



**GOVERNMENT OF THE PUNJAB
RAVI URBAN DEVELOPMENT
AUTHORITY**



**River Training Works & Barrage
R/S Embankment Upper Promenade
RD 0+000 to 10+500 R/S
PACKAGE-1A**

**Bidding Documents (Vol 3/4)
NOVEMBER, 2023**



**NATIONAL ENGINEERING SERVICES
PAKISTAN (PVT.) LIMITED**

A large, faint watermark of the RUDA logo is centered on the page. It consists of a circular emblem with blue and green segments, and the text 'URBAN DEVELOPMENT AUTHORITY' and 'RUDA' around it. Overlaid on the watermark is the text 'NOT FOR USE OF BID SUBMISSION' in a curved path.

SPECIAL PROVISIONS

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SPECIFICATIONS – SPECIAL PROVISIONS

SP- 1 GENERAL

The Ravi Urban Development Authority (RUDA) aims to rehabilitate and develop the dying River Ravi into a perennial freshwater body, to allow high quality waterfront urban development on the reclaimed and adjoining land.

The project aims to create a water body within the waterway of Ravi River by constructing river control structure to head up water. Initially a 3km long River Earthen 2 steps Embankment (lower and upper promenade) is proposed to be constructed from 6 km D/S of Ravi Syphon on Right bank of the River Ravi. In this package scope only upper promenade construction is involved.

Ravi Urban Development Authority (RUDA) is the executing agency of the Project.

SP- 2 DESCRIPTION OF THE WORKS

The works included in this Contract are as follows but not limited to these items only:

- Formation of R/S Earthen Embankment Upper Promenade;
- Stone Apron;
- Stone Pitching;
- Laying of Coarse & Fine filter materials under stone pitching

SP- 3 SITE OF WORKS

The Employer will give to the Contractor possession of as much of the area designated and defined as the Site and shown on the drawings as may be required to implement the Works, but subject to any restrictions set out in the Contract, when the Engineer's Notice to Commence work is given.

The Site is in the flood plain and subject to seismic disturbances and dust storms. Insects and vermin are prevalent. Attention is drawn to the necessity for allowing for these factors in the design and specification of Temporary Works, materials and equipment for which the Contractor shall be responsible.

SP- 4 SETTING OUT

Setting out data and control points for the construction of the embankment, stone apron, pitching will be provided by the Engineer following the 'Notice to Commence' but in any case prior to start of work.

SP- 5 CLIMATOLOGICAL DATA

Lahore features a five-season semi-arid climate with five seasons: foggy winter (30 Nov – 15 Feb) with few western disturbances causing rain; pleasant spring (16 Feb – 15 April); summer (15 April – 30 June) with dust, rain storms and heat wave periods; rainy monsoon (1 July – 16 September); and dry autumn (16 September – 14 November).

The hottest month is June, where average highs routinely exceed 40 °C (104.0 °F). The wettest month is July, with heavy rainfalls and evening thunderstorms with the possibility of cloudbursts. The coolest month is January with dense fog.

The city's record high temperature was 50.4 °C (122.7 °F), recorded on 5 June 2003. On 10 June 2007, a temperature of 48 °C (118 °F) was recorded; The lowest temperature recorded in Lahore is –2.2 °C, recorded on 17 January 1935.

SP- 6 UTILITIES

The Contractor shall directly enquire from the utility companies about availability of connections of electric power supply and telephone lines for his use at the Site. In case of non-availability of electric power supply from national grid to meet his requirements the Contractor shall provide at his own cost electric power generators as necessary for supply of power for the various parts of the Works including his camps, offices, stores, workshops and other installations as well as for the Engineer's Site office provided under Sub-Clause SP 20.1. The Contractor shall bear all costs for constructing, operating and maintaining the generation system, including the standby generation system, and distribution system including providing diesel, oil or other consumables and all services and necessary attendance to ensure uninterrupted power supply at all times.

The Contractor shall make his own investigations and arrangements for supply of water of acceptable quality for construction requirements and safe drinking water for his staff and workmen and for the staff of the Engineer.

No separate payment will be made to the Contractor for works performed under this Clause and the costs thereof shall be deemed to be included in the rates and prices of the various items in the Bill of Quantities.

SP- 7 EXTENT OF WORK

The Contractor shall remove all debris and unsuitable construction. Any depressions shall be filled by the contractor and compacted to the Engineer's satisfaction with no additional cost. The contractor shall construct the Works in accordance with the Drawings and Specifications and as directed by the Engineer. The Contractor shall procure, furnish, provide and arrange all the necessary construction materials, equipment, transportation, fuel, electric power, water and services; be responsible for the construction and maintenance of the construction camps, offices, workshops and access roads that he may require, and perform all other work necessary for completion of the Works described herein, in complete conformity with the Contract.

