



PAKISTAN RAILWAYS

Headquarters Office, Lahore

REQUEST FOR PROPOSAL (RFP) FOR APPOINTMENT OF CONSULTANTS

FEASIBILITY STUDY FOR RESTORATION / UPGRADATION OF JACOBABAD –
SILRA SHAHDAD KOT - LARKANA SECTION (135 KM)

Pakistan Railways intends to hire the services of reputed Consultant or Joint venture of Consultants, for carrying out Feasibility Study in connection with following work.

“Feasibility Study for Restoration / Upgradation of Jacobabad – Silra Shahdad
Kot - Larkana Section (135 Km)”

The interested firms can download RFP documents from Pakistan Railways website (www.pakrail.gov.pk) or PPRA website (www.ppra.org.pk). The document consists of RFP, Terms of Reference, consultant’s evaluation criteria and format of Technical & Financial proposals for this project.

Interested leading Consulting firms or Joint Ventures having respective experience of carrying out Feasibility Studies particularly in Railway Sector are invited to participate for the bidding of this project.

Technical and financial proposals shall be submitted in TWO separate envelopes.

A pre-proposal conference shall be held on **10th September, 2018** at **11:00 am** in Railway Headquarter office Lahore for which prospective Consultants are requested to attend. Any further information can be obtained from the under signed during office hours.

The prospective bidders will submit their proposals only on prescribed format, at the following address on or before **25th September, 2018** up to **11:00 am**. Technical proposals will be opened on the same date and venue at **11:30 am** in the presence of representative of firms, who choose to witness.

Basharat Waheed

Chief Engineer (Surveys & Constructions)
Pakistan Railways, Headquarters Office,
Empress Road, Lahore.

Ph. (042) 99201625, Fax (042) 99201760

Email: cenesc@pakrail.gov.pk Web: www.pakrail.gov.pk

Tender no: 844-W/468(S&C) Tender



PAKISTAN RAILWAYS

REQUEST FOR PROPOSAL (RFP)

FOR

**FEASIBILITY STUDY FOR RESTORATION /
UPGRADATION OF JACOBABAD – SILRA
SHAHDAD KOT - LARKANA SECTION (135 KM)**

AUGUST, 2018

**Chief Engineer / Survey & Construction
Headquarters Office
Lahore Pakistan.
PH: +92-42-9201625 FAX: +92-42-9201760**

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Section 1: Invitation for RFP

No. 844-W/468(S&C) Tender

Date: August 17, 2018.

SUBJECT: INVITATION FOR RFP (REQUEST FOR PROPOSAL) FOR SELECTION OF CONSULTANTS FOR FEASIBILITY STUDY FOR RESTORATION / UPGRADATION OF JACOBABAD – SILRA SHAHDAD KOT - LARKANA SECTION (135 KM)

1. The Chief Engineer/Survey & Construction (S&C) invites Technical and Financial proposals to provide the following consultancy services:

“FEASIBILITY STUDY FOR RESTORATION / UPGRADATION OF JACOBABAD – SILRA SHAHDAD KOT - LARKANA SECTION (135 KM).”

2. Consultants will be selected under Quality and Cost Based Selection (QCBS) method as described in this RFP in accordance with PPRA Rule 2004 and PPRA Procurement of Consultancy Services Regulations 2010.
3. The RFP includes the following documents:
 - Section 1: General Information
 - Section 2: Instructions to Consultants (including Data Sheet)
 - Section 3: Technical Proposal – Standard Forms
 - Section 4: Financial Proposal – Standard Forms
 - Section 5: Terms of Reference
4. It is mandatory for proposals to be prepared using Standard Forms of RFP. Any proposal not prepared according to prescribed format may be rejected. If any information required in the Forms is found missing or written elsewhere, no credit will be given in the relevant section of the evaluation.
5. The Consultants / Firms should submit details of **Five (5)** of their most relevant assignments of similar projects for technical evaluation using the prescribed format. Assignments given beyond the required number will not be considered.
6. CVs of key personnel corresponding to the list given in Data Sheet should provide details of **Five (5)** projects done by each individual in the past.
7. The Consultant can be single entity or Joint Venture / consortium of International and national firms, with total number of firms in JV not more than three.
8. The Technical and Financial proposals are to be submitted in separate sealed envelopes at the following address not later than **25th September, 2018 till 2:00 pm.**

(Basharat Waheed)
Chief Engineer / S&C
Pakistan Railways, Headquarter Office
Lahore.
042 – 99201625
Email: censc@pakrail.com

General Information

The Consultants are required to provide following information which is necessary for further processing of the proposals:

1. Whether applied as Single Entity or Joint Venture, please specify.
2. In case of Joint Venture provide the following information along with attached Form **General-1** for all JV partners.

S.No.	Name of JV partners	% share proposed for this assignment
1.	Lead Partner	
2.	Partner No.1	
3.	Partner No.2	

3. The Consultants are required to provide accurate information on any litigation or arbitration, arising out of the assignments completed or in progress over the last five years in the manner as prescribed in the Form **General-2**
4. Certificate / affidavit that the Firm is not blacklisted by any government department / authority.
5. For local firms National Income Tax number (NTN) of Pakistan and for foreign firms Tax Registration Number of parent country, in case of JV please provide this information for all partners.(please attach copies of valid registration)
6. For local firms Registration with Pakistan Engineering Council (PEC) and for foreign firms relevant registration with relevant engineering bodies of parent country. (please attach copies of valid registration)
7. Last three years audited reports of accounts of the firm.
8. Power of attorney to sign the proposals.
9. Joint Venture agreement in case of JV.

Form General-1 – Basic Information

1. Name of Firm.
2. Office address in Pakistan.
3. Office address overseas (if applicable).
4. Organization Chart.
5. Telephone & Fax
6. e-mail
7. Contact person
8. Place of incorporation / registration
9. Year of incorporation / registration
10. Country of origin (if other than Pakistan)
11. Type of organization (whether partnership / sole proprietorship / public limited company / private limited company)

Note: In case of JV above information should be provided for all partners.

Section 2: Instructions to Consultants

2.1. Definitions

- 2.1.1. “Government Of Pakistan” Means The Government Of Pakistan And All Its Associated Departments, Agencies, Autonomous/Semi- Autonomous Bodies, Boards, Universities And Similar Other Organizations.
- 2.1.2. “Client” means Chief Engineer / S&C, Pakistan Railways, Headquarter Office, Lahore.
- 2.1.3. “Consultants” means any entity / firm / Joint venture of firms that may provide the Services to the Client under the Agreement. The Consultant can be single entity or Joint Venture / consortium of International and national firms, with total number of firms in JV not more than three.
- 2.1.4. “Agreement” means the Agreement signed by the Client and the Consultants and all the attached documents.
- 2.1.5. “Data Sheet” means such part of the Instructions to Consultants used to reflect specific conditions.
- 2.1.6. “Day” means calendar day.
- 2.1.7. “Instructions to Consultants” means the document which provides Consultants with all information needed to prepare their Proposals.
- 2.1.8. “Personnel” means professionals and support staff provided by the Consultant or by any Sub-Consultant to perform the Services or any part thereof; “Foreign Personnel” means such professionals and support staff who at the time of being so provided had their domicile outside Pakistan; ‘Local Personnel” means such professionals and support staff who at the time of being so provided had their domicile inside Pakistan.
- 2.1.9. “Proposal” means the Technical Proposal and the Financial Proposal.
- 2.1.10. “RFP” means the Request for Proposal issued by the Client for the selection of Consultants.
- 2.1.11. “Services” means the work to be performed by the Consultants pursuant to the Agreement.
- 2.1.12. “Sub-Consultant” means any person or entity with whom the Consultants enter into sub-agreement(s) for any part of the Services.

- 2.1.13. “Terms of Reference” (TOR) means the document included in the RFP which explains the objectives, scope of work, activities, tasks to be performed, respective responsibilities of the Client and the Consultant, and expected results and deliverables of the assignment.
- 2.1.14. “Similar Assignment” means Feasibility Study for establishing new route(s) for railway track or feasibility study for up-gradation / improvement of existing railway track

2.2. Introduction

- 2.2.1. The Consultants are invited to submit a Technical Proposal and a Financial Proposal for consulting services required for the assignment named in the Data Sheet. The proposals should be in separate marked and sealed envelopes. The Proposal will be the basis for agreement negotiations and ultimately for a signed Agreement with the selected Consultants.
- 2.2.2. Consultants should familiarize themselves with assignment conditions and take them into account in preparing their Proposals. To obtain first-hand information on the assignment, Consultants are encouraged to visit the Client before submitting a proposal and to attend a pre-proposal conference as per schedule specified in Data Sheet.
- 2.2.3. Consultants should contact the Client’s representative named in the Data Sheet to obtain information regarding the assignment. Consultants should ensure that the concerned official is informed well- ahead of time in case they wish to visit the Client.
- 2.2.4. Consultants shall bear all costs associated with the preparation and submission of their proposals and agreement negotiation. The Client is not bound to accept any proposal, and reserves the right to annul the selection process at any time prior to Agreement award, without thereby incurring any liability to the Consultants.

2.3. Conflict of Interest

- 2.3.1. The policy of Government of Pakistan requires that Consultants provide professional, objective, and impartial advice and at all times hold the Client’s interests paramount, strictly avoid conflicts with other assignments or their own corporate interests and act without any consideration for future work.
- 2.3.2. Without limitation on the generality of the foregoing, Consultants, and any of their affiliates, shall be considered to have a conflict of interest and shall not be recruited, under any of the circumstances set forth below:

2.4. Conflicting Activities

2.4.1. A firm that has been engaged by the Client to provide goods, works or services other than consulting services for a project, and any of its affiliates, shall be disqualified from providing consulting services related to those goods, works or services. Conversely, a firm hired to provide consulting services for the preparation or implementation of a project, and any of its affiliates, shall be disqualified from subsequently providing goods or works or services other than consulting services resulting from or directly related to the firm's consulting services for such preparation or implementation. For the purpose of this paragraph, services other than consulting services are defined as those leading to a measurable physical output, for example surveys, exploratory drilling, aerial photography, and satellite imagery etc.

2.5. Conflicting Assignments

2.5.1. A Consultant (including its Personnel and Sub- Consultants) or any of its affiliates shall not be hired for any assignment that, by its nature, may be in conflict with another assignment of the Consultant to be executed for the same or for another Client. For example, a Consultant hired to prepare engineering design for an infrastructure project shall not be engaged to prepare an independent environmental assessment for the same project, and a Consultant assisting a Client in the privatization of public assets shall neither purchase, nor advise purchasers of, such assets. Similarly, a Consultant hired to prepare Terms of Reference for an assignment should not be hired for the assignment in question.

2.6. Conflicting Relationships

2.6.1. A Consultant (including its Personnel and Sub- Consultants) that has a business or family relationship with a member of the Client's staff who is directly or indirectly involved in any part of (i) the preparation of the Terms of Reference of the assignment, (ii) the selection process for such assignment, or (iii) supervision of the Agreement, may not be awarded an Agreement, unless the conflict stemming from this relationship has been resolved in a manner acceptable to the Pakistan Railways throughout the selection process and the execution of the Agreement.

2.6.2. Consultants have an obligation to disclose any situation of actual or potential conflict that impacts their capacity to serve the best interest of their Client, or that may reasonably be perceived as having this effect. Failure to disclose said situations may lead to the disqualification of the Consultant or the termination of its Agreement.

2.6.3. No agency (except any subsidiary of the Client) or current employees of the Client shall work as Consultants under their own ministries, departments or agencies. Recruiting former government employees of the Client to work for

their former ministries, departments or agencies is acceptable provided no conflict of interest exists. When the Consultant nominates any government employee as Personnel in their technical proposal, such Personnel must have written certification from their government or employer confirming that they are on leave without pay from their official position and allowed to work full-time outside of their previous official position. Such certification shall be provided to the Client by the Consultant as part of his technical proposal.

2.7. Unfair Advantage

- 2.7.1. If a Consultant could derive a competitive advantage from having provided consulting services related to the assignment in question, the Client shall make available to all applicants together with this RFP all information that would in that respect give such Consultant any competitive advantage over competing Consultants.

2.8. Fraud and Corruption

- 2.8.1. Pakistan Railways requires Consultants participating in its projects to adhere to the highest ethical standards, both during the selection process and throughout the execution of an agreement. In pursuance of this policy, Pakistan Railways:

- a) Defines, for the purpose of this paragraph, the terms set forth below as follows:
- (i) “corrupt practice” means the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence the action of a public official in the selection process or in agreement execution;
 - (ii) “fraudulent practice” means a misrepresentation or omission of facts in order to influence a selection process or the execution of an agreement;
 - (iii) “collusive practices” means a scheme or arrangement between two or more consultants with or without the knowledge of the Client, designed to establish prices at artificial, noncompetitive levels;
 - (iv) “Coercive practices” means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in procurement process, or affect the execution of agreement.
- b) will reject a proposal for award if it determines that the Consultant recommended for award has, directly or through an agent, engaged in corrupt, fraudulent, collusive or coercive practices in competing for the agreement in question;

- c) will penalize a Consultant, including declaring the Consultant ineligible, either indefinitely or for a stated period of time, to be awarded a Government of Pakistan agreement if at any time it determines that the Consultant has, directly or through an agent, engaged in corrupt, fraudulent, collusive or coercive practices in competing for, or in executing, a Government of Pakistan agreement; and
- d) will have the right to require that a provision be included requiring Consultants to permit the Government of Pakistan to inspect their accounts and records and other documents relating to the submission of proposals and agreement performance, and have them audited by auditors appointed by the Government of Pakistan.
- e) Consultants, their Sub-Consultants, and their associates shall not be under a declaration of ineligibility for corrupt and fraudulent practices issued by the Government of Pakistan.

2.9. Only one Proposal

- 2.9.1. Each Consultants / JV can submit only one proposal. If a Consultant submits or participates in more than one proposal, all such proposals, in which the Consultants have participated, shall be disqualified.

2.10. Proposal Validity

- 2.10.1. The Data Sheet indicates how long Consultants' Proposals must remain valid after the submission date. During this period, Consultants shall maintain the availability of Professional staff nominated in the Proposal. The Client will make its best effort to complete negotiations within this period. Should the need arise, however, the Client may request Consultants to extend the validity period of their proposals. Consultants who agree to such extension shall confirm that they maintain the availability of the Professional staff nominated in the Proposal, or in their confirmation of extension of validity of the Proposal, Consultants could submit new staff in replacement, who would be considered in the final evaluation for agreement award. Consultants who do not agree, have the right to refuse to extend the validity of their Proposals.

