whether they are complete, whether the requisite tender security has been furnished, whether the documents have been properly signed and whether the tenders are in order in all respects.
- 1.18.4 The tenderer name, the presence or absence of the requisite tender security and such other details will be announced at the time of tender opening by the Employer or his authorized representative.

1.20 PROCESS TO BE CONFIDENTIAL.

- 1.20.1 Except the public opening of Tender, information relating to the examination, clarification, evaluation and comparison of tenders and recommendations concerning the award of contract shall not be disclosed to tenderer or other persons not officially concerned with such process.
- 1.20.2 Any effort by a tenderer to influence the Employer/Engineer in the process of examination, clarification, evaluation and comparison of tenders and in decisions concerning award of contract, may result in the rejection of his tender.

1.21 CLARIFICATION OF TENDERS

- 1.21.1 To assist in the examination, evaluation and comparison of Tenders, the Engineer / Employer may ask tenderer individually for clarification of their tenders, including breakdowns of prices. The request for clarification and the response shall be in writing or by telefax but no change in the price or substance of the tender shall be sought, offered or permitted except as required to confirm correction of arithmetical errors discovered by the Engineer during the evaluation of tenders.
- 1.21.2 Prior to the detailed evaluation of tenders, the Engineer will determine whether each tender is responsive to the requirements of the tender documents.
- 1.21.3 The Employer/Engineer will award, the contract to the tenderer, whose tender has been determined to be substantially responsive, complete and in accordance with the tender documents and whose evaluated Price has been determined to be the lowest. Negotiations, if any, shall be carried out with lowest responsive tenderer.

1.22 RIGHT TO ACCEPT ANY TENDER AND TO REJECT ANY OR ALL TENDERS

- 1.22.1 Notwithstanding Clause 1.21.3, the Employer reserves the right to accept or reject any tender, and to annul the tender process and reject all tenders, at any time prior to award of contract, or to divide the contract between / amongst tenderer without thereby incurring any liability to the affected tenderer or tender's or any obligations to inform the affected tenderer or tender's of the grounds for the Employer's action.

1.23 NOTIFICATION OF AWARD

- 1.23.1 Prior to the period of tender validity prescribed by the Engineer / Employer, the Engineer / Employer will notify the successful tenderer by telegram or telefax to be confirmed in writing by registered letter, that his tender has been accepted. This letter (hereinafter and in the conditions of Contract called the Letter of Acceptance) shall name the sum which the Employer will pay to the contractor in consideration of the execution and completion of the works by the contractor as prescribed by the contract (hereinafter and in the conditions of contract called the Contract Price). The "Letter of acceptance" will be sent in duplicate to the successful tenderer, who will return one copy to the Employer duly acknowledged and signed by the authorised signatory, within two days of receipt of the same by him. No correspondence will be entertained by the Employer from the unsuccessful Tenderer.
- 1.23.2 The "Letter of Acceptance" will constitute a part of the contract.
- 1.23.3 Upon "Letter of acceptance" being signed and returned by the successful tenderer as per clause 1.23.1, the employer will promptly notify the unsuccessful tenderer and discharge / return their tender securities.

1.24 SIGNING OF AGREEMENT

- 1.24.1 The Engineer/Employer shall prepare the Agreement in the Proforma included in this Document, duly incorporating all the terms of agreement between the two parties. However, the successful tenderer shall arrange the necessary Non-judicial stamp papers of requisite value and attend the DMRC office to execute the agreement within two weeks of the date of receipt of the "Letter of acceptance" duly acknowledged and signed by the successful tenderer. Up on executing the agreement the original agreement will be retained by the employer and one copy of the Agreement duly signed

by the Employer and the Contractor through their authorised signatories, will be sent to the contractor.

FORM OF AGREEMENT

Name of the work: -----

This Agreement is made on the ----- day of ----- 2011--- DMRC Ltd. hereinafter called "the Employer" of the one part and ----- (Name and Address of contractor) ----- hereinafter called "the contractor" of the other part.

Whereas the Employer is desirous that "Geotechnical Investigation work as Detailed in ``Section 2.0 - Scope of work "hereinafter called the "the Works" and has accepted a Tender by the contractor for the execution and completion of such works.

NOW THIS AGREEMENT WITNESSETH as follows:

In this Agreement words and expression shall have the same meanings as are respectively assigned to them in the conditions of contract hereinafter referred to.

The following documents shall be deemed to form and be read and construed as part of this Agreement viz.

1. Notice Inviting Tender : -----, consists of following

- ✓ Scope of work
 - ✓ General and special conditions of contract
 - ✓ Technical Specifications
 - ✓ Bill of quantities
 - ✓ Addendums, if any
2. Contract Offer & all corresponds
3. Letter of acceptance

In consideration of the payment to be made by the Employer to the contractor as hereinafter mentioned, the contractor hereby covenants with the Employer to execute and complete the works by ----- and remedy any defects therein in conformity in all respects with the provisions of the contract.

The Employer hereby covenants to pay the contractor in consideration of the execution and completion of the works and the remedying of defects therein, the

Contract price of Rs.----- being the sum stated in the letter of acceptance subject to such additions thereto or deductions therefrom as may be made under the provisions of the contract at the times and in the manner prescribed by the contract.