SP- 8 DRAWINGS**8.1 BIDDING DRAWINGS**

The Drawings provided at end of Bid Documents and hereinafter referred to as Bid Drawings show the scope of the work to be performed by the Contractor. The Bid Drawings shall not be used as a basis for fabrication or construction, but may be used as the basis for planning, scheduling and placing preliminary orders for materials, subject to corrections based on future issue of Construction Drawings. Any other Drawings if issued through Addenda, before opening of Tenders, shall become part of the Bid Drawings.

8.2 CONSTRUCTION DRAWINGS

After award of Contract, Bidding Drawings will be replaced by Drawings issued by the Engineer for Construction, with such modifications as may be necessary. The Drawings Issued for Construction will include Bid Drawings re-issued, Bidding Drawings modified and additional Drawings as required to develop in greater detail the construction required and shall be referred to hereinafter as "Construction Drawings". The Construction Drawings that show changes from the Tender Drawings and Specifications, will be reviewed by the Engineer for determination of adjustments, if any, of the Contract Price in accordance with the provisions of Clause 51.1, Variations, of the Conditions of Contract. The work shall be executed in conformity with the Construction Drawings.

The Engineer and Contractor shall jointly prepare a schedule for issuance of Drawings Issued for Construction of the various parts of the Works based on a list of drawings provided by the Engineer.

8.3 CHECKING DRAWINGS

The Contractor shall carefully check all Construction Drawings as soon as practicable after receipt thereof, and shall promptly advise the Engineer of any errors if discovered.

SP-9 RIGHT TO CHANGE

The Engineer may find it desirable to change location, alignment, dimensions or design of one or more of the features of the Works to conform to the newly disclosed conditions. Toward this end, the Engineer reserves the right to make such reasonable changes, and the Contractor's operations shall be conducted so as to accommodate any such changes in the Works.

SP- 10 DRAWINGS AND DATA TO BE FURNISHED BY THE EMPLOYER / ENGINEER**10.1 PROCEDURE FOR SUBMITTAL OF CONTRACTOR'S DRAWINGS**

All drawings showing construction details shall be provided by the Employer/Engineer.

10.2 OTHER DRAWINGS

Other drawings additional to those referred to hereinabove required by the Specifications showing proposed methods of constructing Temporary Works shall also be submitted to the Engineer for approval.

10.3 OWNERSHIP OF DRAWINGS

All the drawings, details, bills of materials and any other information or documents furnished by the Engineer shall become the property of the Employer/Engineer.

SP-11 CONSTRUCTION PROGRAMME

11.1 GENERAL

The program of work submitted by the Contractor in accordance with Sub-Clause 14.1 "Programme to be submitted" of the General Conditions of the Contract shall be supplemented by submittal of a detailed schedule based on a computerized system, Primavera Enterprise for Engineering & Construction (P6) software or equivalent, covering all construction activities and furnished to the Engineer on paper and a soft copy on the following dates.

- **Construction Schedule:** Along with the Bid Documents.
- **Baseline Schedule:** within 21 days after receipt of Letter of Acceptance.
- **Revised Baseline Schedule:** After 3 months of the approval of Baseline Schedule and thereafter quarterly.
- **Recovery Schedule:** As and when required by the Engineer.

The Baseline Schedule, as approved by the Engineer in consultation with the Employer, will form an integral part of the Contract and will establish Contract completion dates for the various activities as mentioned in the Contract.

All schedules, project plans, progress updates and reports shall be in the form of readable computer printouts as well as in soft data format.

11.2 REQUIREMENTS & PROCEDURES

11.2.1 GENERAL REQUIREMENTS

- The narrative report accompanying the submittal shall describe the construction methods; plant and equipment proposed to be used and shall explain the expected production rates that are the basis of the scheduled durations of different activities.
- Start Date of the Project.
- Dates on which different site possession will be required.
- General administrative items like, Performance guarantee, Mobilization Advance Guarantee, Insurance etc.
- Unique Activity ID, description and duration.
- Activities' earliest start and finish dates, latest start and finish dates.