2.11. Clarification and Amendment of RFP Documents

- 2.11.1. Consultants may request a clarification of any of the RFP documents up to the number of days indicated in the Data Sheet before the proposal submission date. Any request for clarification must be sent in writing, or by standard electronic means to the Client's address indicated in the Data Sheet. The Client will respond in writing, or by standard electronic means and will send written copies of the response (including an explanation of the query but without identifying the source of inquiry) to all Consultants. Should the Client deem it necessary to amend the RFP as a result of a clarification, it shall do so following the procedure as stated in para below.

2.11.2. At any time before the submission of Proposals, the Client may amend the RFP by issuing an addendum in writing or by standard electronic means. The addendum shall be sent to all Consultants and will be binding on them. Consultants shall acknowledge receipt of all amendments. To give Consultants reasonable time in which to take an amendment into account in their Proposals the Client may, if the amendment is substantial, extend the deadline for the submission of Proposals.

2.12. Preparation of Proposal

2.12.1. The Proposal, as well as all related correspondence exchanged by the Consultants and the Client, shall be written in the language (s) specified in the Data Sheet.

2.12.2. In preparing their Proposal, Consultants are expected to examine in detail the documents comprising the RFP. Material deficiencies in providing the information requested may result in rejection of a Proposal.

2.13. Technical Proposal Format and Content

2.13.1. The Technical Proposal shall provide the information indicated in the following paras from (a) to (g) using the attached Standard Forms (Section 3).

- a) A brief description of the Consultants' organization and an outline of recent experience of the Consultants (each partner in case of joint venture) on assignments of a similar nature **are** required in Form TECH-2 of Section 3. For each assignment, the outline should indicate the names of Sub-Consultants/ Professional staff who participated, duration of the assignment, agreement amount, and Consultant's involvement. Information should be provided only for those assignments for which the Consultant was legally engaged by the Client as a firm or as one of the major firms within a joint venture. Assignments completed by individual Professional staff working privately or through other consulting firms cannot be claimed as the experience of the Consultant, or that of the Consultant's associates, but can be claimed by the Professional staff themselves in their CVs. Consultants should be prepared to substantiate the claimed experience if so requested by the Client.
- b) Comments and suggestions on the Terms of Reference including workable suggestions that could improve the quality/ effectiveness of the assignment; (Form TECH-3 of Section 3).
- c) A description of the approach, methodology and work plan for performing the assignment covering the following subjects: technical approach and methodology, work plan, and organization and staffing schedule. Guidance on the content of this section of the Technical Proposals is provided under Form TECH-4 of Section 3.

- d) The list of the proposed Professional staff team by area of expertise, the position that would be assigned to each staff team member, and their tasks (Form TECH-5 of Section 3).
- e) CVs of the Professional staff signed by the staff themselves or by the authorized representative of the Professional Staff (Form TECH-6 of Section 3) along with their Computerized National Identity Card numbers (if local) or Passport numbers (if foreigner).
- f) Estimates of the staff input needed to carry out the assignment (Form TECH-7 of Section 3). The staff- months input should be indicated separately for home office and field activities.
- g) Annual Turnover (Form TECH-8 of Section 3). The annual turnover should be indicated separately for last three years.

2.13.2. The Technical Proposal shall not include any financial information. A Technical Proposal containing financial information may be declared non responsive.

2.14. Financial Proposal

2.14.1. The Financial Proposal shall be prepared using the attached Standard Forms (Section 4). It shall list all costs associated with the assignment.

2.15. Payment of Consultancy & Services Fee

2.15.1. The amount of remuneration will be claimed / paid as per the relevant clause of section-5 TOR.

2.15.2. 5% Retention Money will be deducted from each interim/monthly payment. Retention Money will be returned after six months of completion of the assignment.

2.15.3. The Client shall make all payments to the Consultant in Pak Rupees. However, the Client shall have no objection and shall facilitate the remittance in foreign currency of the remuneration of the foreign partner to the extent of services rendered by it with regard to this consultancy assignment.

2.16. Taxes

2.16.1. The Consultant may be subject to local taxes on amounts payable by the Client under the Agreement. The Client will state in the Data Sheet if the Consultant is subject to payment of any taxes. Payment of all taxes shall be the responsibility of the consultant.

2.17. Submission, Receipt and Opening of Proposal

- 2.17.1. The original proposal (Technical Proposal and Financial Proposal) shall contain no interlineations or overwriting, except as necessary to correct errors made by the Consultants themselves. The person who signed the proposal must initial such corrections. Submission letters for both Technical and Financial Proposals should respectively be in the format of TECH-1 of Section 3, and FIN-1 of Section 4.
- 2.17.2. An authorized representative of the Consultants shall initial all pages of the original Technical and Financial Proposals. The authorization shall be in the form of a written power of attorney accompanying the Proposal or in any other form demonstrating that the representative has been duly authorized to sign. The signed Technical and Financial Proposals shall be marked “ORIGINAL”.
- 2.17.3. The Technical Proposal shall be marked “ORIGINAL” or “COPY” as appropriate. The Technical Proposals shall be sent to the addresses referred to in Data Sheet and in the number of copies indicated in the Data Sheet. All required copies of the Technical Proposal are to be made from the original. If there are discrepancies between the original and the copies of the Technical Proposal, the original governs.
- 2.17.4. The original and all copies of the Technical Proposal shall be placed in a sealed envelope clearly marked “TECHNICAL PROPOSAL” Similarly, the original Financial Proposal shall be placed in a sealed envelope clearly marked “FINANCIAL PROPOSAL” followed by the name of the assignment, and with a warning “DO NOT OPEN WITH THE TECHNICAL PROPOSAL.” The envelopes containing the Technical and Financial Proposals shall be placed into an outer envelope and sealed. This outer envelope shall bear the submission address and title of the Assignment, clearly marked “DO NOT OPEN, EXCEPT IN PRESENCE OF THE OFFICIAL APPOINTED, BEFORE SUBMISSION DEADLINE”. The Client shall not be responsible for misplacement, losing or premature opening if the outer envelope is not sealed and/or marked as stipulated. This circumstance may be case for Proposal rejection. If the Financial Proposal is not submitted in a separate sealed envelope duly marked as indicated above, this will constitute grounds for declaring the Proposal non-responsive.
- 2.17.5. The Proposals must be sent to the address/addresses indicated in the Data Sheet and received by the Client not later than the time and the date indicated in the Data Sheet, or any extension granted thereof. Any proposal received by the Client after the deadline for submission shall be returned unopened.
- 2.17.6. The Client shall open the Technical Proposal immediately after the deadline for their submission. The envelopes with the Financial Proposal shall remain sealed and securely stored.

2.18. Proposal Evaluation

2.18.1. From the time the Proposals are opened to the time the Agreement is awarded, the Consultants should not contact the Client on any matter related to its Technical and/or Financial Proposal. Any effort by Consultants to influence the Client in the examination, evaluation, ranking of Proposals, and recommendation for award of Agreement may result in the rejection of the Consultants' Proposal. Evaluators of Technical Proposals shall have no access to the Financial Proposals until the technical evaluation is concluded.

2.19. Evaluation of Technical Proposal

2.19.1. The evaluation committee shall evaluate the Technical Proposals on the basis of their responsiveness to the Terms of Reference, applying the evaluation criteria, sub-criteria, and point system specified in Evaluation Criteria in Data Sheet and Appendix-I to Data Sheet and each responsive Proposal will be given a technical score. A Proposal shall be rejected at this stage if it does not respond to important aspects of the RFP, and particularly the Terms of Reference or if it fails to achieve the minimum technical score indicated in the Evaluation Criteria.

2.20. Public Opening and Evaluation of Financial Proposals

2.20.1. After the technical evaluation is complete, the Client shall notify in writing to Consultants that have secured the minimum qualifying marks, the date, time and location for opening the Financial Proposals. Consultants' attendance at the opening of Financial Proposals is optional. The opening date shall be set so as to allow interested Consultants sufficient time to make arrangements for attending the opening.

2.20.2. Financial Proposals shall be opened publicly in the presence of the Consultants' representatives who choose to attend. The name of the Consultants and the technical scores of the Consultants shall be read aloud. The Financial Proposal of the three top ranking Consultants who met the minimum qualifying mark will then be inspected to confirm that they have remained sealed and unopened. These Financial Proposals shall be then opened, and the total prices read aloud and recorded.

2.20.3. The Evaluation Committee will correct any computational errors. When correcting computational errors, in case of discrepancy between a partial amount and the total amount, or between word and figures, the formers will prevail. The Evaluation Committee shall correct the quantification indicated in the Financial Proposal so as to make it consistent with that indicated in the Technical Proposal, apply the relevant unit price included in the Financial Proposal to the corrected quantity and correct the total Proposal cost.

2.20.4. The weightage of Technical and Financial Proposals would be as indicated in Data Sheet.

2.21. Technical Negotiations

2.21.1. Technical Negotiations will be held at the address indicated in the Data Sheet. The invited Consultant will, as a pre-requisite for attendance at the negotiations, confirm availability of all Professional staff. Failure in satisfying such requirements may result in the Client proceeding to negotiate with the next- ranked Consultant.

2.21.2. Representatives conducting negotiations on behalf of the Consultant must have written authority to negotiate and conclude an Agreement.

2.21.3. Technical negotiations will include a discussion of the Technical Proposal, the proposed technical approach and methodology, work plan, and organization and staffing, and any suggestions made by the Consultant to improve the Terms of Reference. The Client and the Consultants will finalize the Terms of Reference, staffing schedule, work schedule, logistics, and reporting. These documents will then be incorporated in the Agreement as “Description of Services”. Special attention will be paid to clearly defining the inputs and facilities required from the Client to ensure satisfactory implementation of the assignment. The Client shall prepare minutes of negotiations which will be signed by the Client and the Consultant.

2.22. Availability of Professional Staff / Experts

2.22.1. Having selected the Consultant on the basis of, among other things, an evaluation of proposed Professional staff, the Client expects to negotiate an Agreement on the basis of the Professional staff named in the Proposal. Before agreement negotiations, the Client will require assurances that the Professional staff will be actually available. The Client will not consider substitutions during agreement negotiations unless both parties agree that undue delay in the selection process makes such substitution unavoidable or for reasons such as death or medical incapacity. If this is not the case and if it is established that Professional staff were offered in the proposal without confirming their availability, the Consultant may be disqualified. Any proposed substitute shall have equivalent or better qualifications and experience than the original candidate and be submitted by the Consultant within the period of time specified in the letter of invitation to negotiate.

2.23. Conclusion of the Negotiations

2.23.1. Negotiations will conclude with a review of the draft Agreement. To complete negotiations the Client and the Consultant will initial the agreed

Agreement. If negotiations fail, the Client will invite the Consultant whose Proposal received the second highest score to negotiate an Agreement.

2.24. Award of Agreement

2.24.1. After completing negotiations the Client shall award the Agreement to the selected Consultant and publish details on the website. The agreement will be executed based on Standard Format of Pakistan Engineering Council (PEC) for large projects (Lump Sum Based).

2.25. Confidentiality

2.25.1. Information relating to evaluation of Proposals and recommendations concerning awards shall not be disclosed to the Consultants who submitted the Proposals or to other persons not officially concerned with the process, until the publication of the award of Agreement. The undue use by any Consultant of confidential information related to the process may result in the rejection of its Proposal and may be subject to the provisions of the Consultant Selection Guidelines relating to fraud and corruption.

2.26. Integrity Pact

2.26.1. The successful Bidder shall sign and stamp the Integrity Pact, as per Standard Format of Pakistan Engineering Council (PEC), in case contract value exceeds Pak Rs. 10.000 Million.

2.27. Registration of Foreign Firms with Pakistan Engineering Council (PEC)

2.27.1. The successful Bidder shall be required to abide by the bylaws of Pakistan Engineering Council (PEC) and in case of foreign firm they are required to get registered with PEC after signing of the Contract Agreement.

2.28. Bankable Feasibility Study

2.28.1. The Feasibility Study should be of international standard, acceptable to national / international financial institutions.

2.29. Time for Completion

2.29.1. Time for completion of the assignment shall be as specified in the Data Sheet.

2.29.2. Mobilization Period, after signing of agreement shall be as specified in the Data Sheet.

DATA SHEET: Instructions to Consultants

Paragraph Reference	
2.1.2	<p><u>Name of the Client:</u> Chief Engineer / Survey & Construction, Pakistan Railways, Headquarter Office, Lahore, Pakistan.</p> <p><u>Method of selection:</u> QCBS (Quality and cost based Selection) in accordance with PPRA Rule 2004 and PPRA Procurement of Consultancy Services Regulations 2010.</p>
2.2.1	<p>Name of the assignment is:</p> <p style="text-align: center;">FEASIBILITY STUDY FOR RESTORATION / UPGRADATION OF JACOBABAD – SILRA SHAHDAD KOT - LARKANA SECTION (135 KM).</p> <p>Financial Proposal to be submitted together with Technical Proposal, however, both should be in separate sealed envelope clearly marked with name of Assignment and Firm.</p>
2.2.2	<p>Pre-proposal conference shall be held as per following schedule:</p> <p>First Pre-proposal conference: Date: 10th September, 2018. Time: 11:00 am at Conference Room. No.1, Pakistan Railways, Headquarters Office, Empress Road, Lahore</p>
2.2.3	<p>Basharat Waheed Chief Engineer / S&C, Pakistan Railways, Headquarter Office, Lahore, Pakistan. Phone: +92 42 99201797, 99201625 E-mail: cenc@pakrail.com</p>
2.10.1	Proposals must remain valid for ninety (90) days after the submission date
2.11.1	Clarifications may be requested not later than seven (7) days before the submission date.