IN WITNESS WHEREOF the parties hereto have caused their respective Common Seals to be hereunto affixed / (or have hereunto set their respective hands and seals) the day and year first above written.

For and on behalf of the Contractor

For and on behalf of the Employer

Signature of the authorised Official

signature of the authorised official.

Name of the official
Stamp/Seal of the contractor

Name of the official
Stamp/Seal of the Employer

SIGNED, SEALED AND DELIVERED

By the said

By the said

Name -----
On behalf of the contractor in
The presence of-----

Name -----
On behalf of the Employer
in the presence of -----

Witness
Name
Address

Witness
Name
Address

SECTION 2

SCOPE OF WORK

2.0 GENERAL

The work mainly comprises of Geo-Technical Investigation along the proposed Phase-I corridor of Chandigarh Metro Rail Project (Approx 33km). The work site is located in of Chandigarh Metropolitan Complex consisting of Chandigarh City (UT), Panchkula (Haryana) and Mohali (Punjab).

Activities to be performed are as follows:

1. Drilling bore holes upto a maximum depth of 5 metres in intact Hard Rock (RQD >50%) or 10 m in weathered rock (RQD upto 50%) or 30 metres in soil (upto N=100) using hydraulic / calyx rig by wash boring method as per the directions of Engineer-in-charge and as detailed in Technical Specifications and Schedule.
2. Conducting Standard Penetration Tests in bore holes at regular intervals of 3.0m as per I.S. Code of practice and also in-situ tests as per Schedule.
3. Collecting undisturbed soil samples from bore holes at every change of strata subject to a minimum of two per bore hole as per I.S. Code of practice.
4. Recording of water table level in the bore holes after completion of boring.
5. Conducting in-situ permeability tests in Rocky strata and tests in labs in all other types of soils.
6. Collecting rock core samples from bore holes and record the RQD.
7. Conduct all necessary laboratory tests on samples collected as per Schedule and Technical Specifications.
8. Survey of bore holes for elevation and plotting of bore hole locations in alignment plan.
9. Preparation of report summarizing the details of soil / rock classifications, analysis of test data and recommending the type of foundations to be adopted with design calculations for the proposed Elevated corridor duly highlighting the design criteria and design methodology and different groups of soil strata encountered.

2.1 MATERIALS

2.1.1 Quality

All materials used in the works shall be of the best quality of their respective kinds as specified herein, obtained from sources and suppliers approved by the Engineer and shall comply strictly with the tests prescribed in the Technical Specifications / Code of Practice.

2.1.2 Rejection

Any material found not to conform to the specifications shall be rejected forthwith and shall have to be removed from the site by the contractor at his own cost.

Any work not to the satisfaction of the engineer or his representative will be rejected and same shall be rectified, or removed and replaced with work of required standard of workmanship at no extra cost.

2.2 TIME SCHEDULE

The Contractor shall complete field work within **two and half** months and submit all deliverables/reports within 15days thereafter as per the tender "Time Schedule" for completion of various items of work. This schedule is to be within the overall completion period of three months. The detailed programme in the form of a quantified bar chart or CPM network shall include all activities starting from beginning to completion.

2.3 VARIATION IN QUANTITIES

Quantities provided in BOQ are tentative, which may vary up to 25% on either side with same rates. For quantities above/below $\pm 25\%$ of the BOQ, the rates will be reduced and to be finalized after negotiation with the firm.

SECTION – 3

TECHNICAL SPECIFICATIONS

3.1 SOIL INVESTIGATION

3.1.1 Boreholes

- a) Boreholes shall be sunk at specified locations to obtain information about the sub-surface soil, and to collect soil and rock samples for strata identification and laboratory testing. The minimum diameter of borehole shall be 150 mm in soil and NX size(75 mm dia.) in rock and the boring shall be carried out in accordance with the provisions of IS 1892 and as per specification. Bore holes shall be advanced using water or bentonite. No slush should be allowed to flow on the road. If any slush is there, the same should be cleaned during and after completion of boring. Casing may be necessary to maintain the sides of the boreholes in a stable condition. Rock boring shall be carried out using a double core barrel / triple tube having a diamond bit to get higher core recovery. Necessary barricading with 2.4mx1.8m metallic/wooden boards with necessary fixing / supporting arrangements shall be made around the work area. The barricades shall be provided with wheels for easy shifting and movement. The barricading panels shall be light/movable and shall be as per Sketch No. DMRC/20/Chandigarh/ GEO/2010 enclosed. The cost of providing, maintaining, shifting etc. of barricading shall be borne by the agency.
- b) All boreholes shall be extend upto depths of 30 m in soil (upto N \geq 100) or 10 m in weathered rock (RQD \leq 50%) or 5 m in hard rock (RQD $>$ 50%) unless otherwise directed by the Engineer. However the maximum depth of bore hole does not exceed 30 m. If strata having a standard Penetration Test value greater than 100 with characteristics of rock, is met with earlier, the borehole shall be advanced further by boring with approval of the Engineer. When the boreholes are to be terminated in soil strata, the Standard Penetration Test shall be carried out at the termination depth and recorded.
- c) Casing shall be used in the boreholes to support its sides, if required. When casing is used it shall be ensured that its bottom end is, at all times, less than 150 mm above the bottom of the borehole. In case of cohesion less soil, the advancement of the casing shall be such that it does not disturb the soil to be tested or sampled. The casing shall be advanced by slowly turning the casing pipe and not by driving. Casing can be with drawn after inspection of bore hole by the Engineer with his approval. No extra payment shall be made for providing the casing.
- d) In-situ tests shall be conducted and undisturbed samples shall be obtained at specified intervals in the boreholes. Representative disturbed samples shall be preserved for conducting various identification tests in the laboratory. Water level shall be determined in the boreholes and shall be carefully recorded on the drilling log.
- e) The borehole shall be cleaned, using suitable tools up to the depth of testing or sampling, ensuring that there is minimum disturbance of the soil at the bottom of the borehole. The process of letting through an open tube sample shall not be permitted. In cohesive soils, the borehole may be cleaned by using a bailer with a check valve.