- All activities with zero float.
- Critical path with listing of all activities on the path.
- Dates for Employer furnished material or equipment if any.
- Required dates of Drawings from the Engineer.
- Dates for submittals like Method Statements etc.
- Work Breakdown Structure (WBS) and activity codes.
- Definition of calendars with non-working days or periods i.e. planned closures, flood seasons etc.
- Loading of key resources.
- Milestone dates.
- Network logic Diagram.
- List of constraints i.e. reason and type of constraint.
- Full S – Curve and Critical S – Curve (for critical activities only).
- Cost/ Resource Histograms.
- Planning assumptions and any external relationships
- Explain any discretionary dependencies.
- Appropriate quantity of direct resources (material, labour, equipment) should be allocated to all activities and showed in submitted construction schedule. Labour resource should be divided according to related trades (e.g. Mason, Operator, helper etc.) Contractor should make sure that no resource is being overallocated.
- BOQ amount should be loaded to each construction activity. Earned Value Management Reporting to be ensured accordingly.

11.2.2 CONSTRUCTION SCHEDULE

Construction Schedule will be submitted along with Bid Document and will be prepared in accordance with the Sub-Clause 11.2.1 hereof.

11.2.3 BASELINE SCHEDULE

Baseline Schedule to be submitted within 21 days after the letter of acceptance and will be prepared in accordance with the General Requirements mentioned under the Sub-clause 11.2.1 hereof. Start date will be the date of Notice to Commence.

11.2.4 REVISED BASELINE SCHEDULE

Besides, the General Requirements mentioned above, following will be the additional requirements for or quarterly Baseline Schedule:

- The revised narrative report depicting the actual situation and submittal describing the construction methods, plant and equipment proposed to be used and shall explain the expected production rates that are the basis of the revision of scheduled durations of different activities.
- Start Date will be taken as Notice to Proceed.
- Change in strategy to achieve the target Completion Date describing the additional resources if required, change in sequence of activities etc.
- Actual start and finish dates.

- Incorporation of effects of all approved changes that have occurred during last three months i.e. any change order which will affect the Completion Date of the Project. Any change in Completion Date for milestones shall be on the basis of prior extension if any granted by the Engineer.
- Comparison with the target Baseline Schedule. The narrative of any deviation from the Baseline.

11.2.5 RECOVERY SCHEDULE

The Recovery schedule will be submitted to the Engineer as and when required by the Engineer. If in the opinion of the Engineer any project milestone is likely to be missed, mitigation strategy for recovering the project will be submitted in the form of Recovery Schedule.

11.3 EXPLANATION & DEFINITIONS OF DIFFERENT TERMS

11.3.1 ACTIVITY CODES

Activity codes will include the following details:

- Type of Structure
- Area / RDs
- Work Restrictions (Closure etc.)
- Responsibility if identified, in the Contract to be shared with an agency other than the Contractor.

11.3.2 WORK BREAKDOWN STRUCTURE

The Work Breakdown Structure (WBS) shall divide the project scope into hierarchical, manageable, definable packages of work that will clearly indicate the scope and budget for the element. The WBS elements shall clearly reflect project's purpose and objectives, functional/ performance design criteria, project scope, technical performance requirements, and other technical attributes. The WBS to be submitted by the contractor will be based on the following parameters:

- The WBS submitted by the contractor will include and be a part of the high level WBS provided by the Engineer.
- Each WBS element will represent a single tangible deliverable.
- Each WBS element will represent an aggregation of all subordinate WBS elements listed immediately below it.
- Each subordinate WBS element must belong to only one single parent (or superior) WBS element.
- The deliverables should be logically decomposed to the level that represents how they will be produced (designed, purchased, sub-contracted, fabricated). The partitioning of the deliverables from higher levels within the WBS to lower levels must be logically related.

- Deliverables must be unique and distinct peers, and should be decomposed to the level of detail needed to plan and manage the work to obtain or create them.
- Deliverables should be clearly defined to eliminate duplication of effort within WBS elements, across organizations, or between individuals responsible for completing the work.
- Deliverables should be limited in size and definition for effective control – but not so small as to make cost of control excessive and not so large as to make the item unmanageable or the risk unacceptable.
- A coding scheme for WBS elements that clearly represents the hierarchical structure when viewed in text format will be used.

11.4 PROGRESS MEASURING SYSTEM

The Contractor will agree with the Engineer the Progress Measuring System after award of the Contract and before submission of Sub-Clause 14.1 Schedule.

11.4.1 ACTIVITY DEFINITION

Activity definition will involve identifying and documenting the specific activities that must be performed to produce the deliverables and sub deliverables identified in the Work Breakdown Structure (WBS). Within the context of the process of Activity Definition, decomposition will include identifying and documenting a list of activities that will be performed on the project. It will be organized as an extension to the WBS and will not include any activities that are not required as part of the project scope. The adequate level of detail must be carefully planned for the intent of the schedule based on the following parameters:

- The list of activities should lead to the identification and achievement of major deliverables of the project, including project management.
- Cost, resource and duration estimates will be loaded for the activities.
- Progress Measurement Criteria and Activity Weights Definition will be devised for progress reporting.
- Each Activity will be assigned a unique Activity ID based on a coding structure. The coding structure logic will also be indicated and communicated to the Engineer.