2.12.1	Proposals shall be submitted in the following language: English.
2.16.1	Withholding / Advance Income Tax will be deducted as per prevailing government rules. It will be exclusive Consultant's responsibility to include all applicable Federal, Provincial or City taxes / fees & levies in the Financial Proposal
2.17.3	Consultant must submit one original and two (2) copies of the Technical Proposal and the original of the Financial Proposal.
2.17.5	The Proposal submission address is: The Chief Engineer / S&C, Pakistan Railways, Headquarter Office, Empress Road, Lahore, Pakistan Proposals must be submitted not later than the following date and time: <u>On or before 25th September ,2018 not later than 11:00 am</u>

2.19.1	Criteria, sub-criteria, and point system for the evaluation of Technical Proposals are:	
	(i) Company Profile:	40%
	(ii) Project Team:	40%
	(iii) Approach & Methodology:	20%
	<u>Description</u>	<u>Points</u>
	(i) Company Profile:	[100]
	a) Number of similar assignments	[40]
	b) Value of similar assignments	[40]
	c) Organizational structure	[10]
	d) Financial Capability	[10]
	Total = A ₁	
(ii) Project Team:	[100]	
1. Project Manager (Permanent way Expert)	[10]	
2. Railway Expert / Bridges & Structures	[8]	
3. Railway Alignment Design Expert	[8]	
4. Railway Expert / Train Operation	[7]	
5. Railway Expert / Signalling & Telecom	[7]	
6. Railway Expert / Electrical	[7]	
7. Railway Expert / Mechanical	[7]	
8. Transport Economist & Financial Specialist	[8]	
9. Environmental & Social Expert	[5]	
10. Transportation Expert	[5]	
11. Geologist	[5]	
12. Geo-Tech Expert	[5]	
13. Hydrology Expert	[6]	
14. Topographic Survey Expert	[6]	
15. GIS Expert	[6]	
	Total = A ₂	
(iii) Approach & Methodology:	[100]	
a) Understanding & Innovativeness	[40]	
b) Methodology & Work plan	[60]	
	Total = A ₃	
$\text{Technical Score} = \frac{A_1[40]}{100} + \frac{A_2[40]}{100} + \frac{A_3[20]}{100}$		
The minimum technical score (St) required to pass is: 70 Points <i>Further details of Evaluation Criteria are described in Appendix-I to Data Sheet</i>		

DATA SHEET

2.20.4	<p>Technical = 80%</p> <p>Financial = 20%</p> <p>The formula for determining the financial scores is as following:</p> $Sf = 100 \times Fm / F$ <p>Sf = The financial score Fm = The lowest price F = The price of the proposal under consideration.</p>
2.21.1	<p>Address for Technical negotiations:</p> <p>Chief Engineer / S&C, Pakistan Railways, Headquarter Office, Empress Road, Lahore, Pakistan.</p>
2.29	<p>2.29.1 Time for completion of the assignment shall be Six (06) Months after the mobilization period, excluding 15 days required by the Client for review and submission of comments on Draft Feasibility Report to the Consultants.</p> <p>2.29.2 Mobilization Period, after signing of agreement shall be fifteen (15) days.</p>

Details of Evaluation Criteria

1. Mandatory Requirements

- i. As a mandatory requirement Consultants must have completed at-least two similar assignments. Any Consultant not fulfilling the said requirement is liable to be technically disqualified.
- ii. Any Consultant who failed to complete Feasibility Study, already awarded to him and delay has occurred more than six months (without legitimate time extension) shall be awarded with negative marking of 10 Marks per assignment.
- iii. A Professional Expert will not be considered for Evaluation if he is already engaged in more than one (01) Client’s ongoing Consultancy Assignment. The professional, nominated for an Expert position in an assignment, which is not yet awarded, will be considered engaged.

(1) Company Profile (100 Marks)

a) Number of similar assignments (40 Marks)

One Project	= 8
Two Projects	= 16
Three Projects	= 24
Four Projects	= 32
Five Projects	= 40

- i). Similarity will be established and weightage will be given as under:

Strong = 100%, Medium = 80%, Weak = 70%

b) Value of similar assignments (40 Marks)

For completed projects having value

80% or more of this assignment	= 100%
50% to 80%	= 80%
Less than 50%	= 70%

For the purpose of Technical Evaluation, with a view to compare the cost of projects executed by the Consultants with this consultancy assignment, the estimated cost of this consultancy assignment shall be considered as Rs.60 Million.

c) Organizational structure (10 Marks)

Excellent = 100%, Good = 80%, Satisfactory = 60%

d) Financial Capabilities (10 Marks)

Annual Turnover (Pak Rs in Million)

More than or equal to 500 = 100%

More than or equal to 300 but < 500 = 80%

Less than 300 = 50%

(2) **Project Team**

For minimum qualification and experience of project team please refer to Appendix-II to Data Sheet. Each member of Consultant's team will be evaluated on the following criteria:

i). Education (40%)

MSc or equivalent = 100%

BSc or equivalent = 90%

Higher education i.e., MSc shall be considered only if these are in relevant field / discipline.

In case the Consultants provide two CVs, one for foreign and other for local professional for particular professional category, then CV of the foreign professional will be considered for the purpose of Technical Evaluation.

Appendix-I to Data Sheet (contd.....)

Details of Evaluation Criteria

ii). Experience (30%)

Where overall experience is 20 years

- Twenty five years or more = 100%
- 20 to <25 years = 90%
- Less than 20 years = 0% (Staff will not be considered for evaluation)

Where overall experience is 15 years

- Twenty years or more = 100%
- 15 to <20 years = 90%
- Less than 15 years = 0% (Staff will not be considered for evaluation)

Where overall experience is 10 years

- Fifteen years or more = 100%
- 10 to <15 years = 90%
- Less than 10 years = 0% (Staff will not be considered for evaluation)

iii). No of similar assignment (30%)

- Five or more = 100%
- 2 to less than 5 = 80%
- Less than two = Zero

(3) Approach & Methodology

Methodology submitted by Consultant will be analyzed by evaluating team and graded as under:

Quality	Grade	Weight
Excellent	A	100%
Good	B	70%
Average / below average	C	50%
Absent	D	0

Methodology will be analyzed based on following:

a) Understanding & Innovativeness

- i). What is the depth of the firm's understanding of the requirements and objectives of the consultancy assignment?
- ii) What is the quality of the improvements to the TOR suggested by the consultant to improve the outcome of the assignment?
- iii) What is the level of identification of potential risks that will affect the execution of the assignment, and what is the quality of the mitigation strategies proposed?

b) **Methodology & Work plan**

- i) How in-depth is the Statement of Work: does it fully cover the scope of the assignment and is it sufficiently developed to ensure assignment completion?
- ii) How developed is the Work Breakdown Structure (WBS) for the assignment?
- iii) How suitable is the Work Plan (staffing schedule): is the resource utilization sufficient and practical?

Appendix-II to Data Sheet

Minimum Qualification and Experience required for each position in Project Team

1. The professional having experience less than minimum specified below shall not be considered

Sr. No.	Position	Min-Qualification	Overall Experience	Min- Relevant Experience
1	Project Manager (Permanent way Expert)	B.Sc. Civil Engineering	20 years	10 years
2	Railway Expert / Bridges & Structures	M.Sc. Structure Engineering	15 years	8 years
3	Railway Alignment Design Expert	B.Sc. Civil Engineering	15 years	8 years
4	Railway Expert / Train Operation	M.Sc Transportation	15 years	8 years
5	Railway Expert / Signaling & Telecom	B.Sc. Electrical / Signaling /Telecommunication Engineering	15 years	8 years
6	Railway Expert / Electrical	B.Sc. Electrical Engineering	15 years	8 years
7	Railway Expert / Mechanical	B.Sc. Mechanical Engineering	15 years	8 years
8	Transport Economist & Financial Specialist	M.Sc./M.A Economics / CA	15 years	8 years
9	Environmental & Social Expert	M.Sc. Environmental Engineering / Sciences	15 years	8 years
10	Transportation Expert	Master in Transportation Planning / Engineering	15 years	8 years
11	Geologist / Tunnel Expert	M.Sc. Geology / Mining Engineering	15 years	8 years
12	Geo-Tech Expert	M.Sc. Geotechnical / Geological Engineering	15 years	8 years
13	Hydrology Expert	M.Sc. Hydrology/Water Resources Engineering./Hydraulics Engineering	15 years	8 years
14	Topographic Survey Expert	B.Sc. Civil Engineering	10 years	5 years
15	GIS Expert	M.Sc. GIS	10 years	5 years

2. Similar project has been defined under definitions for the purpose of comparison of the projects completed by the Consulting firm and assignment under consideration. For various professionals, the similar assignment shall be as per their respective field of specialization.

Section 3: Technical Proposal – Standard Forms

CONSULTANTS ARE REQUIRED TO PREPARE TECHNICAL PROPOSAL AS PER FOLLOWING FORMAT:

- TECH-1 Technical Proposal Submission Form
- TECH-2 Consultant’s Organization and Experience
 - A Consultant’s Organization
 - B Consultant’s Experience
- TECH-3 Comments or Suggestions on the Terms of Reference.
- TECH-4 Description of the Approach, Methodology and Work Plan for Performing the Assignment
- TECH-5 Composition of Team to be deployed for this assignment and Task Assigned
- TECH-6 Curriculum Vitae (CV) of Proposed Professional Staff
- TECH-7 Staffing Schedule
- TECH-8 Financial Capabilities

FORM TECH-1 TECHNICAL PROPOSAL SUBMISSION FORM

(Please submit on Company's Letterhead)

To: **The Chief Engineer / S&C,**
Pakistan Railways,
Headquarter Office,
Lahore, Pakistan.

Subject: **FEASIBILITY STUDY FOR RESTORATION / UPGRADATION
OF JACOBABAD – SILRA SHAHDAD KOT - LARKANA
SECTION (135 KM)**

Dear Sir,

We, the undersigned, offer to provide the subject in accordance with your Request for Proposal. We are hereby submitting our Proposal, which includes this Technical Proposal, and a Financial Proposal sealed under separate envelopes.

We are submitting our Proposal in association with: _____
[Insert a list with full name and address of each associated Consultant]

We hereby declare that all the information and statements made in this Proposal are true and accept that any misinterpretation contained in it may lead to our disqualification.

If negotiations are held during the period of validity of the Proposal, we undertake to negotiate on the basis of the proposed staff. Our Proposal is binding upon us and subject to the modifications resulting from Agreement negotiations.

We undertake, if our Proposal is accepted, to initiate the consulting services related to the assignment not later than the date indicated in the Data Sheet of the proposal.

We understand you are not bound to accept any Proposal you receive. We remain,

Yours sincerely,

Authorized Signature *[In full and initials]*: _____

Name and Title of Signatory: _____

Name of Firm: _____

Address: _____

FORM TECH-2 CONSULTANT'S ORGANIZATION AND EXPERIENCE

A - Consultant's Organization

Please provide the following information for your firm/entity and each associate for this assignment

1. Firm's Background and Achievements (min two pages)
2. Organogram.
3. List of professional Staff with Qualification and Experience.

FORM TECH-2 CONSULTANT'S ORGANIZATION AND EXPERIENCE

B - Consultant's Experience

*[Using the format below, provide information on each assignment for which your firm, and each associate for this assignment, was legally contracted as a corporate entity or as one of the major companies within an association, for carrying out consulting services **similar to the ones requested under this Assignment.**]*

Assignment name:	Value of the Project (in Pak Rs or US\$):
Country: Location within country:	Duration of assignment (months):
Name of Client:	
Start date (month/year): Completion date (month/year):	Value of consultancy services provided by your firm under the agreement (in Pak Rs or US\$):
Name of associated Consultants, if any:	Percentage of input provided by associated Consultants:
Name of senior professional staff of your firm involved and functions performed (indicate most significant profiles such as Project Director/Coordinator, Team Leader):	
Narrative description of Project:	
Description of actual services provided by your staff within the assignment:	

FORM TECH-3

Comments or suggestions on the TOR.

(Client is not bound to accept the suggestions provided by the Consultants. The Consultants are requested not to include any financial impact of the their suggestions in the Financial Proposal. Any claim on this account shall not be accepted at the stage of evaluation or after award of contract)

[Technical approach, methodology and work plan are key components of the Technical Proposal. You are suggested to present your Technical proposal divided into the following three chapters:

- a) Technical Approach and Methodology,
- b) Work Plan
- c) Organization and Staffing

- a) **Technical Approach and Methodology.** In this chapter you should explain your understanding of the objectives of the assignment, approach to the services, methodology for carrying out the activities and obtaining the expected output, and the degree of detail of such output. You should highlight the problems being addressed and their importance, and explain the technical approach you would adopt to address them. You should also explain the methodologies you propose to adopt and highlight the compatibility of those methodologies with the proposed approach.
- b) **Work Plan.** In this chapter you should propose the main activities of the assignment, their content and duration, phasing and interrelations, milestones, constraints (including interim approvals by the Client), and delivery dates of the reports. The proposed work plan should be consistent with the technical approach and methodology, showing understanding of the TOR and ability to translate them into a feasible working plan. A list of the final documents, including reports, drawings, and tables to be delivered as final output, should be included here.
- c) **Organization and Staffing.** In this chapter you should propose the structure and composition of your team. You should list the main disciplines of the assignment, the key experts responsible, and proposed technical and support staff.

**FORM TECH – 5 COMPOSITION OF PROFESSIONAL STAFF TEAM TO BE
DEPLOYED FOR THIS ASSIGNMENT AND TASK ASSIGNED**

Name of Staff	CNIC / Passport No.	Firm	Area of Expertise	Position Assigned	Task Assigned
For Foreign Professional Staff					
For Local Professional Staff					

FORM TECH-6 CURRICULUM VITAE (CV) OF PROPOSED PROFESSIONAL STAFF

1. **Proposed Position** [*only one candidate shall be nominated for each position*]: _____

2. **Name of Firm** [*Insert name of firm proposing the staff*]: _____

3. **Name of Staff** [*Insert full name*]: _____

4. **Date of Birth:** _____ **Nationality:** _____

5. **CNIC No (if Pakistani):** _____ **or Passport No:** _____

6. Education:

<i>Degree</i>	<i>Major/Minor</i>	<i>Institution</i>	<i>Date (MM/YYYY)</i>

7. **Membership of Professional Associations:** _____

8. **Other Training** [*Indicate significant training since degrees under 6 - Education were obtained*]:

9. **Languages** [*For each language indicate proficiency: good, fair, or poor in speaking, reading, and writing*]:

<i>Employer</i>	<i>Position</i>	<i>From (MM/YYYY)</i>	<i>To (MM/YYYY)</i>

11. Detailed Tasks Assigned

[List all tasks to be performed under this assignment]

10. Employment Record *[Starting with present position, list in reverse order every employment held by staff member since graduation, giving for each employment (see format here below): dates of employment, name of employing organization, positions held.]:*

12. Work Undertaken that Best Illustrates Capability to Handle the Tasks Assigned
[Among the assignments in which the staff has been involved, indicate the following information for those assignments that best illustrate staff capability to handle the tasks listed under point 11.]

- 1) Name of assignment or project: _____
Year: _____
Location: _____
Client: _____
Main project features: _____
Positions held: _____
Activities performed: _____
- 2) Name of assignment or project: _____
Year: _____
Location: _____
Client: _____
Main project features: _____
Positions held: _____
Activities performed: _____

FORM TECH – 7 PROFESSIONAL STAFFING SCHEDULE¹

Year: 2015-16		Total staff-month input												
No	Name of Staff	1	2	3	4	5	6	7				Home	Field ³	Total
		For Foreign Professional Staff												
1		[Home]												
		[Field]												
2														
3														
For Local Professional Staff														
1		[Home]												
		[Field]												
2														
3														

- 1 For Professional Staff the input should be indicated individually; for Support Staff it should be indicated by category (e.g: draftsmen, clerical staff, etc.).
- 2 Months are counted from the start of the assignment. For each staff indicate separately staff input for home and field work.
- 3 Field work means work carried out at a place other than the Consultant's home office

Section 4: Financial Proposal - Standard Forms

Financial Proposal Standard Forms shall be used for the preparation of the Financial Proposal.