3.2 ROTARY DRILLING

Rotary method can be used in all types of soil below water table. In this method, boring shall be done by rotating the bit fixed at the bottom of the drill rod. Proper care shall be

taken to maintain contact between the bit and the bottom of the borehole at all times. Use of percussion tool shall be permitted in hard clays and dense sandy deposits.

3.3 WATER LEVEL MEASUREMENT

The water level in the borehole shall be carefully recorded and reported, when first encountered whilst drilling the water level shall be measured every morning before recommencement of the drilling activities.

3.4 IN-SITU TESTS

3.4.1 Standard Penetration Tests:

SPT tests shall be conducted in all types of deposits at 1.5m intervals or as per direction of engineer in charge. The tests shall be carried out by driving a standard split spoon by means of 63.5kg hammer (140 lbs) having a free fall of 76 cms(30 inches). Detailed procedure for testing as specified in IS 2131 shall be followed. The samples obtained in this split spoon shall be placed in an airtight jar or equivalent, leveled and preserved for identification tests in the laboratory.

3.4.2 Water samples

- a) Samples of ground water shall be obtained from each bore hole when first encountered or unless specified otherwise.
- b) At the specified depth, water shall be pumped out so that fresh ground water flows into the borehole. Care shall be taken in avoiding any contamination with surface water at any time. Water samples shall be collected in 5 litre polythene or glass container and labeled properly.

3.4.3 Field Permeability Tests:

Field Permeability Tests shall be conducted, if required to determine the water percolation capacity of overburden soil. The specifications of the equipment required for the tests and the procedure of testing shall be in accordance with IS 5529 Part-1.

a) Constant Head Method

This test shall be conducted in boreholes where soils have high permeability. Water shall be allowed into the borehole through metering system ensuring gravity flow constant head so as to maintain a steady water level in the borehole and reference mark shall be done at a convenient level, which can be easily seen in the casing pipe to note down the fluctuations of water level. The fluctuations shall be counteracted by varying the quantity of water flowing into the borehole. The evaluation of water shall be observed at every 5 minute interval. When 3 consecutive readings show constant value, the necessary observations such as flow rate, evaluation of water surface above test depth, diameter of casing pipe etc. shall be made and recorded as per the proforma recommended in IS : 5529 Part-1 Appendix-A.

b) Falling Head Method

This method shall be adopted for soils of low permeability and which can stand without casing. The test section shall be sealed at the bottom of borehole and a packer at the top of the test section. If the test has to be conducted at an intermediate section of a borehole, then double packers shall be used. Access to the test section through the packers shall be by means of a pipe, which shall extend to above the ground level. Water shall be filled in the pipe upto the level marked just below the top of the pipe and water allowed to drain into the test section. The water level in the pipe shall be recorded at regular intervals as mentioned in IS: 5529 Part-1 appendix-B. The test shall be repeated till constant records of water level are achieved.

3.5 SAMPLING

3.5.1 General

- a) Sufficient number of soil samples shall be collected. Disturbed soil samples shall be collected for field identification and conducting tests such as sieve analysis, Index properties, i.e. Plastic & Liquid limits, chemical analysis etc. Undisturbed samples shall be collected to estimate moisture content, density, the physical strength and settlement properties of the soil.
- b) All accessories required for sampling and the methods of sampling shall conform to IS 2132 and IS 1892.
- c) All disturbed and undisturbed samples shall be collected at site as per IS : 1498/1970.
- d) All samples shall be identified with date, borehole number, depth of sample etc. The tube samples shall be properly trimmed at the ends, waxed and suitably capped. Soil samples shall be transported to the laboratory at the end of each working day with proper protection against loss and damage.

3.5.2 Disturbed Soil Samples

Disturbed soil samples shall be collected in boreholes at regular intervals. Samples, weighing approximately 1 kg shall be collected in boreholes at 1.5m intervals starting from a depth of 0.5m below ground level and at every identifiable change of strata to supplement the boring records. Samples shall be immediately stored in air-tight containers or equivalent and which shall be filled to capacity as much as possible.