11.4.2 ACTIVITY SEQUENCING

Activity sequencing will involve identifying and documenting interactivity logical relationships. Activities will be sequenced accurately to support development of a realistic and achievable schedule. A project network diagram using Precedence Diagramming Method (PDM) will be utilized for showing dependencies between the activities.

11.4.3 ACTIVITY DURATION ESTIMATION

Activity durations will be estimated based on the work quantity, productivity and resources applied to the activity. Calendar dates will be utilized for all duration estimation with a minimum time unit of days. Calendars, constraints and assumptions will be documented and reported.

11.4.4 SCHEDULE DEVELOPMENT

The schedule will be developed to indicate the start and finish dates for project activities. The schedule developed will be iterated during the project according to the frequency of progress reporting. Critical Path Method (CPM) will be used for mathematical analysis of the schedule for calculation of Early and Late dates. As-Built construction schedules submitted by the Contractor periodically shall form the basis of evaluation of claim for Extension of Time, if any.

11.5 REPORTING REQUIREMENT

11.5.1 EXECUTIVE SUMMARY

Briefly set out the key issues together with recommendations for actions to be taken relating to the reporting period. The following topics may be covered:

- Cash flow utilization: actual versus planned.
- Physical progress: main progress activities during the month vs planned milestones.
- Main risks, challenges, and issues encountered during the month.
- Main mitigation, preventive, or corrective measures envisaged and person(s) responsible to carry out such measures.

11.5.2.....CONTRACT STARTUP ACTIVITIES

- List all activities that should take place from the issuance of the letter of acceptance by the Employer to the selected bidder until 60 days after the commencement date, mentioning due date, actual date and responsibility.
- Mobilization Activities (planned date as per programme, actual date and remarks)

11.5.3 RISK MANAGEMENT

- Include risk identification, risk assessment, and risk mitigation in a comprehensive Risk Register.

11.5.4 PROGRAMME MONITORING

Including but not limited to the following

- Tabular form of progress – planned dates, actual dates, variances
- Graphical form – line graph illustrating actual verses planned progress
- Pie chart – overall progress (%), time elapsed, time remaining
- One month look ahead table with target dates
- A short paragraph commenting on the critical path and the progress recorded to date.
- Description of all work carried out since the last report;
- Earned Value Analysis

11.5.5 PERFORMANCE SECURITY / GUARANTEES & INSURANCES DETAILS

11.5.6 CHANGE MANAGEMENT

Variation and Claim Register

11.5.7 FINANCIAL MANAGEMENT

- Payment Schedule
- Evolution of Contract Price

11.5.8 ENVIRONMENTAL MANAGEMENT HEALTH & SAFETY

Complete Compliance Report

11.5.9 COMPLETION OF WORKS AND CONTRACT CLOSURE

List all activities with due date, actual date and responsibility

11.5.10 PHOTOGRAPHS TO ILLUSTRATE PROGRESS

The caption shall be typed on each photograph

- Title of Project
- Identification of subject shown
- Station point of camera and direction of view
- Date & Time (automatically displayed on the photos)
- Name of Employer / Engineer and Contractor

11.6 DRONE VIDEO PROGRESS DOCUMENTARY

The contractor shall document the entire project development from various positions and capture a complete video documentary on monthly basis with high resolution drone cameras. Properly identifying areas / segments of the project with a comprehensive progress video as required by the the Engineer / Employer.

Drone Video Progress Documentary must be submitted on Monthly Basis as per satisfaction of The Engineer / Employer along with Monthly Progress Report on 8th Day of Each Month.

11.7 TIME LAPSE & REALTIME WEB BASED PROGRESS CENTRE

The contractor shall document the entire project development and project assets from various static angles by placing several Time-lapse high-resolution cameras and setup an un-interrupted web based progress center

SP- 12 LAY OUT OF WORKS**12.1 REFERENCE POINTS, LINES AND LEVELS**

The Engineer will provide a reference line or lines in the field with accompanying points and/or bench-marks to enable the Contractor to establish survey control points for construction.

12.2 VERIFICATIONS

The Engineer may make checks as the work progresses to verify lines, levels and grades established by the Contractor and to determine the conformance of the work as it progresses with the requirements of the Specifications and the Drawings. Shall not relieve the Contractor of his responsibility to perform all work in accordance with the Drawings and Specifications and the lines, levels and grades given therein.