- FIN-1 Financial Proposal Submission Form
- FIN-2 Summary of Costs
- FIN-3 Breakdown of Cost for Local Component and Foreign Remittance
- FIN-4 Breakdown of Remuneration of Staff deployed for Feasibility Study
- FIN-5 Breakdown of Reimbursable Expenses

FORM FIN-1 FINANCIAL PROPOSAL SUBMISSION FORM

(Please submit on Company's Letterhead)

[Location, Date]

To:

Chief Engineer / S&C
Pakistan Railways', Headquarters Office,
Lahore

**Subject: FEASIBILITY STUDY FOR RESTORATION / UPGRADATION
OF JACOBABAD – SILRA SHAHDAD KOT - LARKANA
SECTION (135 KM)**

Dear Sir,

We, the undersigned, offer to provide the consultancy services for subject assignment in accordance with your Request for Proposal and our Technical Proposal. Our attached Financial Proposal is for the sum of [*Insert amount(s) in words and figures*]. This amount is inclusive of all applicable taxes.

Our Financial Proposal shall be binding upon us subject to the modifications resulting from Agreement negotiations, up to expiration of the validity period of the Proposal.

No commissions or gratuities have been or are to be paid by us to agents relating to this Proposal and Agreement execution.

We understand you are not bound to accept any Proposal you receive.

We remain,

Yours sincerely,

Authorized Signature [*In full and initials*]: _____

Name and Title of Signatory: _____

Name of Firm: _____

Address: _____

Item	Costs (Pak Rupees)	
	In Figure	In Words
FEASIBILITY STUDY FOR RESTORATION / UPGRADATION OF JACOBABAD – SILRA SHAHDAD KOT - LARKANA SECTION (135 KM)		

Note:

1. Cost of Feasibility Study should be inclusive of all applicable taxes, overheads and any other cost required to complete the assignment as per ToR.
2. Any tax imposed by the government after submission date of RFP shall be paid separately to Consultant, in addition to accepted Financial Proposal.

Authorized Signature of Consultants

**BREAKDOWN OF COST FOR LOCAL COMPONENT AND
FOR FOREIGN REMITTANCE**

Item	Amount (Pak Rs)		
	Payment of Local Staff & other expenditure	Payment of Foreign Staff & other expenditure required to be remitted to home country	Total
FEASIBILITY STUDY FOR RESTORATION / UPGRADATION OF JACOBABAD – SILRA SHAHDAD KOT - LARKANA SECTION (135 KM)			

Note:

- All payments shall be made in Pak Rupees; however the above breakup is to facilitate the Consultants in the remittance in foreign currency of remuneration paid to the foreign staff of the Consultant in Pak Rupees.

Authorized Signature of Consultants

FORM FIN-4

BREAKDOWN OF REMUNERATION OF STAFF DEPLOYED FOR FEASIBILITY STUDY

Name ²	Position ³	Staff-month Rate (PKR) ⁴
Foreign Professional Staff		
		[Home]
		[Field]
Local Professional Staff		
		[Home]
		[Field]

1. Form FIN-4 shall be filled in for the same Professional and Support Staff listed in Form TECH-7.
2. Professional Staff should be indicated individually; Support Staff should be indicated per category (e.g.: draftsmen, clerical staff)
3. Positions of the Professional Staff shall coincide with the ones indicated in Form TECH-5.
4. Indicate separately staff-month rate for home and field work.

FORM FIN-5 BREAKDOWN OF REIMBURSABLE EXPENSES

(Information to be provided in this Form shall only be used to establish payments to the Consultant for possible additional services requested by the Client)

No.	Description ¹	Unit	Unit Cost (Pak Rupees)
1	Per diem allowances	Day	
2	International Flight ²	Trip	
3	Miscellaneous travel expenses	Trip	
4	Communication costs between [Insert Place] and [Insert Place]		
5	Drafting , reproduction of reports		
6	Equipment, Instruments, materials, supplies		
7	Shipment of personal effects	Trip	
8	Use of Computers , software		
9	Laboratory tests / surveys.		
10	Sub agreements		
11	Local transportation costs		
12	Office rent, clerical assistance		
13	Training of Client' personnel / International Study Tour		
14	International Seminar		

1. Delete items that are not applicable or add other items if required.
2. Indicate route of each flight, and if the trip is one-or two-ways.

Section 5: Terms of Reference

Terms of Reference

TERMS OF REFERENCE (TOR)

FOR

FEASIBILITY STUDY

FOR

RESTORATION / UPGRADATION OF JACOBABAD -
SILRA SHAHDAD KOT - LARKANA SECTION (135 KM)

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1 BACKGROUND OF THE FEASIBILITY STUDY

Pakistan Railways intends to up-grade existing rail links as mentioned below with a view to ascertain the existing condition of the infrastructure and improvements required to achieve the speed and axle load as mentioned in Appendix-A. The project will cater for the public facilitation to access the Main Line -2 at Jacobabad and Larkana.

Sections		Length (km)
i	Larkana - Silra Shahdad Kot	51.42
ii	Silra Shahdad Kot - Jacobabad	83.58
Total		135.00

(Project area Map is attached as **Appendix-B**)

2 SCOPE OF SERVICES

The rehabilitation/improvement of the existing track on subject sections is desired to be carried out to achieve higher speed and axle loads as mentioned in Appendix-A, for which feasibility study is required to be conducted by the nominated consultant. All the infrastructure including right of way shall be proposed for double railway track. However construction of single line or double line will be recommended by the consultant based on traffic volume.

For detailed understating of design parameters and in case of any conflict or ambiguity the guiding document will be AREMA manual (latest) for all of the different parts and sections of the study. For areas where AREMA manual is found limited in its elaboration or detail, other well established international codes such as AASHTO, UIC, European Codes or other regional Codes/Manuals can also be followed with approval of the client.

All information, data, procedures, standards etc. provided by the consultant in the various fields and areas of the feasibility study shall be properly referenced leaving no ambiguity whatsoever. The Successful Consultant will focus on but not limited to following:

- i. Study of the existing condition of the track infrastructure on the entire section based on the data/information to be made available by the Client and preparation of Track Condition Report.

- ii. This Report and the results of the studies/investigations proposed in the TOR will form basis for the proposed Up-gradation / Rehabilitation of track infrastructure to enhance the line capacity and make the railway track fit for a speed and axle load as mentioned in Appendix-A (except where un-avoidable).
- iii. Visual survey of bridges and carry out analysis to indicate the bridges requiring Rehabilitation / Extension / Reconstruction to maintain desired operational speed and axle as mentioned in Appendix-A, as per HMBG Loading of Pakistan Railway Bridge Rules -1970.
- iv. Hydrology Study, comprising, identification of vulnerable points against the threat of floods, hill torrents and regime study of major flood openings based on past flood history. Proposal for provision of new flood openings of suitable sizes/ increasing the capacity of existing openings to make the track fit for all weather conditions.
- v. Study for Up-gradation/conversion of Level Crossings (at grade crossing) into overhead bridge / underpass / manned level crossings where necessary, based on traffic count, vulnerability / adverse geometrical conditions.
- vi. Easement of sharp curves and grades (where possible) to achieve the design speed as mentioned in Annexure-A.
- vii. Study for improvement of signaling and telecommunication system to match the prescribed designed speed.
- viii. Plan and Profile of the entire corridor including areas which need horizontal and / or vertical alignment improvement. (Topographic Survey)
- ix. Traffic Study for assessment of Passenger & Freight Traffic demand after 5, 15 and 30 years of up-gradation and rehabilitation. The assessment must include the economical influx of CPEC after development of ML-I and ML-II (Western Corridor)..
- x. Geological Study and Geotechnical Investigations along the railway alignment.
- xi. Study for provision / improvement of water supply and drainage system at the

stations

- xii. Power Supply Study, for provision / improvement of electricity to key stations and other installations on the section.
- xiii. Preparation of initial environmental examination.
- xiv. Study of existing railway yards. Preparation of proposal for remodeling of yards to remove bottlenecks (if any) and make them fit for the designed speed and cater for long haul freight trains. Addressing the drainage problem of station yards and drainage along/across the track where the track level become lower than adjoining areas and is prone to flooding.
- xv. Study of existing buildings and proposal for their up-gradating particularly station buildings (where required).
- xvi. Proposal for construction of boundary wall / fencing on major railway yards to restrict the tress passing.
- xvii. Train operation and Rolling Stock Study for improvement / establishment of maintenance facilities for Locomotives, Carriages and Freight Wagons.
- xviii. Cost estimation of Up-gradation of track and infrastructure.
- xix. Financial and Economic Analysis

2.1 Condition Survey Report of the Existing Track Infrastructure

2.1.1 Data / Information to be provided by the Client

2.1.1.1 The Client shall provide the following existing data/information in respect of the track infrastructure on this section:

i) Rails

Different types of rails laid in the track, their kilometer-wise location, their year of manufacture / laying in track. Locations, where the rails are welded or where the rails form the jointed track, general condition of rails etc.

ii) Sleepers

Different types of sleepers laid in the track, kilometer-wise location, density, year of manufacture and year of laying in track, condition and percentage of unserviceable sleepers, location (kilometer-wise).

iii) Track Fastening System

Different types of track fastenings laid in the track, kilometer-wise location, year of laying in track, condition and percentage of unserviceable track fastenings, location (kilometer-wise).

iv) Points & Crossings

Station wise number and type of the points and crossing (Turnouts) at the station and their angle of crossing. Type of rails used in point and crossing and present condition.

v) Loops & Sidings

Station wise detail of main line, loop lines, sidings as indicated in the station yard plan including the clear stabling length (CSL) of each line. Type of rails and sleepers etc

vi) Private Sidings

The description of the private sidings including the name of the sponsoring authority and other details of siding

vii) Condition of Ballast

Condition of the ballast, average existing ballast cushion in track and on shoulders etc.

viii) Curves

List of all the existing curves, degree and radius, chainage and total length, the super elevation provided and whether the curve is circular or transitioned.

ix) Gradients

List of gradients, indicating the location and chainage and whether it is in up or down direction (ascending or descending).

x) **Bridges**

List of existing bridges, location, type and span etc. Annual bridge inspection registers and other inspection reports, which indicates current general condition of bridges.

xi) **Condition of Embankment**

The condition of embankment and available data of problematic stretches prone to excessive settlements, erosions, inundation, over toping, movement of sand dunes and inadequacies of the cross sections etc.

xii) **Foot over Bridges & Road over Bridges**

List of all the foot over bridges and road over bridges, location, type and width etc.

xiii) **Level Crossings**

List of level crossings, location, the class of level crossing, manned or un-manned, traffic or engineering, the width of level crossing, interlocked or not, etc.

xiv) **Sui gas & other Utility Services Crossings**

List of the pipe line crossings under the existing railway line for passage of sui gas or other utility services e.g. water supply, telephone and telecommunications cables etc. shall be provided, indicating the type of the utility service, the name of the sponsoring agency, size and other details of the crossing.

xv) **River Training Works and Protection Bunds**

Details of any river training works and/or flood protection work(s) provided along or across the existing railway embankment, giving its brief details , including its location, type of protection work, purpose for its provision, its length and cross section.

The Consultant shall study the above-mentioned data/information provided by the Client and put random check on this data for the sake of up-dation / validation and prepare the Track condition survey report.

2.1.2 Preparation & Submission of Track Condition Survey Report

2.1.2.1 Based on the data/information provided by the Client and survey conducted by Consultant, the result of the visual survey of track component, bridges, Embankments and Level crossings etc, the Consultants shall prepare and submit the Track Condition Survey Report of the section.

2.1.2.2 The report shall summarize the existing condition of the track including rails, sleepers, fastenings, ballast and the formation etc, based on the data made available by the Client and data collected by Consultant for the sake of up-dation / validation of Client's data.

2.2 Visual Survey of Bridges and Bridge Analysis of Selected Bridges

2.2.1 There are about 237 bridges of different types with varying spans on subject section. Most of these bridges are more than 80 years old and have passed their useful life. The breakdown of the total number of bridges on this section under their types is as under:

<u>Sr.No</u>	<u>Type of Bridges</u>	<u>Total</u>
1.	Girder Bridges	77
2.	Brick Arch Bridges	07
3.	RCC Slab Bridges	13
4.	Hume Pipe/RCC Pipe etc,	138
5.	Others	2
	Total	237

2.2.2 The Client will provide available data in respect of above mentioned bridges. All these bridges will be inspected by the Consultants in general by visual survey.

2.2.3 The Consultant will verify or recoup missing information in bridge data (provided by the Client) during the reconnaissance survey of the

alignment, in respect of type, span, location of bridge and any dimensional data required for structural modeling of bridge.

2.2.4 A team of the Consultant's experts shall visit all the bridge to collect all pertinent data including layout dimensions, super structure details, sub structure details, elevations, hydrological and topographic conditions. Any defects/damages in the substructure and superstructure shall also be identified. This visual survey will be conducted using a pre-developed Performa including an extensive photography of the relevant structure.

2.2.5 After assessment based on the field visit and data collected, the Consultant shall prepare comprehensive report indicating the structures requiring rehabilitation/strengthening or replacement/reconstruction

2.2.6 Structural Analysis of Selected Bridges

2.2.6.1 With the veiew to ascertain the suitability of existing bridges for proposed track parameters as mentioned in Appendix-A, the Consultant shall carryout detailed structural analysis of specified bridges, as mentioned in Table-A, on the basis of data provided by Client and field survey. Based on the detailed analysis of selected bridges the Consultant will draw conclusions and recommendations along with comprehensive plan for reconstruction/ rehabilitation and strengthening, of all bridges along with the cost.

Table-A

Sr.No.	Type of Bridges	Existing (No.)	To be Analysed (No.)
1.	Girder Bridges	77	5
2.	Brick Arch Bridges	07	1
3.	RCC Slab Bridges	13	1
4.	Hume Pipe/RCC Pipe etc,	138	5
5.	Other	2	-
	Total	237	12

2.2.6.2 Based on the bridge data, provided by Client and field survey, fully integrated models of bridges shall be developed and analyzed by the

Consultant for both super structure and sub structure. Finite Element Analysis Programs (e.g. SAP 2000 and Staad Pro or any latest version of equivalent software patent in market) shall be used to determine the effects of increased loads on these structures. This assessment/analysis will be carried out in accordance with the relevant provision of P.R. Bridge Rules, AREMA Manual, UIC, European Codes, AISC, ACI specifications and other regional/international codes & manuals. The loads to be applied include dead, live and impact loads, tractive effort, breaking force, centrifugal, longitudinal, wind, stream flow, buoyancy, seismic and other applicable loads/forces and their prescribed combinations.

2.2.6.3 The existing bridges are to be analyzed for speed and axle load as mentioned in Appendix-A and for train operation with D.E locomotives and trailing load comprising of high capacity freight wagons.