3.5.3 Undisturbed Soil Samples

In each borehole, undisturbed soil samples shall be collected at every change of strata subject to a minimum of two as follows. Undisturbed samples shall be of 100mm dia and 450 mm length. Samples shall be collected in such a manner that the structure of the soil and the moisture content do not get altered. The specifications for the accessories required for sampling and the sampling procedure shall conform to IS: 1892 and IS: 2132. The undisturbed sample shall be immediately followed by SPT test, after the borehole has been cleaned.

3.5.4 Undisturbed sampling in cohesive soil

- a) Undisturbed samples in soft to stiff cohesive soils shall be obtained using a thin-walled sampler. In order to reduce the wall friction, suitable precautions, such as oiling the surfaces, shall be taken.
- b) Undisturbed samples in very loose saturated sandy and silty soils and very soft clays shall be obtained by using a piston sampler, consisting of a sampling cylinder and piston system. In soft clays and silty clays, with water standing in casing pipe, piston sampler shall be used to collect undisturbed samples. During this method of sampling, expert supervision is called for.

Accurate measurements of the depth of sampling, height of sampler, stroke and length of sample recovered shall be recorded on the field log. After the sampler is pushed to the required depth, both the sampler cylinder and piston system shall be drawn up together, ensuring that there shall not be any disturbance to the sample which shall then be protected from changes in moisture content. The ends of the tubes will be waxed and provided with caps. All samples must be transported to the laboratory at the end of each working day. The tubes shall be clearly marked to indicate the type of the sample.

3.5.5 Chemical Tests

Chemical test shall be conducted on soils and water samples as per relevant BIS (latest revisions) to report the following:

- a) pH
- b) Chlorides in ppm & percentage
- c) Sulphates in ppm and percentage and expressed as SO₃ & SO₄.

3.6 Presentation of Drilling Information and Core Description

- 3.6.1 Daily drilling reports confirming to Appendix –A, IS: 4464 shall be prepared and submitted to the Engineer.
- 3.6.2 Within 24 hours of completion of each borehole a field borehole log shall be prepared by a competent engineering geologist or geotechnical engineer. The log will include descriptions of the materials encountered and shall include the observations made during drilling including the samples obtained along with the depth, SPT, N-value and relevant information. The Engineer will comment on the log and provide comments to be incorporated for the final report. This shall conform to Appendix-B of IS: 4464 and shall be submitted in triplicate to the Engineer-in-charge. The Contractor must seek the approval of the Engineer for the bore hole log format.
- 3.6.3 On completion of all drilling and test, a factual report shall be prepared (see clause 3.10).

3.7 ROCK INVESTIGATION

3.7.1 Drilling

Rotary core drilling shall be adopted by open holing through soft materials, or by drilling ahead in soft ground boring which has already been made. The substrata to be cored, may be soft, or may contain mixture of hard rock and soft weathered rocks. The drilling equipment used shall have an adequate capacity so as to ensure that required depths are reached and good quality rock core is recovered. The drilling equipment shall be hydraulically operated. The equipment, method and the procedure for drilling shall conform to IS: 1892.

Drilling shall be carried out using NX / EX size diamond tipped drill bits, a double core barrel with core catchers shall be used to ensure continuous and good core recovery. Core barrels and core catchers shall be used for breaking off the core and retaining it when the rods are withdrawn, double tube core barrels shall only be permitted. Water shall be circulated continuously down the hollow rods and the washings at the surface shall be collected. A very high recovery ratio shall be aimed at in order to get a satisfactory undisturbed sample. Core of 1.5m length shall be aimed at. If the Engineer determines that poor core recovery is due to the inability of the drilling crew a new borehole will be drilled at no cost to the client.

- 3.7.2 No drilling run shall exceed 1.5 m in length. If the core recovery is less than 80 % in any run, the Engineer shall be informed and the length of the subsequent run shall be reduced to 0.75 m.
- 3.7.3 Prior to commencement of the drilling operations, the rig shall be properly weighted down, or anchored, so as to minimize vibrations and ensure maximum core recovery.
- 3.7.4 Full observations in respect of the colours and nature of the return drill water, water loss and permeability, speed of drilling, core loss and other relevant details, shall be described as per relevant IS codes.

- a) The colour of return water at regular intervals, the depth at which any change of colour of return water is observed, the depth of occurrence and amount of flow of hot water, if encountered, shall be recorded.
- b) The depth through which a uniform rate of penetration was maintained, the depth at which marked change in rate of penetration or sudden fall of drill rod occurs, the depth at which any blockage of drill bit causing core loss, if any, shall be recorded.
- c) Any heavy vibration or torque noticed during drilling should be recorded together with the depth of occurrence.
- d) Special conditions, like the depth at which grouting was done during drilling, presence of artesian conditions, loss of drilling fluid, observations of gas discharge with return water etc., shall also be observed and reported.