12.3 PRIMARY CONTROL POINTS

Based upon the Engineer's basic control, the Contractor shall provide his own primary control points, as needed for the Works, and shall preserve and maintain them until otherwise authorized.

The Contractor shall be responsible for maintaining all survey markers/monuments, and property corners. If any markers/monuments are disturbed or destroyed by the Contractor, the Contractor shall arrange, at his own cost, to retrace and replace them to the entire satisfaction of the Engineer. If a monument cannot be replaced in its original position, the Contractor shall install a witness corner. The Contractor shall complete and file monument reference cards on all monuments as per instructions of the Engineer.

12.4 CONTRACTOR'S SURVEYORS

The Contractor shall provide experienced construction surveyor/s with adequate experience in the construction surveys similar in nature as required by this Contract.

12.5 BASIC CONTROL MONUMENT

Based upon the Engineer's established basic control monuments the Contractor shall establish all lines and grades necessary to control the Works, and shall be responsible for all measurements that may be required for execution of the Works to the tolerance prescribed in Sub-Clause 12.7 below.

12.6 SURVEYS AND COMPUTATIONS

The Contractor shall perform such surveys and computations as are necessary to determine quantities of work performed or placed during each progress payment period, and shall also perform all surveys required by the Engineer to determine final quantities of work in place. The Engineer will determine final quantities based

on original ground levels determined by the Contractor and agreed by the Engineer.

The Contractor shall notify the Engineer at least 24 hours before performing a quantity survey unless specifically waived, quantity surveys shall be performed in the presence of and agreed by an authorized representative of the Engineer.

12.7 TOLERANCE

Degree of accuracy for the survey works shall satisfy the following specified tolerances:

- (a) Alignment of tangents and curves shall be within 0.1 foot for 1,000 feet i.e., an accuracy of 1:10,000.
- (b) Structure points shall be set within 0.01 foot accuracy from point to point, except where tighter tolerances are required.
- (c) Cross-section points shall be located within 0.10 foot, horizontally and 0.01 foot vertically.
- (d) Permissible closing error for a levelling line meant for establishing Temporary Bench Mark (TBMs) shall not exceed $0.045 \times \sqrt{M}$ foot, where M is in miles. The permissible closing error shall be duly adjusted.

12.8 MATERIAL AND EQUIPMENT

The Contractor shall provide all materials, equipment and labour required for work.

SP-13 STANDARDS AND SPECIFICATIONS

Except as otherwise provided by these Specifications or the Drawings all materials, equipment and fabrication and testing thereof shall conform to the latest applicable Standards and Specifications contained in the following list or to equivalent applicable Standards and Specifications. Copies of these Standards and Specifications may be purchased from the indicated agency, which publishes them:

- | | |
|--|--------|
| - American Society for Testing and Materials | ASTM |
| - American Association of Highway & Transportation Officials | AASHTO |
| - Unified Soil Classification System | USCS |
| - American Concrete Institute | ACI |

Where relevant Standards and Codes of Practice now quote metric units only, these are to be interpreted as required to the nearest equivalent imperial (foot/pound) unit for the purposes of this Contract.

All materials and workmanship not fully specified herein or covered by an approved Standard shall be of such a kind as is used in first class work and suitable to the climate in the Project Area.

If the Contractor, at any time and for any reason, wishes to deviate from the above standards or desires to use material or equipment not covered by the above

standards, he shall state the exact nature of the changes, the reason for making the change and shall submit complete specifications of the materials and equipment to the Engineer for approval.

SP- 14 ACCESS TO SITE

14.1 MAINTENANCE OF ACCESS AND HAUL ROUTES

The Contractor shall be responsible for maintenance of access and haul routes to Site of Works till completion of the Works. The Contractor shall make his own investigations of the condition of available public or private roads and of clearances, restrictions, bridge load limits and other limitations that affect or may affect transportation and ingress and egress at the job sites. The repair, maintenance and reinstatement of access routes, roadways, drain and canal banks if damaged during operation shall be the responsibility of the Contractor without any additional cost to the Employer.

14.2 RESTORATION OF SITE

On completion of the Works, the Site shall be restored by the Contractor to its original conditions as far as practicable and left in tidy condition.

SP- 15 FACILITIES TO BE PROVIDED BY THE CONTRACTOR AT SITE

15.1 CONTRACTOR'S CAMPS

Pursuant to the provisions of Sub-Clauses 34.4 to 34.7 of the Particular Conditions of Contract, The Contractor shall arrange Camp facilities in the nearby area of the Project.