2.2.6.4 Interpretation of Results

2.2.6.4.1 The results of structural analysis shall be studied in detail to arrive at logical, reliable and efficient rehabilitation / strengthening measures required to upgrade the life expectancy and load carrying capacity of the structure under study. If the above testing and analysis reveals that any strengthening measures will not be sufficient enough, demolition and reconstruction shall then be proposed. The results of detailed analysis of selected bridges shall be applied to other similar bridges and draw conclusions and recommendations along with comprehensive plan for reconstruction/ rehabilitation and strengthening, of all bridges along with the cost.

2.2.6.5 Reporting and Presentation

2.2.6.5.1 The results of detailed investigation and analysis shall be presented to the Client for each studied structure and the recommendations / action plan given for each category of bridges (type / size / location) based on these studies. Recommendations shall be made for requisite rehabilitation / strengthening procedures to be followed for increasing the durability and reliability against intended loads and speeds as mentioned in Appendix-A.

Preliminary designs and sketches for these rehabilitation/strengthening works shall also be appended to the report along with Preliminary cost estimates.

2.2.6.5.2 The proposed works shall be developed based on considerations of economy, constructability, durability, environment, strength, and serviceability. A tentative plan for carrying out rehabilitation/strengthening activities shall be provided in the report.

2.3 Passenger & Freight Traffic Study

2.3.1.1 Consultant shall carry out passenger & traffic survey and traffic forecasting shall be carried out.

2.3.1.2 The passenger and traffic survey and forecasting will be carried out in accordance with the procedure / requirements indicated in the following paragraphs:

2.3.2 Transport Profiles

2.3.2.1 In the context of freight and passenger movement the consultant will study the operations of major competitors of Railway i.e. trucks, buses, coaches etc giving focus to large truck and bus terminals /operations with a view to have a competitive edge. The Consultant will also obtain the following information:

- i. Number of transport agencies
- ii. Origin and destination of main cargo and passenger routes
- iii. Passenger Rates and Freight rates per passenger / ton or per bus / truck to other major cities
- iv. Approximate number of trucks / buses arriving and departing the area
- v. Actual weight carried by truck by size and type
- vi. Number of passengers carried by busses / coaches by size and type

2.3.3 Traffic Diversions

2.3.3.1 Certain project sections are likely to experience a substantial patronage by traffic diverting from adjacent roads. The extent of the diversion will depend on the relative travel cost in terms of VOC and travel time as compared between the respective project section and the alternate route. The Consultants are expected to develop a simple diversion model in each case.

2.3.4 Traffic Growth

2.3.4.1 Traffic growth models shall be established at the macro and micro levels for overall application and variation on individual routes/sections. Overall growth rates will be established on the basis of growth rates of various transport demand indicators based on historical data to be indicated in the methodology & approach and in more detail in the Inception Report.

2.3.4.2 The growth rates established by the National Transport Plan and other studies (so far such information is available) will be taken into account. Overall growth rates may have to be modified for individual routes depending upon socio-economic conditions on the route/influence areas and other local conditions.

2.3.5 Growth Estimates

2.3.5.1 Overall traffic growth tendencies shall be determined & reviewed comparing planned development growth and actual achievement in recent years, establishing a framework of growth relevant to the project, addressing major evaluation factors and then estimating local traffic growth on each project route/section by extending current socio-economic trends in the future influence areas, and interrelating them with traffic on the project routes.

2.3.6 Traffic Forecast

2.3.6.1 After establishing current transportation demand traffic forecast shall be done for the next 30 years using an appropriate model to be developed by the consultants and outlined in the methodology & approach in the Technical

proposal and in more detail in the Inception Report. On the basis of this traffic forecast, traffic revenues will also be worked out based on rationalized tariff structure.

2.3.6.2 The relevant professional trade and industry organization such as Chamber of commerce in Pakistan should also be consulted for traffic forecast analysis.

2.3.6.3 Proposed fares should also be included in the study. This is crucial in terms of understanding the economic viability of the project. Forecast of earnings based on sound business analysis is also required to know whether the project needs government subsidy after completion for maintenance & operations or not. In case it does then what percentage of operational costs can be funded with railway earnings.

2.3.6.4 Competition from other modes of transportation should also be included in the study.

2.3.6.5 Connecting roadway transportation systems should be taken into account in terms of passenger movements to and from the railway stations and future projections of up to 30 years to be estimated.

2.3.6.6 The consultant should identify locations where new railway stations may have to be provided depending upon passenger & freight demand.

2.3.6.7 The traffic sources should be identified and shown on maps in order to rationalize alignment and provision of supporting facilities. The economic and social activity centers should be studied and linked with the rail link.

2.3.6.8 The other modes of transportation creating competition for the rail link must be studied in order to ascertain the ridership and preferred choice of passengers.

2.3.6.9 Methodology for determining traffic forecast should be in line with International best practices. Methodology shall be clearly referenced and linked to international standards and the consultant shall get approval for the same prior to start of work.

2.3.7 Market Analysis

2.3.7.1 The over-whelming objective of the market research/analysis shall

be helpful in analyzing current transport demand of goods and passengers in the project area and to establish realistic projections. The Consultant will refer to the existing studies and reports, if available on the subject, and carry out his own analysis arrive at a tangible quantification of the following parameters:

- i). To identify the travelling pattern of passenger and goods transportation
- ii). To ascertain the preferences of passengers and goods transporters
- iii). To determine the needs of passengers and goods transporters
- iv). To identify the social/cultural constrains if any for using one or other mode of transportation.
- v). To identify the comparative strengths and weaknesses of rail and road traffic.
- vi). To get the perspective of rail and road operators.
- vii). To identify the purpose of travel

2.3.7.2 For this purpose the Consultant shall review the secondary data available on the subject, interact with the major target groups, hold FGDs, and statistically analyze the data so obtained using SPSS or other similar software for making important inferences.

2.3.8 Traffic Forecasting

2.3.8.1 Based on the work done as elaborated above the Consultant will describe the traffic potential for the proposed route in terms of Tons Kms for freight and Passenger Kms for passenger.

2.4 Hydrological Studies

2.4.1 Scope of Work

2.4.1.1 The Consultants shall carry out hydrological investigations with the analysis of rainfall and flood records supplemented by detailed field investigation for improving existing and providing new cross-drainage structures (where required) after proper hydrological and drainage evaluation. The Consultant shall identify vulnerable points against the threat of floods and carry out regime study of major flood openings based on past flood history. Prepare proposal for provision of flood openings of suitable sizes to make the section fit for all weather tracks. Consultant shall also submit recommendations based upon concise field data for the closure of redundant bridges, culverts etc to eliminate the weak portion in the track infrastructure.

2.4.2 Collection of Data

2.4.2.1 Information / data, not limited to the following shall be collected for preparation of Hydrological Study.

- i). Evidence of flooding and flood record data in the vicinity of track.
- ii). Historical data of flood passed through flood openings.
- iii). Breach of railway embankment or damage to any bridge or protection works
- iv). Rainfall data.
- v). Water logged areas, slushy/marshy land.
- vi). Saline area.
- vii). Waterway area of existing structures.
- viii). Nature of the stream bed.

2.4.3 Flood Studies

2.4.3.1 Rainfall Frequency Analysis

2.4.3.1.1 Rainfall frequency analysis will be carried out for all stations which will be required for the estimation of flood values corresponding to various return periods. For this purpose, one day maximum rainfalls of each year will be used. Rainfalls corresponding to 2, 5, 10, 20, 25, 50 and 100 years return period will be computed using five flood frequency distribution functions, i.e. Normal, 2 Parameter Log Normal, 3 Parameter Log Normal, Gamma, and Gumble. These frequency distribution functions will be evaluated using both approaches, i.e. Method of Moments and Method of Maximum Likelihood. Mean Relative Deviations (MRD) will also computed for each distribution function results to select the distribution which best fits the observed data.

2.4.3.1.2 Hydrologic Frequency Analysis (HYFA) software developed by the Army Corps of Engineers will be used to carry out the rainfall frequency analysis.

2.4.3.2 Development of IDF curves

2.4.3.2.1 Intensity Duration Frequency (IDF) curves will be developed for various meteorological stations using very fine temporal scale rainfall data of the severe most historical rainstorms of each year. Rainfall mass curves will be plotted for each severe most rainstorm. For various rainfall durations, maximum amounts of the rainfalls will be computed. Then using Gumbel's approach, rainfall depths for various return periods will be evaluated. Finally average rainfall intensities will be computed simply by dividing the rainfall amounts with the respective durations. In this way several Intensity duration curves will be developed for various return periods.

2.4.3.2.2 These curves are useful for the estimation of appropriate intensity of rainfalls corresponding to various rainfall durations (time of concentrations) and return periods, which is required for the estimation of flood magnitudes using Rational Method.

2.4.3.3 Assessment of Watershed Characteristics

2.4.3.3.1 From GIS watershed maps, all relevant watershed characteristics will be evaluated like, watershed area, highest elevation, lowest elevation, length of the drainage path, slope and time of concentration etc.

2.4.4 Hydrological Investigations

2.4.4.1 The hydrological investigations shall include comprehensive examination of the phenomenon of flash floods in hilly areas where even sporadic rains result in enormous discharge inundating embankments and structures. The railway line may in some cases have to be re-aligned after proposing new flood openings or raising the formation levels to completely avoid or mitigate the effects of hill torrents/floods in order to make it all weather line.

2.4.5 Studies Related to Irrigation Network in the Area

2.4.5.1 The Consultant shall also inspect all bridges of canal / irrigation channels and report shall be made part of hydrology Study. The following data shall be obtained from the concerned Provincial Irrigation Department or WAPDA as the case may be:-

- i. Maximum design discharge.
- ii. Actual discharge.
- iii. Velocity of flow in the canal bed.
- iv. Bed level and full supply level including freeboard.
- v. Bed width, top width, bed and side slopes.
- vi. Scour, if any and proposed remedy.

2.4.5.2 While preparing the report for irrigation channels the Consultant shall also study that whether the discharge of canal is same as per design discharge or has increased with the passage of time. In case of increased discharge the area of flow has accordingly been revised, if not then what are

the effects on bridge structure.

2.4.6 Preparation & Submission of Hydrology Study Report

2.4.6.1 The Report shall include the results of hydrological investigations discussed in above paragraphs. The railway line may have to be re-aligned at some locations after proposing new flood openings or raising the formation levels to completely avoid or mitigate the effects of hill torrents/floods in order to make it all weather line.

2.5 Topographic Survey / Plan & Profile of the Entire Corridor

2.5.1 Monumentation for the Permanent Control Points

2.5.1.1 The Consultant shall establish Permanent Survey Control Points, to be used as reference system. In this regard Permanent Ground Markers, made of precast concrete, of size 15 cmx15 cmx75 cm or 4 inch dia PVC pipe filled with 1:2:4 PCC duly reinforced with suitable 1 cm dia steel rod or steel nail in the centre shall be fixed at every railway station but not more than 10 kilo-meters apart.

2.5.1.2 Description of all the monuments along with photographs will be prepared by the Consultant and included in the Report.

2.5.2 Horizontal Control

2.5.2.1 Horizontal control for topographic survey shall be established by intermediate traversing. The traverse circuits shall be started and closed on the GPS monuments already established during the above mentioned GPS survey. The transverse monuments measuring 15cm x15cm x75cm shall be fixed at 5 km interval.

2.5.2.2 After verifying the accuracy of traverse circuit at known survey of Pakistan (SOP) control points, the plane control shall be calculated using scale factor. These plane coordinates shall be used for project survey.

2.5.2.3 Azimuths shall be checked by Polaris/Solar observations at 10 to 15 Km interval. The minimum acceptable accuracy of the traverse line shall be

1/10, 000 or better.

2.5.3 Vertical Control

2.5.2.4 Vertical control shall be provided by double levelling based national datum established by Survey of Pakistan.

2.5.2.5 All the traverse points/ground markers established during horizontal control shall be connected to the levelling net.

2.5.2.6 Vertical mis-closure within the levelling net shall not exceed + 10 K mm where K is the length of levelling line in kilo-meter.

2.5.3 Topographic Strip Survey

2.5.3.1 Topographic survey of the alignment corridor will be carried out by both DGPS and EDM tachometry method. The control points already established will be used for this purpose. Some additional control points will also be established, to facilitate topographic survey works along rivers. The data will be saved in raw form, so that if there is any change in datum the data can be recomputed without any problem.

2.5.3.2 All man-made and natural physical features within route corridor will be surveyed. Ground levels will be surveyed in the shape of cross sections at appropriate interval and cover topographic features as well as ditches, road edges and buildings and installations. The cross sections alignment will be kept perpendicular to center line visually and may not be a straight line. The interval will be maximum distance 1 km in straight line and flat area and will be reduced in the reaches where the terrain and / or alignment changes sharply as well as at crossings and in built up areas. The cross section interval will be marked approximately by pacing etc.

2.5.3.3 The boundary of built up area and the fenced areas will be the limit of survey if these exist within the corridor width of 50 m to each side of the track. However, built up area and the fenced areas within the corridor width of 30 m to each side of the track will be surveyed to allow for a sufficiently accurate DEM (digital elevation model) of the existing track bed. The boundary of forest and fields or property line within the corridor width of 50 m

to each side of the track will be identified.

2.5.3.4 In the course of the survey, the centre line of the existing track will be surveyed and the respective data will be allocated to present the existing alignment properly in the topographic survey layout (Element Location [km from – to], Length of Straight / Curve / Transition, Degree / Radius of Curve, Super Elevation). Accordingly, the existing track will be presented in each cross profile (centre line of track, super elevation, elevation of top of non-elevated rail).

2.5.3.5 Additionally, existing track information like Chain-age markers, etc. will be surveyed and shown on the layout drawings, moreover existing rail system equipment like signalling and telecommunication equipment, drainage systems, switches, etc.

2.5.3.6 On the stations the survey will cover the yards area showing all station buildings operational for handling passenger, freight, operation and maintenance services, platforms, tracks, sidings, stabling lines etc., up to the building line of buildings on both sides of the railway line that are not related to the station / yard operation.

2.5.3.7 Lieca made, TRIPLE Frequency DGPS, model GS15 & GS10 with internal radios with rovers and an external radio transmitter with base, may also be used generally for detailed topographic survey in RTK mode. The radio will transmit the signal from base to rover at the frequency of 464 MHz at 1 second time interval. The reliability of the radio will be insured to 100% before start of RTK survey. The signal rate for RTK survey will be 9600 baud rate. The RTK survey will be stored in the memory card attached with the survey controller at rover end. The number of rovers may be increased to improve progress. The minimum epochs for a single point will be 10 at 1 second interval.

2.5.3.8 All the data will be in the form of points having attributes as Point ID, Easting, Northing, Elevation etc. All features along the existing centreline and its buffer will be surveyed for inclusion on the route survey plan as per specifications.