3.8 EXTRACTION AND STORING OF CORE SAMPLES

- 3.8.1 Core samples shall be extracted by the application of a continuous pressure at one end of the core with the barrel held horizontally without vibration. Friable cores shall be extracted from the barrel directly into a suitable sized half round plastic channel section. Core shall be taken to maintain the direction of extrusion of sample same as while coring.
- 3.8.2 Immediately after withdrawal from the core barrel, the cores shall be placed in a tray and transferred to boxes specially prepared for the purpose. The boxes with a sturdy cover shall be made from seasoned timber or any other suitable material and shall be indexed on top of the lid as per IS: 4078. The cores shall be numbered serially and arranged in the boxes in a sequential order. The description of the core samples shall be recorded as per IS: 4464. When core is recovered, it shall be recorded as specified in the standard and the engineer should be informed so that remedial measures can be implemented. Continuous record of core recovery and RQD to be mentioned in the log as per IS: 11315, Part-II. All core boxes shall be transported and handed over to the Engineer on completion of each bore hole. All core boxes shall be photographed and the photos attached to the report. The photographs shall show the rock core box clearly labelled indicating project name, borehole number, and depth stored in the core box and the serial number of the box for the bore hole (e.g. box 2 of n).
- 3.8.3 All cores/samples shall be kept in the safe custody by the contractor till the completion of the work. The cores/samples shall be disposed off as per the instructions of Engineer-in-charge. In no case sample shall be destroyed without written permission of Engineer-in-charge.

3.9 LABORATORY TESTING

- 3.9.1 At the completion of the borehole the field log should be transmitted to the engineer within 24 hours. The engineer will assign a laboratory test programme for the samples of that borehole within 3 working days after receipt of the field log.
- 3.9.2 These boreholes are to be conducted for confirmation of data available and for finding out the depth of rock profile at certain locations. As such the testing of samples has to be carried out in a meticulous manner. Availability of testing facilities as directed is a must and a visit to the laboratory may be made by a representative of DMRC LTD. before accepting any offer submitted by any Tenderer.
- 3.9.3 The Engineer may visit to observe tests of soil as well as rock in the laboratory.

3.9.4 Necessary laboratory tests shall be conducted on selected samples in consultation with the Engineer-in-charge. For this purpose, all undisturbed samples shall be entered on the proforma shown in relevant IS Codes and submitted, in triplicate, to the Engineer with records of the field bore logs.

3.9.5 All tests shall be performed as per IS: 2720 (relevant parts) and as per the directions of the Engineer-in-Charge as directed.

3.9.6 Testing of Rock Samples

Selected core samples shall be tested in the laboratory for hardness / crushing and shear strength, test samples shall be chosen so as to include joints, fissures etc. as far as possible

3.9.7 Point Load Test on rock Cores

Intact samples of minimum 50 mm diameter and length equal to 1.5 times the diameter should be tested on a Point Load Tester and its point load index shall be determined. The Uniaxial Compressive Strength (UCS) of the sample should be calculated from the point load index. The index as well as the UCS should be reported.

Uniaxial Compressive Strength of Intact Rock Samples Intact rock cores of minimum NX/EX size and length 2.5 to 3 times the diameter should be tested for its uniaxial compressive strength. This test should be conducted on perfectly cylindrical samples, which shall be polished and conform to Indian Standard Code of practice. The UCS of the sample should be reported along with the diameter and length of the sample.

3.9.8 Laboratory Tests

Tests as indicated in the specification and as called for by the Engineer, shall be conducted as per the Schedule of Quantity.

Direct shear and triaxial tests shall both be conducted at same depth for same material obtained from one sampler at least at two locations in each bore hole to find out the values of cohesion and the angle of shearing resistance. The tests shall be carried out, for all conditions and their specific engineering significance should be maintained. However, conditions of test i.e., unconsolidated undrained, consolidated drained etc. shall be as per specific instructions from Engineer.

Type and location of other tests shall be decided by the Engineer. It shall be the duty of the contractor to obtain details of locations and type of tests from the Engineer before starting boring for a particular bore hole. The Engineer shall however, be free to change these locations if so warranted by site conditions.

The analysis of above data shall include calculations for self standing height, de-watering requirements including capacity of pumps and number of pumps and shall be included in report in detail.

All soil testing as directed by Engineer shall be conducted by Laboratory holding current accreditation under Inter-national Standard Organisation / Bureau of Indian Standards.

3.10 REPORT

3.10.1 On completion of field and laboratory work, for every km, a draft factual report in triplicate, shall be submitted incorporating the following:

- a) A complete description of the soils and rocks encountered, along with in-situ test results and the samples type and depths.
- b) Procedure of investigation employed.
- c) Detailed bore hole logs, laboratory and field test results, both in tabular as well as in graphical form, and a plot plan showing locations and reduced levels of bore holes and other tests.
- d) Soil classification curves including Table indicating D-10, D-30, D-60 size, uniformity coefficient etc. These figures should be made on Auto Cad and submitted to DMRC LTD. on floppies.
- e) Mohr's circle diagrams drawn on the basis of data obtained from shear strength tests shall be enclosed.
- f) Aggressiveness of soil and soil water to concrete, steel and other building material.
- g) Any other information of special significance encountered during investigations and likely to have a bearing on design and construction.
- h) Reduced levels and coordinates of bore holes shall be tabulated. The depth of water table with respect to ground shall also be given.
- i) Detailed report giving recommendations for type of foundation, analysis of borelogs & tests results along with SBC values.