15.2 TEMPORARY SANITARY FACILITIES

- (a) The Contractor shall provide adequate temporary sanitary conveniences for the use of his employees and persons engaged on the work, including the Engineer and his employees. He shall ensure that his employees and labour make proper use of the latrines and do not foul the Site.
- (b) In addition to toilet facilities, suitable and adequate washing facilities shall be provided.
- (c) Sanitary facilities shall be located as directed or approved by the Engineer and shall be maintained in a clean and sanitary condition during the entire course of the work.
- (d) The septic tank and/or temporary holding tank(s) shall be kept pumped out at such intervals that the tank(s) will not overflow and contaminate the ground, flowing streams or surface drainage.
- (e) On completion of the Works, sanitary facilities shall be properly disinfected and all evidence of same including temporary buried tanks and foundations removed from the Site.

15.3 MEDICAL FACILITIES

The Contractor shall arrange provision of adequate medical facilities for his employees.

Adequately equipped dispensary/ies with qualified and experienced staff shall be provided by the Contractor at his camps. In addition, suitably equipped first aid stations manned by trained staff shall be provided at strategic locations, to administer first aid treatment at all times free of charge to all persons on the Site, including personnel of the Engineer and the Employer. The nature, number and location of facilities furnished and the Contractor's staff for administering first-aid treatment shall meet the requirements of the Health Services of the Government of Pakistan.

15.4 OPERATION AND MAINTENANCE OF THE CAMPS AND FACILITIES

For the purpose of operation and maintenance of the camps and facilities provided as above, the Contractor shall comply with all applicable provisions of the Pakistani Labour Laws and specifically to the following requirements:

- (a) Camp areas shall be kept dry and free from dense vegetation. Measures shall be taken to control dust within the camp area, by water or oil spraying or other approved means.
- (b) Any ponded water around a camp shall be sprayed weekly with oil or other approved anti-malaria liquid.
- (c) The Contractor shall provide garbage collection and disposal services for his construction camps and the Engineer's office. Disposal shall be by burial (landfill) and/or incineration. Disposal area shall be located a sufficient distance away and downwind from camp facilities and offices so as not to create objectionable odours or health hazards. Equipment, methods of collection and disposal and location of disposal areas shall be submitted to the Engineer for approval.
- (d) The interior walls and ceilings of buildings shall be lime washed or painted. The whole of the open spaces around the buildings shall be swept each day and all rubbish removed. The living areas shall be suitable for the climatic conditions. Roof height shall not be less than 10.5 ft. and adequate number of ceiling fans shall be provided.
- (e) Adequate sanitary conveniences, including washing and bathing places shall be maintained at each of the camps. All sanitary fixtures, receptacles, toilet rooms, lavatories and wash rooms shall be cleaned and disinfected at least once every day.

15.5 DRAINAGE

The ground around the buildings shall be graded to slope away from building perimeters so as to provide adequate drainage and shall be thoroughly compacted.

Excavated material shall be disposed of by filling in low areas or as otherwise directed by the Engineer.

15.6 WATER SUPPLY

The Contractor shall arrange for the water supply for his staff residences, labour camps, site offices, work yards, workshops, and various camp facilities. Construction of pumps, storage tanks, overhead tank, distribution system, and their proper running and maintenance shall be his responsibility. Water shall be supplied to the camps 24 hours a day. Adequate supply of water, cooled in summer, shall be ensured in camps and sites of work. Water samples shall be tested periodically to ensure that it is fit for human consumption.

15.7 ELECTRICITY SUPPLY

The Contractor shall provide electricity required for the Works including labour camps, staff residences, offices including the Engineer's Site office and various camp facilities. The Contractor shall also provide sufficient standby electricity supply arrangements for his needs.

15.8 UTILITY LINES

The Contractor Shall conduct his operations, make necessary arrangements, take suitable precautions and perform all required work incidental to the protection of and avoidance of interference with power, telephone, water and other utilities within the areas of his operations in connection with the Contract. No separate payment shall be made for such incidental work. In case the utility lines are required to be relocated the Contractor shall arrange their relocation with the concerned departments and organizations.

15.9 HANDING OVER / REMOVAL AFTER COMPLETION

Upon completion of the Works, these facilities with regard to Contractor's camps, labour and staff accommodation, site office, other installations and temporary buildings constructed and all facilities provided by the Contractor under this Clause shall be handed over to the Employer or if the Employer desires, the Contractor shall remove these facilities and the Site cleared and reinstated to the satisfaction of the Engineer.

15.10 MEASUREMENT AND PAYMENT

No separate payment will be made for the work included under the Clause SP-19; the cost thereof is deemed to be included in the rates and prices of other items entered in the Bill of Quantities.