2.5.4 Plan and Profile of the Entire Corridor

2.5.4.1 The Consultants shall carry out topographic survey of the entire length of the sections included in Feasibility Study, by using GPS ground Survey method or by Total Station in consultation with Client or to use other latest gadgets having more precision as compared to above mentioned devices.

2.5.4.2 The adjusted co-ordinates and elevations of control points/traverse points shall be used for topographic survey. The topographic strip survey shall depict all the natural and man-made features within a corridor of railway land on either side of the track. The survey shall be tied to control/traverse points already established by the Consultant.

2.5.4.3 A rough sketch of the area under survey shall be prepared. All the features shall be numbered and coded as "Strings". Sufficient spot heights shall be observed to accurately represent the land form and provide height information, at regular intervals to produce an adequately detailed digital terrain model.

2.5.4.4 At the railway stations the railway land on both sides is generally more than the railway land in block sections and ranges from 200 ft to 400 ft on either sides of the railway line. It is not desired to cover the whole land on stations. The scope includes only yards covering station building, platform, all tracks, sidings, stabling lines etc, up to building line on both sides.

2.5.4.5 The topographic strip survey shall show the position, levels and lines of existing structures and their features, carriage ways, road shoulders, ridges, cliffs, river beds and banks, embankments etc.

2.5.4.6 Survey of Pakistan (SOP) control points or UTM shall be used for carrying out topographic survey.

2.5.4.7 The Consultants shall plot the right of way, longitudinal profile, cross-sections, detail of utilities crossing under the track, electrical crossings over the track and other details necessary to make the best possible route for the design speed.

2.5.4.8 In case of road crossings, the proposed alignment, angle of skew,

width of road metalling, shoulders and top levels of the road surface shall be observed on both sides at adequate spots for plotting X-section proposal for under pass/over head bridge be submitted.

2.5.4.9 Cross sections of railway embankment and profile levelling shall be run at not more than 1 km intervals. However, where required, due to important features or sudden topographic changes, the said interval should be reduced as per site requirements.

2.5.4.10 Consultants shall also prepare Longitudinal Profile at the centre of the existing track and centre of new alignment (where applicable) to be plotted on 1/2500 horizontal and 1/100 vertical scale.

2.5.4.11 The survey data shall be computer processed using suitable software and computer aided mapping carried out to the desired scale. The mapping shall be in thematic layers format or any other better / latest techniques.

2.5.5 Marking of Major Track Components and Fixtures

2.5.5.1.1 The Consultant shall mark, but not limited to, the following on topographic sheets / drawings showing detailed data of each:

i) Level Crossings

- Location (kms) and Level Crossing Number.
- Sketch of Level Crossing.
- Type of Level crossing.
- Width of Gates / Gate Posts.
- Width and type of Road.

ii) Bridges

- Location (kms) and Bridge Number.
- Sketch of Bridge.
- Type of Bridge.
- Total Span with width of each span.
- Digital Photograph

iii) Curves

- Location (kms from – to--).
- Length of Curve.
- Degree / Radius of Curve.
- Circular or Transition.
- Length of transition
- Super Elevation

2.5.6 Units of Measurement

2.5.6.1 The linear measurement units will be metric and the angular measurement units will be in degrees, minutes and seconds.

2.5.7 Data Processing & Production of Drawings

2.5.7.1 The topographic survey data, electronically recorded in GNSS memory will be downloaded into laptops which will be available with survey crew at site. The data shall be processed and checked at the site for quality and gaps if any.

2.5.7.2 Further, the observed data will be digitized in the AutoCAD software in the form of point line and polygon. The digitization of the features will be done by creating the feature layers in the AutoCAD software. The different feature layers will have the unique colour, code and symbols so that they can be well distinguished from the other features. Finally, the layouts were prepared on scale 1:2500 for Horizontal and 1:100 for Vertical for the entire alignment and 1:1000 for station areas.

2.5.7.3 For major crossing of roads and highways longitudinal profiles at scale 1:1.000 / 100 will be submitted. All drawings will be prepared in A3 format.

2.5.8 Preparation & Submission of Topographic Survey Report

2.5.8.1 This Report shall include the results of topographic survey carried out, as described in above paragraphs.

2.6 Geological and Geo-technical Investigations

2.6.1 Finalization of Subsurface Investigation Program

2.6.1.1 Geotechnical Investigations shall be carried by drilling bore holes for identification of sub soil strata, Standard Penetration Test (SPT), Rock Quality Designation (RQD) at appropriate locations (to be selected by Consultant) including particular locations of Bridges and tunnels. However, total length of all boreholes should be 100 meter (assuming average borehole depth as 20 meter).

2.6.2 Preparation of Technical Specifications for Subsurface Investigations

2.6.2.1 Technical specifications will be prepared for all the subsurface investigation works including surface geological mapping, drilling of boreholes, excavation of test pits, adits and various field tests sampling and laboratory testing.

2.6.3 Subsurface Investigations Methods

2.6.3.1 All drilling operations at the main area other than those in the river will be preferably undertaken using Long year Model 38 wire line equipped with diamond rotary bits. In rock, the drill will advance with coring equipment. The cores recovered will be logged and preserved in core boxes by the drilling agency under the supervision of Consultants.

2.6.3.2 In overburden soils, drilling will be advanced by percussion or rotary methods. Standard penetration and permeability tests will be carried out at suitable intervals.

2.6.3.3 Off-shore drilling in the rivers / Nullahs alluvium will be carried out with both percussion and straight rotary methods, as the conditions permit. The depth of the alluvium in the river bed will be determined. Continuous core drilling in bed rock will be carried out, if encountered. Undisturbed and disturbed sampling in the soil/overburden and rock coring in bedrock will be carried out. In situ testing like standard penetration tests, cone penetration

tests and permeability tests will also be performed. Test pits and trenches will be excavated to explore nature of overburden soils overlying the bedrock along the route alignment and in the borrow areas. Approximate size of each pit would be 2.0 m x 2.0 m x 2.0 m at approximate interval of 5 km.

2.6.3.4 Investigation Adits will be excavated at each proposed tunnel (if applicable) to explore the nature of overburden, assessment of the rock conditions and rock mass classifications to assess the rock support. The approximate size of each adit would be 2m x 3m x 10m.

2.6.3.5 As per TOR, the Consultants shall carryout but not limited to the following field testing:

- i. Execution of boreholes in overburden soil/rock, by straight rotary/heavy/light percussion drilling method including backfilling of boreholes to their original position using cement-sand-bentonite mix.
- ii. Continuous core drilling (NW size) in bedrock including preservation of core samples in core boxes, waxing of core samples, photography of rock cores and transportation of core samples to the laboratory.
- iii. Performance of Standard Penetration Tests (SPTs) in the boreholes in overburden soils generally at 1 m depth interval, including collection and preservation of spilt-barrel samples as per latest ASTM D - 1586.
- iv. Execution of Cone Penetration Tests (CPT) in overburden soils at specified locations along the section as per latest ASTM D-5778.
- v. Collection of relatively undisturbed soil samples (UDS) from each borehole through Shelby/Denison/Pitcher sampler including their waxing, labelling, packing, storage & transportation to an approved testing laboratory.
- vi. Excavation of test pits along the alignment and in borrow areas,

below top of the ground in overburden soil, including backfilling of test pit to original condition.

- vii. Performance of field density tests by sand replacement method in test pits at selected horizons including collection of small disturbed samples in moisture tins, for determination of moisture content as well as labelling, packing, storage & transportation to an approved testing laboratory.
- viii. Extraction of hand-cut Block samples (30cm x 30cm x 30cm) from test pits.
- ix. Collection of composite bulk soil samples (at least 60 kg for sandy/clayey soils & 120 kg for gravelly soils) from test pits including their labelling, packing, storage & transportation to an approved testing laboratory.
- x. Collection of ground water samples (if encountered) from boreholes/test pits including their labelling, packing, storage & transportation to an approved testing laboratory.

2.6.4 Supervision of Subsurface Investigations

2.6.4.1 The investigation work will be carried out by the staff of the sub-contractor. The subsurface investigations will be supervised by the Consultants to ensure execution of all the works by the Contractor as per laid down technical specifications. The supervising geologists/geotechnical engineers will prepare geologic logs of the boreholes and test pits and will maintain the records pertaining to the field tests. They will also decide about the type, sequence and interval of collection of soil/rock/water samples together with the supervision of all the field tests envisaged in the study.

2.6.5 Drilling

2.6.5.1 It is anticipated that the drilling programme could be commenced within 1 month from the start of the study. It is planned to have all drilling

completed within three months. The programme we have established is based on the realistic drilling rate. This is an overall rate and allows for moving of the rigs between holes at a site and all down-the-hole testing. This assumption is conservative as our experience in similar geological conditions suggests that greater rates are achievable. However, flexibility needs to be retained in the drilling programme to allow for the inevitable changes that will occur during the course of the studies.

2.6.5.2 The main objective of the core drilling is to obtain complete geotechnical information on the prevailing conditions. Good quality core recovery makes possible the determination of the mechanical and mineralogical properties of soils and rocks by inspection and laboratory tests. It is recommended to use at least N-size bits and double or triple-tube core barrels. In certain rock formations it would be even more advantageous to use H-size bits.

2.6.5.3 All cores will be stored in adequate core-boxes and logged by the Consultant, and will be photographed. Selected samples from the recovered cores will be sent for analysis and/or testing.

2.6.6 Field Testing

2.6.6.1 Field testing will comprise:

- Standard penetration tests
- Cone penetration tests
- Field density test by sand replacement method

2.6.6.2 Standard Penetration Tests: The bearing capacity of the soft rock and the soil is assessed by the use of standard penetration test results at various depths. Data are required for use in all foundation engineering work.

2.6.6.3 Cone Penetration Tests: Cone Penetration Tests will be performed according to ASTM D-5778.

2.6.6.4 Field Density Test by Sand Replacement Method: The in-situ density of the soil in the project area will be determined by performing Field

density tests in the excavated test pits using the sand replacement method.

2.6.7 Test Pits

2.6.7.1 Test pits will be excavated at sites of major structures to establish the presence and character of soils and weathered rock and to take samples for material testing. At places it will be possible to determine the presence of fracture or fault zones, study the character, conditions, spacing and orientation of joints and to establish the presence of unsuitable soil materials. Particularly in borrow areas a considerable number of test pits will be needed to study the mechanical properties of construction materials.

2.6.7.2 All pits will be re-filled after logging and sampling to minimize hazards to local population and livestock.

2.6.8 Laboratory Testing

2.6.8.1 Laboratory testing is an integral part of the Geotechnical investigation process. The staff members and on site geologists are particularly trained in following industry standards during the collection, preservations and transportation of soil/rock samples. Consultant is well aware of the importance of the quality of samples and believes that this is the most crucial part of investigations that is commonly neglected.

2.6.8.2 The samples collected during the subsurface and materials investigations will be preserved, properly packed and transported to an approved laboratory for carrying out various laboratory tests in accordance with the design requirements. Consultants will prepare detailed laboratory testing program. Appropriate supervision of laboratory testing will also be provided by the Consultants. The purposes of these tests are.

- i. Classification.
- ii. Strength/deformation characteristics.
- iii. Potential suitability for use as fill material or as aggregate.

- iv. Identification of deleterious material.

The range of tests and the scope is set out below:

Table 1 Laboratory Testing

TESTS	QUANTITY (NOS.)
Sieve Analyses	As suggested by Consultant
Hydrometer Analyses	As suggested by Consultant
Atterberg Limits	As suggested by Consultant
Specific Gravity	As suggested by Consultant
Bulk Density	As suggested by Consultant
Moisture content	As suggested by Consultant
Direct shear test	As suggested by Consultant
Unconfined Compression Test	As suggested by Consultant
Modified Proctor Test	As suggested by Consultant
Tensile Strength Test (Brazilian Test)	As suggested by Consultant
Point Load Test	As suggested by Consultant
California Bearing Ratio Test (CBR)	As suggested by Consultant
Swell/Collapse Potential Test	As suggested by Consultant
LA Abrasion Test	As suggested by Consultant
Testing for Chemical Characteristics of water (SO ₄ , CL, TDS, PH value)	As suggested by Consultant

2.6.8.3 Whereas all efforts will be made to follow the above programme, the Consultants may recommend modifications during the course of work depending upon the type of rocks / materials actually encountered.

2.6.9 Construction Material Investigations

2.6.9.1 The Consultant material expert will conduct thorough reconnaissance of the project and surrounding area to identify suitable potential sources for different materials required for construction. All the available test results of the existing sources will be collected and reviewed. Laboratory testing will be carried out on representative samples. The potential material sources will be investigated through excavation of test pits so as to ascertain the thickness and distribution of required materials. Representative samples will be collected from test pits and river bed for necessary testing. Existing and potential rock quarries will also be investigated and representative samples will be collected for testing.

2.6.9.2 In addition to the field and lab testing Consultants shall also provide following information:

- i. Identification of potential borrows pit areas.
- ii. Identification of locally available sources in the vicinity of proposed alignment for coarse and fine aggregates for concrete works and use as ballast.
- iii. Identification of sources of water.
- iv. General geology and topography of the area and their possible effects on the proposed embankment and foundations.

2.6.10 Geological Cross-sections along the section

2.6.10.1 Engineering geologic cross-section shall be developed relative to subsurface lithology resulting from geotechnical investigations

2.6.11 Geological and Geotechnical Investigations Report

2.6.11.1 The Geological and Geotechnical Investigation report should comprise, but not limited to the following:

- i. General description of the site and field activities

- ii. Location of Boreholes and Test pits
- iii. Test pits groundwater elevation measurements
- iv. Undisturbed samples details
- v. Recommendations for borrow areas
- vi. Foundation recommendations and capacity curves
- vii. Results of all tests / investigations and Recommendations

2.7 Study for Up-gradation/conversion of Level Crossings

2.7.1 The Consultants will inspect all the level crossings existing on the alignment and collect necessary data/ information during the reconnaissance survey and the topographic survey.

2.7.2 The Consultant shall study all level crossings (at grade crossings) with a view to increase the safety of train and road users. The Consultant shall prepare a comprehensive report on all level crossings after taking into consideration visibility of level crossing from track and road, previous accident history, interlocking arrangements, condition of road, road traffic census etc. The road traffic census is not required to be carried out for all level crossings. The minimum number of level crossings for which traffic census of 72 hours is to be carried out is specified in Table-B below.

<i>Table - B</i>		
<i>Section</i>	<i>Level Crossing</i>	
	<i>Existing</i>	<i>Minimum No. for census</i>
<i>Larkana-Silra-Jacobabad</i>	236	10

2.7.3 Based on the analysis the Consultant also suggests (where required) provision of flyover or underpass and up-gradation of un-manned level

crossings into manned level crossing besides shifting, to mitigate chronic problems or closure where above conditions of traffic census do not employ further requirements of the same. The Consultant also estimate the cost of such up-gradation and include it in the overall cost estimate. The Consultants shall prepare and submit a Report to the Client on the completion of this study.