3.10.2 Final report shall be submitted only after incorporation of comments by the Engineer.

3.10.3 Four copies of report for every km including all figures shall be given to DMRC LTD. Computer diskettes /CDs for this report and figures shall be submitted by contractor to DMRC LTD. Any data supplied by DMRC LTD. shall not be used for any other purpose other than it is meant for.

3.10.4 The data, reports and figures generated out of this assignment shall be the sole property and the contractor shall give an undertaking that he shall not use this for any other purpose. No computer back-ups shall be kept by him.

3.10.5 All the locations of bore hole points shall be marked on drawing and give horizontal, Coordinates and reduced levels. The Reduced Levels of the top of Bore holes shall be interlinked with the GTS Bench Marks in Co-ordination with the Agency doing the detailed topographical Survey.

SECTION 4.0

SPECIAL CONDITIONS OF CONTRACT

4.1 Work Program

The contractor shall submit the work program before the start of work and submit 2 copies of weekly progress report to General ED/Civil, or his representative, clearly indicating the target achieved and programme for next week.

4.2 Safety precautions during progress of works

The contractor shall take all precautions to ensure safety of the staff, existing utility services, adjoining structures etc., during progress of work. The contractor shall also make necessary arrangement for the safety of his workers, if any accident occurs, the entire responsibility accidental insurance cover fall on the part of the contractor.

4.3 Damage to Government property or private life & property.

The contractor shall be responsible for all risks to the works and for trespasses and shall make good at his own expense all loss or damage whether to the works themselves or to any other property of the Government (including Utility Services.), DMRC Ltd. is not responsible for the lives of persons or property of others whatsoever may be the cause in connection with or as a result of the execution of works until they are taken over by the DMRC Ltd., even though all reasonable and proper precautions may have been taken by the contractor. Such cost, loss or damages or compensation (including that payable under the provisions of the Workmen's Compensation Act or any statutory amendments thereof) to any person or persons sustaining damage as omission on the part of the contractor, is to be borne by the contractor.

The amount of any costs or charges (including costs and charges in connection with legal proceedings), which may incur in reference thereto, shall be charged to the or to defend or comprise any claim or threatened legal proceedings or in anticipation of legal proceedings being instituted consequent to the action or default of the contractor to take such steps as may be considered necessary or desirable to ward off mitigate the effect of such proceedings, charging to the contractor as aforesaid any sum or sums of money which may be paid and any expenses whether for reinstatement or otherwise which may be incurred and the propriety of any such payment, defense or comprise and the incurring of any such expenses shall not be called in question by the contractor.

4.4 Risks and Cost

In case contractor fails to complete work as per schedule, DMRC Ltd. has discretion to get the work done completed by any other agency at risk and cost of the agency to which the work has initially been awarded by giving seven days notice.

4.5 Permission

Most of the bore holes shall be carried out along the central verge/median of the road. Hence, contractor shall make his own arrangement for providing necessary traffic sign board to regulate the traffic, cutting the road and making good the same after completing the field work and obtaining necessary permission from the concerned agencies for carrying the GT investigation work. Nothing extra shall be paid on this account. However, assistance in the form of letters etc. to local agencies for obtaining permission shall be extended to contractor. In case it is not possible to carry out the work on central verge/median, work shall be carried out on footpath.

4.6 Taxes and Levies

All statutory liabilities as per applicable laws and act at site will be borne by contractor and DMRC Ltd. will not entertain any claim in this regard. Income tax as per rules shall be deducted from each bill.

4.7 Liquidated Damages

Time is essence of the contract and it shall be strictly adhered to. In case of any delay not attributed to DMRC Ltd. in the execution of work beyond stipulated time period, DMRC Ltd shall recover as liquidated damage from contractor at the rate of 1/2 (half) percent of contract value per week of delay, limited to 10 (ten) percent of total value of the contract.

4.8 Force Majeure

War, invasion, revolution, riot, sabotage, lockouts, strikes, work shut down imposed by Government, acts of legislative or other authorities, stoppage in supply of raw materials, fuel or electricity, break down of machinery by mob or mass, act of God, epidemic, fires, earthquakes, floods, explosives, accidents and navigation blockages, or any other acts or events whatsoever, which are beyond reasonable controls of contractor and which shall directly or indirectly prevent completion of project within the time specified in the agreement, will be considered Force Majeure. DMRC Ltd. shall grant necessary extension of completion date to cover the delays caused by Force Majeure without any financial repercussions.

4.9 Settlement of disputes.

Matters will be finally determined by DMRC Ltd. All disputes and differences of any kind whatsoever arising out of or in connection with the contractor, whether during the progress of the works or after their completion and whether before or after the determination of the contract shall be referred by the contractor to and DMRC Ltd shall within a reasonable time after their presentation made and notify decisions thereon in writing. The decisions, directions, classification, measurements drawings and certificates with respect to any matter the decision of which is specially provided for by these or other special conditions, given and made by the DMRC Ltd, or a by the Engineer on behalf of the DMRC Ltd, are matters which are referred to hereinafter as accepted matters and shall be final and binding upon the contractor and shall not be set aside on account of any informity, omission, delay or error in proceedings, In or about the same or any other ground or for any other reasons and shall be without appeal.