SP- 16 PROVISION OF FACILITIES FOR THE ENGINEER / EMPLOYER

16.1 SITE OFFICE FOR THE EMPLOYER / ENGINEER

The Contractor shall provide within 14 days after signing of Contract:

- a) Contractor's Office, Workshop, Material Testing Laboratory and Work Areas (areas required and proposed layout, type of construction of building, etc.)
- b) The Employer, The Engineer and The Engineer's Representative's office duly approved by The Engineer at suitable location along the route considering convenience and ease of access with the provision of following facilities / services:
 - i. Furnished with furniture, air-conditioning, heating, power, etc.
 - ii. Communication media including telephone, fax, internet devices, etc. (4 Nos.)
 - iii. Latest Model of Laptops 2 no. (01 no. for Client and 01 no. for Consultants), Computers Desktop 2 no. (01 no. for Laboratory, 01 no. for office work), and printing & photocopy facilities (3-in-1 printers) (01 no. for Client and 01 no. for Consultants)

16.2 TRANSPORTATION

The Contractor shall within 14 days after signing of Contract provide minimum 02 Nos. 4x4 Double cabin 2800 cc or more diesel engine vehicle on rental basis (01 no. for Employer, 01 no. for the Consultants), 01 Nos Cars 1300cc or more (one for Employer) not more than 02 years old model with driver, within one week (07 days) of signing the Contract. Contractor shall be responsible for POL (up to 300L for each vehicle) and maintenance of the vehicles till completion of Defects Liability Period.

16.3 MEASUREMENT AND PAYMENT

No separate payment will be made for the facilities provided under the Clause SP-16; the cost thereof is deemed to be included in the rates and prices of other items entered in the Bill of Quantities.

SP- 17 SITE FACILITIES TO BE PROVIDED BY THE EMPLOYER

17.1 GENERAL

Without prejudice to the generality of the various clauses of the Contract and except for the facilities referred to hereinafter, particular attention is drawn to the obligations of the Contractor to make his own arrangements for providing, maintenance and furnishing of labour camps, staff residences, offices, workshops, stores watching and guarding thereof.

The Contractor shall submit his written demand of his requirements of land for his Site Facilities as herein specified, at least 28 days in advance.

SP- 18 SAFETY MEASURES AT CONSTRUCTION SITE

- a) Pursuant to the provisions of Sub-Clause, for Safety Measures the Contractor shall observe high standards of safety for men and machines at all times and with regard to safety.

- b) The Contractor shall take all possible measures to protect his personnel from harm. In case of any casualty or injury to any person due to the Contractor's operations, the Contractor shall ensure quality medical treatment and payment of due compensation.
- c) The Contractor shall not permit casual observers to come close to the sites where excavation and other hazardous operations are being performed.

SP- 19 ENVIRONMENTAL PROTECTION

The Contractor shall exercise care to protect the natural landscape and shall conduct his construction operations so as to prevent any unnecessary destruction, scarring or defacing of the natural surroundings in the vicinity of the Works. Except where clearing is required for the Permanent Works, approved construction roads and the Temporary Works, and for excavation operations, all trees and native vegetation shall be preserved and shall be protected from damage which may be caused by the Contractor's construction operations and equipment. On completion of the Works, all work areas shall be smoothed and graded in a manner to conform to the natural appearance of the landscape. Where unnecessary destruction, scarring, damage or defacing may occur as a result of the Contractor's operations, it shall be repaired, replanted, or otherwise corrected as directed by the Engineer at no additional cost to the Employer.



Ravi Urban Development Authority (RUDA)

Package-1A (R/S River Embankment Upper
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Specifications



SPECIFICATIONS



Ravi Urban Development Authority (RUDA)

Package-1A (R/S River Embankment Upper
Promenade) from RD 0+000 to 10+500 R/S
River Training Works & Barrages
Specifications (Part-B)



Specifications (Part - B)

TECHNICAL SPECIFICATIONS

NOT FOR USE OF BID SUBMISSION



TECHNICAL SPECIFICATIONS

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NOT FOR USE OF BID SUBMISSION

TECHNICAL SPECIFICATIONS

1- GENERAL ITEMS

Brief Description of Works

1.1 This Technical Specification is prepared for use on the Package-1A of River Training Works and Barrage starting from RD 00+000 to RD 10+500 Right Embankment (Upper Promenade), Ravi River Front Urban Development Project is designed to cater the maximum flood that occurs in the history of River Ravi. River Ravi has been channelized that will cater the 1,000-year return period flood of 586,000 cusecs.