2.8 Easement of sharp curves and grades (where possible) to achieve the design speed

- 2.8.1 After the completion of the topographic survey of the alignment corridor in the section, the Consultants shall study the existing alignment in accordance with the requirements of the design parameters. The alignment shall be redesigned wherever considered practicable and viable by easing out the sharpness of the curves and the gradients.
- 2.8.2 After carrying out the above study the Consultant shall prepare a comprehensive report regarding their suitability for increased speed and required hauling capacity. The Consultant shall also propose, if so required, the easement of curves to negotiate the proposed increased as mentioned in Appendix-A. In addition, where necessary the Consultant shall propose easement of grades either by changing the level of proposed new track or by detouring it.
- 2.8.3 The Consultant shall also prepare cost estimate of such interventions including the assessment of cost of requirement of additional land (if any) and include it in the overall cost estimation.
- 2.8.4 The Consultants shall prepare and submit the Report on Easement of Curves and Gradients to the Client on the completion of this study.

2.9 Design of the Railway Alignment Conforming to the Prescribed Track Parameters

- 2.9.1 Computer Aided Design of the Railway Line

2.9.1.1 The Digital Terrain Model of the existing alignment, prepared on the basis of the Topographic strip survey, shall be used as the basis for the computer aided design of the railway alignment, conforming to the new track parameters defined in Appendix-A of this Terms of Reference, by using Pro VI or any other similar software.

2.9.1.2 Particular attention is required from the consultant to envisage connecting areas of high density and activity in terms of land usage. The rail link itself can lead to high density land usage and human activity which needs to be in terms of economics and overall impact on society.

2.9.1.3 The consultant is required to spell out his criteria for re-alignment (if proposed) through urban and rural areas separately.

2.9.1.4 Final track levels shall be fixed keeping in view the natural ground levels, free board of waterways, type of bridges/culverts and minimum cushion over these and the governing HFLs in the area etc.

2.9.2 Final alignment plans and profiles

2.9.2.1 The approved final alignment shall be presented as plans and profiles to a horizontal scale of 1:2,500 on A3 paper. Larger format can be used with the approval of the Employer. Contours shall be to an interval not exceeding 1m. The plans/profile drawings shall, as a minimum, show the following:

- i. Railway centre line with chain-ages at regular intervals, not exceeding 500m;
- ii. Right-of-way limit;
- iii. Horizontal and vertical curves with the chain-ages of the salient points shown; and
- iv. Location (chain-age), brief description and reference of all structures.

2.9.3 Typical cross-sections

2.9.3.1 An appropriate number of typical cross sections along the approved final alignment shall be prepared showing the existing/natural ground, the proposed construction and other appropriate information. The cross-section will be plotted on 1/200 horizontal and 1/20 vertical scale or as directed by the Employer.

2.9.4 Structures

2.9.4.1 All major structures across the track shall be located and briefly described. These structures shall include bridges, viaducts, tunnels, culverts, etc.

2.9.5 Earthwork quantities

2.9.5.1 The earthwork quantities for the new alignment shall be estimated to the stipulated accuracy. All principal earthworks items shall be considered including common excavation, rock excavation, common fill, rock fill, etc.

2.10 Initial Environmental Examination (IEE) Report

2.10.1 The up-gradation /rehabilitation of the subject section shall be carried out mostly within the existing right of way of Pakistan Railways. There will as such not be any significant environmental consequences, except for at any location where there may be major shift in the alignment resulting in the acquisition of additional land.

2.10.2 The Consultants will however, conduct an IEE to ensure that the development options under consideration are environmentally sound and sustainable, and that environmental consequences are recognized early in the project cycle and taken into account in the project planning, and design.

2.10.3 While conducting IEE, the Consultant will follow the guidelines issued by Government of Pakistan from time to time.

2.10.4 Standards to be followed for environmental examination must be

provided by the consultant.

2.10.5 The IEE should include effects of both construction and eventual operations.

2.10.6 In terms of choice of technology in all areas of the feasibility study, renewable and alternative sources of energy for reduced carbon footprint should also be studied.

2.10.7 Preliminary Environmental Status

2.10.7.1 Environmental examination shall assess in detail the potential environmental examination of the proposed action. The purpose of the review will be to discuss the environmental consequences of the proposed action, designed to alert the agency and other decision makers and the public at large as to the environmental risks involved.

2.10.7.2 Environmental examination shall present:-

- i. Detailed Description of the proposed action including information and technical data adequate to permit a careful assessment of environmental impact.
- ii. Discussion of the probable impact on the environment, including any impact on ecological systems and any direct or indirect consequences that may result from the action.
- iii. Any adverse environmental effects that cannot be avoided.
- iv. Alternatives to the proposed action that might avoid some or all of the adverse environmental effects including analysis of costs and environmental impacts of these alternatives.
- v. An assessment of the cumulative long term effects of the proposed action.
- vi. Any irreversible or irretrievable commitment of resources that might

result from the action or that would curtail beneficial use of the environment.

2.10.8 Environmental issues to be addressed

2.10.8.1 The construction of railway line may result in environmental degradation if not properly planned for. The following environmental issues will accordingly be addressed:-

- i. Air Pollution
- ii. Noise
- iii. Soil erosion
- iv. Habitat destruction, community cohesion
- v. Loss of vegetation
- vi. Loss of wildlife
- vii. Hydrographic modification
- viii. Land use change
- ix. Human resettlement
- x. Socio economic alteration
- xi. Vibrations
- xii. Disruption of natural landscape

2.10.9 Resettlement of affected Stakeholders

2.10.9.1 In the face of the position brought out in the section above, there will not be any issue in respect of resettlement of affected persons. However, the Consultants shall prepare a comprehensive report regarding resettlement of affected stakeholders if any and their socio economic impacts along with relocation plans / proposal.

2.10.10 Preparation of report as per Standard Formats of concerned agencies

2.10.10.1 The Consultant shall prepare the report(s) as per standard

format of concerned Environmental Protection Agencies of Pakistan or provinces. If required Client will submit these reports to concerned agencies and also pay necessary fee, however, Consultant shall prepare reply of observations raised by concerned agencies.

2.11 Study for improvement of Signaling and Telecommunication System

2.11.1 The Consultant shall study the existing signaling and telecommunication system over the section and prepare a comprehensive report regarding its existing condition and the up-gradation / improvement of existing system or installation of new modern signaling system to commensurate with the speed mentioned in Appendix-A, and the line capacity required for catering the future traffic volume. The new signaling and telecommunication system shall be proposed in consultation with the Client.

2.11.2 The design of the signaling and telecommunication system shall cover the following essential elements:

- i. Defining signaling and telecommunication system based on traffic forecasts, recommended train speeds and resulting density of traffic for each section.
- ii. Rules & regulations, local requirements, flexibility for operation etc.
- iii. Technical design standards of the proposed systems.
- iv. Study of various modern signaling and telecommunication systems and description of salient design features, broad outline of specifications of the equipment and power supply system etc. of the recommended system.
- v. Yard layouts.
- vi. Cost estimates of the equipment, recurring expenditure, availability of spares, cost of training etc.

- vii. Establishment of maintenance workshops and centers, maintenance structure and organization etc.

2.11.2.1 The telecommunication system is not limited to the regular telephone communication along the railway line regarding the operational and commercial needs. Efficient and effective railway telecommunication systems are essential to allow transmission of all relevant information from the technical and operational installations along the railway line to the Operation Control Centre (OCC) via cables or wireless systems.

2.11.2.2 Fibre optic cables are most probable in modern systems due to their high capacity, while for long-distance communication radio links may be used. Local cabling depends on the type of installation and the level of cable load and capacity. The cabling can be designed with copper or aluminium cables of different types and dimensions.

2.11.2.3 According to the results of the telecommunication concept, number and type of the pieces of telecommunication equipment with its investment costs will be estimated. The investment in telecommunication will be phased to match the development of the rail transportation volume.

2.12 Train operation and Rolling Stock Study Report

2.12.1 Keeping in view the future traffic forecast, the Consultant shall define the type and design standard of rolling stock.

2.12.2 The Consultant shall also update the requirement of rolling stock (locomotives, coaches, freight wagons, special stock, if any) based on traffic forecasts, location of Loco Sheds, Sick Lines, Washing Lines etc.

2.12.3 Consultant will propose an efficient Train operation plan for attaining speed and axle load parameters as specified in the Appendix-A. Consultant will not only identify the limitation of available rolling stock and locomotives (that may become hurdles for attaining desired speed and axle load) but also propose suitable new models of rolling stock and locomotives(Diesel Electric) to achieve desired speed and axle

load. Broad parameter for new models of rolling stock and locomotives (Diesel Electric) must be part of this Report.

2.12.4 If in case the desired speed, axle load and trailing load are impossible to attain concurrently with available rolling stock and locomotives due to steep gradient, Consultant will base feasibility study on new suitable models of rolling stock and locomotives with prior approval and mutual consultation with Client.

2.12.5 Traction type to be considered will be as mentioned in Appendix-A.

2.12.6 The Consultant shall submit the train operation and rolling stock study report accordingly.

2.13 Electric Power Study Report

2.13.1 The Electric Power Study Report shall include distribution network for supply to stations, yards, residential/office building, colonies, pumping stations and signaling equipment etc. The report to also include the condition survey of the existing facilities at each station of the sections

2.13.2 The Consultant shall also identify the sources of electric supply and also propose electric power generation, if required.

2.14 Study of Yards, Water Supply, Drainage system, Building and Boundary wall

2.14.1 The Consultant shall inspect and study following aspect of all station/ yards.

2.14.1.1 Remodeling of yard to cater for speed and axle load as mentioned in Appendix-A.

2.14.1.2 To check sufficiency of existing water supply source for upcoming influx of passenger and suggest alternative water supply sources to cater for additional demand.

2.14.1.3 To check adequacy of existing drainage system for not only

station/yards but also for sections where the height of rail top from Natural surface level is not adequate and propose remedial measures accordingly. Consultant will propose an efficient and environment friendly waste management system for Human and Mechanical (Locomotives) waste.

2.14.1.4 To check structural health of building and to propose retrofitting or demolition (as the case may be) and suggest new buildings keeping in view the upcoming passenger and freight influx and modern passenger amenities. It is important to mention here that while proposing new structures (service and residential buildings) care should be taken for accommodating additional staff that will be required for forecasted train operation.

2.14.1.5 To ensure security and safety in station/yards and to restrain the tress passers, Consultant will propose the boundary wall/fence around station, yards and in the block sections using location data of tress passing obtained during Topographic survey. Consultant will also propose boundary wall/fence on those sites where potential for encroachment of railway land is high due to increasing population near railway boundaries.

2.14.2 Consultant shall carryout feasibility study level design and prepare cost estimates of all above mentioned components keeping in view forecasted passenger and freight traffic influx.

2.15 Feasibility Study level Design of the Infrastructure

2.15.1 Feasibility study level engineering design

2.15.1.1 The Consultant shall perform the feasibility study level engineering design work. This design must include feasibility study level design of Track Structure along with feasibility study level design of retrofitting of existing bridges and feasibility study level design for Construction of new bridges. Feasibility study level Engineering design must be in accordance with the following requirements:

2.15.2 Feasibility study level engineering design extent

2.15.2.1 The Consultant shall perform the project feasibility study level engineering design to an extent/level that will enable the project quantities to be estimated to within an accuracy of +/- 20%.

2.15.3 Project feasibility study level engineering design parameters

2.15.3.1 The Consultant shall perform the feasibility study level engineering design based on the railway design parameters given in Appendix A to these Terms of Reference. These design parameters are for guidance only and the Consultant can modify them using his best professional judgment provided the Employer's approval is sought and obtained for any material changes.

2.15.4 Feasibility study level engineering design methodology

2.15.4.1 All feasibility study level engineering design work shall be performed in accordance with the relevant national/international standards/specifications subject to the approval of the Employer. The engineering design methods used shall be the latest subject to being widely used.

2.15.5 Feasibility study level engineering design calculations

2.15.5.1 Where applicable, the feasibility study level engineering design calculations shall be provided as annexes to the relevant Assignment deliverable. The design calculations shall be clear and sufficiently detailed to enable checking by others. The basis of all design decisions (if not calculated) shall be reported. Metric SI units shall be used throughout.

2.15.6 Feasibility study level engineering design drawings and brief specifications

2.15.6.1 The principal output of all feasibility study level engineering designs shall be feasibility study level drawings drawn to an appropriate scale supplemented by brief specifications and schedules. The feasibility study level drawings shall be to sufficient detail to enable a third party to take-off quantities and to later perform detailed engineering design. All feasibility

study level drawings shall be plotted in color on A3 paper. Metric SI units shall be used throughout.

2.15.7 Feasibility study level quantity estimates

2.15.7.1 For each feasibility study level engineering design, a schedule of estimated quantities for the main items shall be prepared. The quantity take-off sheets shall be provided as an annex to the relevant Assignment deliverable. The quantity take-off sheets shall be clear and sufficiently detailed to enable checking by others.

2.15.8 Feasibility study level cost estimates

2.15.8.1 For each feasibility study level engineering design, the Consultant shall derive feasibility study level cost estimates by applying unit rates or lump sums (as appropriate) to the schedule of quantities.

2.15.8.2 Foreign currency (preferably United States Dollars) and local currencies shall be shown separately.

2.15.8.3 For foreign currency costs, the following items shall be shown separately:

- a. Imported materials, supplies and equipment;
- b. Salaries of expatriate staff; and
- c. Company overheads and profit.

2.15.8.4 For local currency costs, the following items shall be shown separately:

- a. Right of Way (ROW) acquisition, if any (not to be included in the economic/financial evaluation of the project)
- b. Local materials, supplies and equipment; and
- c. Salaries and wages of local staff.

2.15.8.5 Any local taxes and duties shall be indicated separately. The Consultant may be required to explain any unit rate or lump sum which the Employer considers unreasonable. The estimated costs of any environmental or social mitigation measures shall be taken into account.

2.16 Preparation of Cost Estimates

2.16.1 The Consultant shall prepare cost estimates for both construction and operation & maintenance including the cost of land acquisition if any.

2.16.2 Based on the results of the engineering investigations, the Consultants will prepare feasibility study level design , estimate the quantities of work and costs for entire route. The costs will be given separately for foreign exchange and local currency. Consultants will also provide BOQ for land, track, structure, signal, telecom, electrical, tunnels, earthwork, sub-ballast etc.