In the event of any dispute or differences between the parties hereto as to the construction or operation of this contract or the respective rights and liabilities of the parties on any matter in question, dispute or differences on any account, or as to the withholding by DMRC Ltd of any certificate to which the contractor may claim to be entitled to or if the DMRC LTD. fails to make a decision within a reasonable time, then and in any such case, the contractor after 30 days of presenting his final claim on disputed matter may demand in writing that the dispute or differences be referred to arbitration. Such demand for arbitration shall specify the matters which are in question dispute or differences and only such disputes or differences of which the demand has been made and no other, shall be referred to arbitration., obligations during tendency of arbitration work under the contract, shall unless otherwise directed by the Engineer, continue during the arbitration proceedings and no payment due or payable by DMRC LTD. shall unless withheld on account of such proceeding, provided however, it shall be open for the arbitrator or arbitrators to consider and decide whether or not such work should continue during arbitration proceedings.

4.10 Arbitration

Matters in question, dispute or differences to be arbitrated upon shall be referred to for decision to a sole arbitrator who shall be the H.O.D. level or higher level officer, DMRC Ltd. or a nominated person will be appointed by Director Project, DMRC LTD., whose decision shall be final and binding to the contractor.

The work shall be continued as per programme during pendency of arbitration.

4.11 Schedule of payment.

Payment shall be made as per the following schedule:

- 10% Mobilization advance on mobilisation/inspection of instruments at site against Bank Guarantee issued by any Scheduled bank in favour of DMRC Limited.
- 60% of the quoted item rates as per accepted schedule of rates on completion of field work and submission of bore logs details.
- 10% of the quoted item rates as per accepted schedule of rates on submission of draft report.
- 20% of total remuneration on acceptance of final reports.

4.12 DELIVERABLES

The following drawings, reports, documents etc. shall be submitted by the Contractor/Sub-consultant as per time frame indicated below:

a) Inception report.	15 days from the date of award of work
b) Completion of field work and submission of draft report.	2.5 months from the date of award of work
c) Submission of final reports.	3.0 months from the date of award of work

4.13 Running payments not prejudicial to final settlement

Running payment made to the contractor shall be without prejudice to the final payment of accounts (except where measurements are specifically noted in the measurements book as final measurements and as such have been signed by the contractor) and shall in no respect be considered or used as evidence of any facts stated or in or to be inferred from such accounts not of any particular quantity of works having been executed nor of the manner of its execution being satisfactory.

4.14 Certificate of completion of work

As soon as in the opinion of the Engineer-in-Charge, the work shall have been substantially completed the Engineer-in-Charge shall issue a certificate of completion in respect of work.

4.15 Escalation

No escalation in rates shall be allowed on any account.

4.16 Security Deposit

Tender security shall be retained as a part of initial Security deposit. Balance security deposit shall be recovered @10% of each running bill till total deposit inclusive of tender security become 10% of the contract value.

Security deposit will be refunded only after the completion of work in all respects by the contractor and formal issue of completion certificate by the Engineer.

4.17 Alteration to scope of work

DMRC LTD. Engineers or representative shall have power to make any alteration, omission addition substitution for the original work. No claim whatever on account of above shall be entertained except the payment for the actual work done.

4.18 Water and Electricity

All arrangements shall be made by the Contractor for obtaining water, electricity etc., required for the drilling operations.

4.19 Below Ground Utilities

The Contractor shall note that the works are to be undertaken in an urban Environment on the busy roads and that utilities are present along the alignment. All efforts shall be made to ensure that no damage is caused to the Utilities. Before starting the work, site of borehole is to be properly barricaded to avoid any hindrances or inconvenience to users as indicated in clause 3.1.1.a. Manual excavation may be done upto suitable depth to ascertain that no utility is passing through the bore hole location. No claim on accounts such excavation or shifting of any equipment etc. shall be entertained.

4.20 Other Conditions

In case of premature termination DMRC, no extra compensation shall be payable. Payment of remuneration in that case will be made to the extent the services rendered till that time can be made use of by DMRC, limited to the period for which the agency had actually rendered the service and subject to the intermediate targets being adhered to as per the work schedule mutually agreed to. No notice of termination or remuneration thereof will be necessary and continuance shall be solely at the discretion of DMRC.

All the documents and drawings created out of the assigned work will become the sole property of the DMRC and DMRC will be free to use the same in any manner deemed fit.

The agency will exercise all responsible skill, care and diligence in the performance of the service under this work and shall carry out all the responsibilities with recognized latest professional standards.

All the boreholes location is on road so the work area shall be properly barricaded as per directives of Engineer. Necessary watch and ward luminous indicators etc. as required shall be provided at the cost of the contractor. Reflective paint / tape shall be provided on barricades to ensure safety at night. Adequate measures shall be taken to ensure that no water or soil spillover the road. The barricading shall be made as per clause 3.1.1.a.

The specifications for the works are attached. All work shall be carried out in accordance with relevant IS Codes or any other internationally accepted standards e.g. British Standards or ASTM.

Quality of the work undertaken is of paramount importance. The thrust of the investigation is to obtain good quality and reliable technical data, which will form the basis of subsequent design. Constant site supervision will be necessary to ensure that the desired end result is obtained. As part of the tender process, you are invited to put forward CVs of two staff members who will be responsible for the technical aspects of the work. One CV should be of a qualified Geo-technical Engineer/ Engineering Geologist who will be responsible for coordinating all field activities including sampling operations, and preparation of the field logs. The other should be of a Senior Engineer who will provide guidance from the office, make periodic site visits, and be available for discussion with DMRC LTD. staff at all reasonable hours to respond to any queries arising.

As part of your submission you are requested to submit details of all relevant equipment at your disposal (drilling machines, laboratory testing equipment, etc.) If you need to associate with another company in executing the works then this should be clearly mentioned in your offer. The details of laboratory where the samples to be tested shall also to be indicated.

DMRC will depute Engineer at site to sort out day to day problems arising at site.

**SECTION 5.0
BILL OF QUANTITIES**

S. No.	Description	Unit	Qty.	Rate (Rs.)	Amount (Rs.)
I	Field Investigation				
1.	Drilling of bore hole in all types of strata				
	a) GL to 10m	M	1020	311.50	317730.00
	b) 10m to 20m	M	540	249.20	134568.00
	c) more than 20m	M	540	200.25	108135.00
2.	Drilling gravel strata required cutting by diamond bits/cutters				
	a) 10m to 20m	M	240	1275	306000.00
	b) more than 20m	M	240	1275	306000.00
3.	Carry out SPT tests	Nos	780	74.76	58312.80
4.	Collecting disturbed samples	Nos	780	40.05	31239.00
5.	Collecting Undisturbed samples	Nos	160	74.76	11961.60
6.	Conducting Permeability test				
	a) In over burden using falling head	Nos	5	1001.25	5006.25
7.	Collecting water samples	Nos	78	49.84	3887.52
8.	Survey all bore holes including plotting of coordinate (XYZ) on alignment plan	KM	33	756.50	24964.50
II	Laboratory Test				
A	Soil Samples/Gravel samples				
1	Sieve Analysis	Nos	780	24.92	19437.60
2	Hydrometer Analysis	Nos	250	44.50	11125.00
3	Specific Gravity	Nos	250	29.37	7342.50
4	Moisture Content	Nos	250	11.57	2892.50
5	Dry Density	Nos	250	24.92	6230.00
6	Atterberg limits	Nos	780	70.31	54841.80
7	Direct Shear Tests	Nos	160	150.41	24065.60
8	Triaxial Shear Tests	Nos	160	150.41	24065.60
9	Chemical Analysis				
	a) Soil	Nos	80	249.20	19936.00
	b) Water	Nos	80	249.20	19936.00
III	Report				
1	Provide final report 1 set (6 copies)	Nos	1	49839.80	49840
	Total Amount				1494117
	Add service tax @ 10.3%				1648011

Note:- All above Items rates are excluding all taxes.

Note:

1. The rate shall be quoted by Contractor % above or below of indicated rates in figures as well as in words. Where there is a discrepancy between figures and words, the rate in words will govern.
2. The Quoted rates shall be inclusive of all cost of labour, materials, equipment, preparation of drawing if any, all taxes for proper completion of the work
3. Nothing extra shall be paid for mobilization, setting up boring rig from one location to another location, demobilization the same at site.
4. Most of the boreholes shall be carried out at centre verge of the road. Hence agency shall make his own arrangement for providing necessary traffic sign boards, obtaining permission from traffic police authorities for regulating the traffic and cutting the road and making good the same after completing the field work. No extra payment shall be made on this account.
5. Wherever bore hole are not possible on the center verge of the road, the same shall be done on footpath as per the instruction of Engineer.
6. Necessary barricading with 2.4mx1.8m metallic/wooden boards with necessary fixing /supporting arrangements shall be made around the work area .The barricades shall be provided with wheels for easy shifting and movement. The barricading panels shall be light/movable and shall be as per Drg. DMRC/20/Chandigarh/ GEO/2010 enclosed. The cost of providing, maintaining, shifting etc. of barricading shall be borne by the agency.

SECTION – 6

SITE INFORMATION

WORK SITE

The project site is located in the area of Chandigarh Metropolitan Complex, which includes Mohali and Panchkula also.

The tentative route alignment is shown as follows.

- (i) Line 1 – from Sector 15, Panchkula to Sarangpur via Sector 5 (Panchkula), Dhillon Complex, Chandigarh Railway Station, Transport Nagar, Sector 19, PGI, Punjab University with total length of 19 kms.
- (ii) Line 2 – from Secretariat to Sector 75 (Mohali) via Rock Garden, Sector 9, Aroma Chowk, Sector 43, Sector 52 (Mohali), Sector 72 (Mohali) with total length of 14 kms.