2.16.3 Capital Investment

2.16.3.1 The initial capital requirements/costs of the proposed new work shall be segmented by major groups as associated with this type of work. These work groups include land acquisitions, with details of land to be acquired, separately for Urban & Rural area, cost of construction, maintenance facilities, locomotives, freight wagons, passenger coaches, signalling, Telecommunication, electrical and other miscellaneous capital equipment.

2.16.4 Construction Cost

2.16.4.1 The construction cost shall be segregated into major groups such as civil/structural works, track structure, railway signal & Telecommunications, railway facilities, other miscellaneous works and contingencies.

2.16.5 Railway Operating Costs

2.16.5.1 The Railway operating costs are extremely peculiar in nature and comprise fixed and variable costs, divided broadly into maintenance of permanent way and other infrastructure, maintenance of equipment, general charges, train service expenses & marketing expenses, and shall be carefully worked out.

2.16.6 Unit Rate Analysis

2.16.6.1 With the raw data on the local cost of labour, materials, and equipment collected, basic rates for all anticipated items of work such as track, bridges, platforms etc. including structural work shall be developed.

2.17 Economic & Financial Analysis

2.17.1 Economic Analysis

2.17.1.1 Economic analysis methods yield a comparison of a project's benefits and costs over time, thereby serving as useful input into the evaluation and decision making process of infrastructure investment. As such, the objective of the economic analysis will be determined if the project is economically feasible from a social or government perspective, i.e. the project shall be deemed to be desirable if the benefits are in excess of the estimated costs.

2.17.2 Methodology and Assumptions

2.17.2.1 The Consultants shall carry out economic analysis, ascertaining potential benefits and cost impacts, quantifying and monetizing these impacts over a 20 year project evaluation period. Three economic evaluation measures such as BCR, NPV & IRR will be used to present the results of analysis of the proposed rail network.

2.17.2.2 The Consultant will study and outline the methodology and assumptions to carry out the analysis.

2.17.3 Evaluation of Results of Economic Analysis and Summary

2.17.3.1 The relative contribution of the various links/networks shall be worked out and evaluated separately and cumulatively as well.

2.17.4 Financial Analysis

2.17.4.1 Besides economic feasibility it will be analyzed that the project proposed for implementation achieves financial returns sufficient to justify such huge investment. This is also considered necessary from the standpoint

of private sector investors to build and operate such enterprises.

2.17.5 Costs and Revenues

2.17.5.1 The capital and operating costs of the various links and services will be worked out and combined, as mentioned in the previous section.

2.17.5.2 Revenue derived from freight and passenger transport are the product of the ton-Kms and passenger-Kms delivered, multiplied by the tariff rate. Rail freight and passenger tariff rates will be set with the consideration to the competitive options available to shippers and passengers.

2.17.6 Operation Results

2.17.6.1 Operating results shall be determined by the revenues and costs for each network evaluated.

2.17.7 Proforma Income Statements

2.17.7.1 Full 30 year spreadsheet income statement projections shall be prepared for each section/network. These proforma statements will show annual details of operating costs, net income, and investment returns etc.

2.17.8 Investment Results

2.17.8.1 The investment returns shall be summarized in a table as per specimen below under the following headings analyzing their implications:-

- i. Average annual operating return
- ii. Payback period
- iii. I.R.R
- iv. N.P.V

<i>Investment Return Summary by Network</i>							
Section/ Network	Description	Freight/ Passenger	Average Operating ROI	IRR	Payback period	NPV	BCR

2.17.9 Sensitivity analysis

2.17.9.1 The analysis described above will be built around the traffic projections, estimated capital and operating costs and estimated tariffs for the various types of traffic. The returns reported from these “base case” network evaluations represent the returns expected to be achieved in practice. However, there are significant uncertainties and unknowns at this level of project development. Sensitivity analysis will seek to guide the decision-making process by providing information on the effect on project returns of changes to the base projections and estimates on the project returns.

2.17.9.2 Sensitivity results will be calculated for each section/network. Sensitivity results will be given in terms of changes to the most meaningful indicator of project performance i.e. the IRR. Sensitivity analysis for each network consists of all combinations of the following conditions.

- i. High capital costs at 20% increase in total capital costs
- ii. Low capital costs at 20% decrease in total capital cost
- iii. High operating costs at 20% increase in total operations and maintenance (O&M) costs
- iv. Low operating costs at 20% decrease in total O & M costs
- v. High traffic volume at 20% increase in traffic
- vi. Low traffic volume at 10% decrease in traffic
- vii. Low tariff at reduction in the tariff level
- viii. Very low tariff-a further reduction in the tariff level
- ix. Increase in tax structure by 10%
- x. Decrease in tax structure by 10%

2.17.9.3 The IRR sensitivity result will be presented in a single table for all sections / networks compared to the base condition.

2.17.10 Risk Analysis

2.17.10.1 The Consultant shall identify the project risks and suggest means to control and reduce them.

2.17.11 Financial Model

2.17.11.1 The Consultants will develop a financial model for the project considering various financing options of the proposed investment, the expected returns etc identifying any implications.

2.18 Draft Feasibility Report

2.18.1 After carrying various studies as described in the TORs, the Consultant shall prepare and submit Draft Feasibility Report and shall include all technical studies made and conclusions drawn, there from.

2.19 Final Feasibility Report

2.19.1 After having discussion on the Draft Feasibility Report and receiving comments from the Client, the Consultant shall prepare Final Feasibility Report.

2.20 DELIVERABLES

2.20.1 The Consultants shall provide ten (10) copies of each of the following deliverables with an editable soft copy on CD/DVD.

2.20.2 Detail of Deliverables are as below:

S. No	Description / Deliverables	Remarks
1.	Inception Report	Softcopies (5 sets minimum) of all models developed in different engineering, economics and finance related soft-wares used for analysis in all
2.	Track Condition Survey Report	
3.	Bridge Analysis report	
4.	Passenger and Freight Traffic Study Report	
5.	Hydrology Study Report	
6.	Topographic Survey Report	
7.	Geological & Geo-technical study report	
8.	Alignment Design Report with Longitudinal profile and cross sections.	
9.	Report of study of up-gradation / conversion	

	of Level Crossings	the study areas of the feasibility report should be provided on CDs for detailed scrutiny in addition to .Ten (10) copies of each report with editable Soft Copy on CD/DVD
10.	Study of Yards, Water Supply, Drainage system, Building and Boundary wall	
11.	Report on easement of sharp curves & Grades	
12.	Initial Environmental Examination (IEE) Report	
13.	Report for improvement of signaling and telecommunication system	
14.	Train operation and Rolling Stock Study Report	
15.	Electric Power Study Report	
16.	Feasibility study level Design Report	
17.	Preparation of Cost Estimates	
18.	Financial and Economical Analysis Report	
19.	Draft Feasibility Report	
20.	Final Feasibility Report	

3 MODE OF PAYMENT

3.1 Currency used for payments

The Client shall make all payments to the Consultant in Pak Rupees. However, the Client shall have no objection and shall facilitate the remittance in foreign currency of the remuneration of the foreign partner to the extent of services rendered by foreign partner with regard to this consultancy assignment.

3.2 Schedule of payments

3.2.1 Payment shall be made as per following schedule. However, Part payment for individual study is allowed. Each Report must be duly signed by respective nominated professionals against positions shown in Data Sheet of RFP against Clause no. 2.19.1

No	Description / Deliverables (Payment will be done on acceptance of Deliverable)	%age Payment
1	Inception Report	5%(Five)
2	Track Condition Survey Report	5%(Five)
3	Bridge Analysis report	12%(Twelve)
4	Passenger and Freight Traffic Study Report	10%(Ten)

S. No	Description / Deliverables (Payment will be done on acceptance of Deliverable)	%age Payment
5	Hydrology Study Report	5%(Five)
6	Topographic Survey Report	10%(Ten)
7	Geological & Geo-technical study report	10%(Ten)
8	Alignment Design Report with Longitudinal profile and cross sections.	2%(Two)
9	Report of study of up-gradation / conversion of Level Crossings	2%(Two)
10	Study of Yards, Water Supply, Drainage system, Building and Boundary wall	2%(Two)
11	Report on easement of sharp curves & Grades	2%(Two)
12	Initial Environmental Examination (IEE) Report	2%(Two)
13	Report for improvement of signaling and telecommunication system	2%(Two)
14	Train operation and Rolling Stock Study Report	2%(Two)
15	Electric Power Study Report	2%(Two)
16	Feasibility study level Design Report	5%(Five)
17	Preparation of Cost Estimates	2%(Two)
18	Financial and Economical Analysis Report	5%(Five)
19	Draft Feasibility Report	5%(Five)
20	Final Feasibility Report	10%(Ten)

3.2.2 5% Retention Money will be deducted from each interim/monthly payment. Retention Money will be returned after six months of completion of the assignment.

4 TIME FOR COMPLETION OF ASSIGNMENT

Completion Period is as mentioned in Data Sheet of RFP, excluding 15 days required by the Client for review and submission of comments on Draft Feasibility Report to the Consultants.

5 GENERAL REQUIREMENTS

5.1 Integrity Pact

The consultant shall sign and stamp the Integrity Pact, as per Standard Format of Pakistan Engineering Council (PEC), in case contract value exceeds Pak Rs. 10.000 Million.

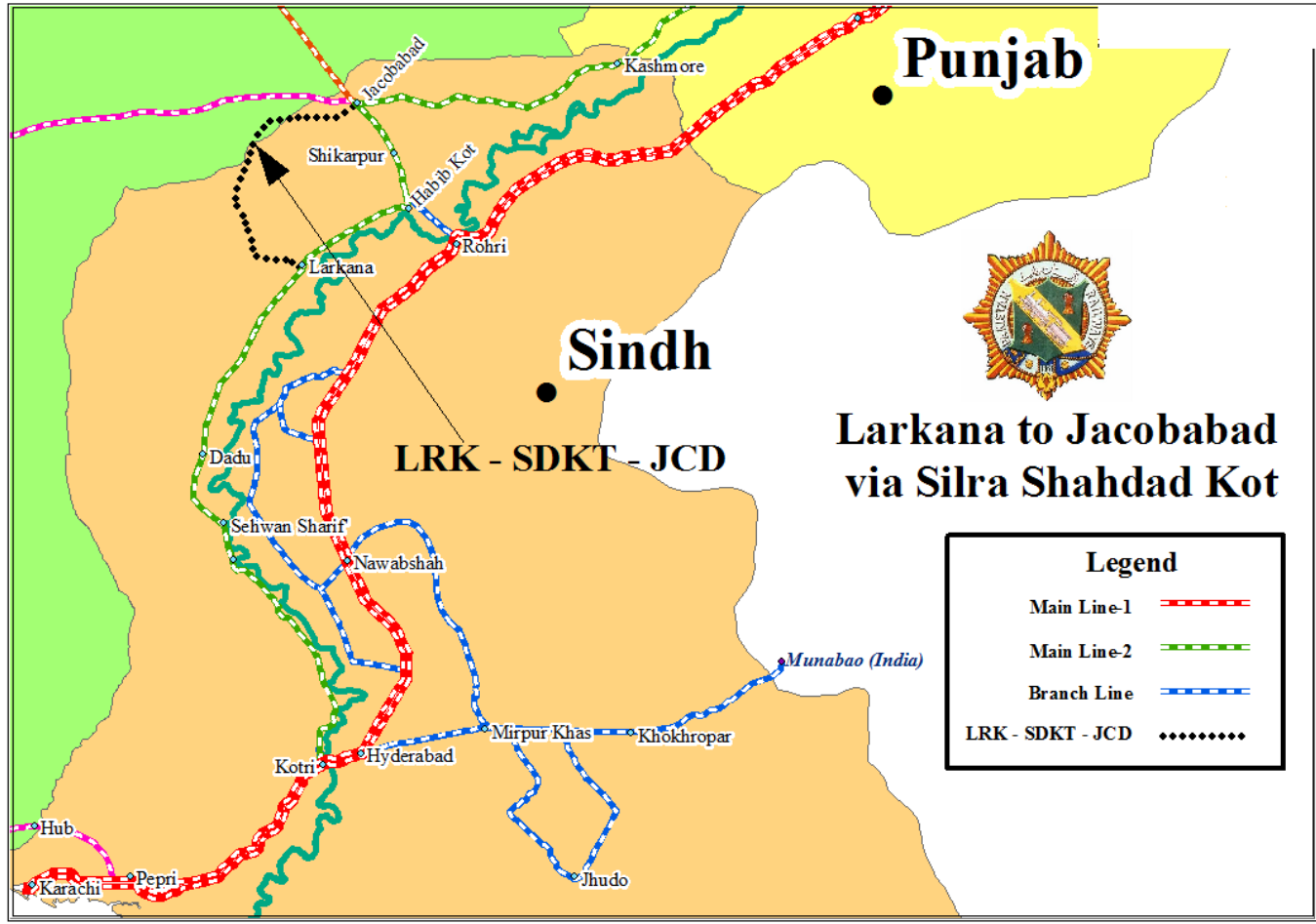
5.2 Registration of Foreign Firms with Pakistan Engineering Council (PEC)

The consultant shall be required to abide by the bylaws of Pakistan Engineering Council (PEC) and foreign firm should get registered with PEC after signing of the Contract Agreement.

APPENDIX -A

S.No.	Parameter	Requirements as per TOR
1.	Track Gauge	Broad Gauge (1676mm)
2.	Single or Double Track	The entire infrastructure including right of way shall be proposed for double railway track. However construction of single line or double line will be recommended by the consultant based on traffic volume.
3.	Proposed Speed of track infrastructure (Passenger)	120 km/h (or maximum possible speed as advised by Consultant keeping in view the constraints due to terrain.)
4.	Proposed Speed of track infrastructure (Freight)	To be proposed by Consultant for 3400 tons trailing load
5.	Axle Load	For track 25 M. Ton, For Bridges HMBG Loading
6.	Ruling Gradient	Should not be sharper than existing ruling gradients. Easing out where possible to suit speed of 120 Km/hr
7.	Curves	Compatible with speed of 120 Km/hr & with parabolic transition
8.	Rails	UIC 54/60 kg/m as per EN standard, continuously welded (CWR)
9.	Sleepers	Pre-stressed Mono block Concrete
10.	Fastening	Elastic (W-14)
11.	Ballast	Crushed Stone, thickness below sleeper as suggested by Consultant

12.	Sub Ballast	As suggested by Consultant
13.	Line turnouts	60 kg/m rail, suitable for 160 Km/h on concrete bearers, Crossing angle 1 in 16
14.	Signaling	As suggested by the Consultant
15.	Fencing	Station Yards, Populated areas or as suggested by the Consultant.
16.	Type of Traction	Diesel Traction



JACOBABAD (JCD)– SILRA SHAHDAD KOT (SDKT)- LARKANA(LRK) SECTION (135 KM)

TOR FOR URESTORATION / UPGRADATION OF JACOBABAD – SILRA SHAHDAD KOT - LARKANA SECTION (135 KM)