In order to cater that flood approximately 28 ft high (from proposed river bed level) earthen embankment is proposed which consist of two levels; lower and upper promenade. Lower promenade is 125 ft wide whereas upper promenade is 70 ft wide. Proposed embankment consists of following materials;

- Zone -A Material, impervious in nature, will act as dowel around the embankment fill.
- Zone-B material, consist of coarser soil, mostly contains sand and pervious in nature to act as other fill material.
- 45 ft wide and 5 ft thick Stone apron is provided on river bed to address scour issues
- Coarse and fine filters at the embankment slopes
- 1.5 ft thick Stone pitching on sloping surface to provide slope stability and to stop the weathering affects i.e. rain cuts etc.

Mobilization for Construction of the Works

1.2 The Contractor shall mobilize all resources as required for construction of works according to the Contract Provisions. The major items of mobilization are, but not limited to listed and described hereof. The Contractor shall make his own assessment for provision and maintenance of mobilization and demobilization requirements and shall ensure their availability to the satisfaction of the Engineer.

- (a) Shipment of Contractor's plant and equipment with all accessories / spare parts to site and making such plant and equipment operational.
- (b) Mobilization of Contractor's personnel and labour at site.
- (c) Provision of facilities for housing, accommodation, and amenities for staff and labour.
- (d) Provision of Contractor's field offices, testing laboratories, workshops, warehouse, sheds, storage yards and other operational facilities by the Contractor for proper and efficient execution of the works.

- (e) Provision of electrical power supply and standby power supply, to operate and maintain the Contractor's camps, offices, workshops and equipment site offices for the Engineer / Employer including supplies of power.
- (f) Provision for potable and raw water systems for use in camps / housing, offices and construction including installation of the necessary wells, pumps, pipe lines, canal / ditches, storage tanks and suitable arrangements for delivery of water at various points of requirement.
- (g) Provision of sanitary, sewerage and storm water drainage systems.
- (h) Collection of garbage and its disposal.
- (i) Provision of facilities required to perform religious activities.
- (j) Provision of lighting and communication systems, security facilities including security fencing and gates; fire-fighting arrangement including associated equipment and supplies.
- (k) Provision of such roads as may be deemed necessary by the Contractor in his camp areas, up-to camp area and haul & approach roads on the site of works.
- (l) Operation and maintenance of the above facilities ('e' through 'k') and all other facilities deemed necessary by the Contractor and provided by him for the health and welfare of his labour staff throughout the Contract period to maintain efficient execution of the works.

Provision of Camps

1.3 The Contractor shall provide such camps as are required for the proper and efficient progress of the work to house his own employees and to provide such site office facilities for use of the Engineer and Employer. The contractor shall provide for a cold food storage area, food preparation and associated waste facilities as well as refectory for all employees which meet the satisfaction of Engineer. On the completion of the Contract, these camps along with facilities will become the property of Employer. If the Employer not required these camps after completion of the Project then the Contractor shall remove the said camps and facilities and reinstate the camp area to the satisfaction of Engineer and the Employer. Contractor shall be responsible for any damage caused by his labour and machines to trees and other utilities.

The Contractor's camps shall comply with the rules of the Pakistan Labour Camp Rules, 1960, issued by the Pakistan Health, Welfare and local Government Department and the requirements therein set forth.

The Contractor shall provide, maintain, operate such temporary buildings as his staff quarters, stores, workshops, labour camps, Engineer & Employer's offices, rooms and other temporary buildings necessary for the execution of the Works at the place purchased/leased by the Contractor. The Contractor shall submit site plans and general particulars of the prescribed buildings to the Engineer for his approval

within the prescribed period. The construction of the buildings shall not be started until his proposals have been finally approved by the Engineer.

The Contractor's staff quarters, labour camps, Engineer & Employer's offices, rooms shall be provided with all necessary services for drainage, lighting, roads, and paths, parking places, fencing, sanitation, cook-houses, fire prevention and fire fighting equipment. All labour camps, workshops and storage area shall be built on hard compacted ground with sufficient bundling and spill kits so as to prevent the loss or infiltration of leaked or spilt fluids into surrounding soils, ground water or water courses.

The Contractor shall also provide an adequate water supply system to the Contractor's office, his staff quarters, labour camps, workshops, Engineer & Employer's offices and other places of the Work on the Site. The Contractor shall make his own arrangements for electricity supply to the Contractor's office, Engineer & Employer's offices, rooms, his quarters, labour camp, workshop and stores and other temporary buildings.

Provision of Contractor's Office

1.4 The Contractor shall provide administrative and field offices as required for the proper and efficient progress of the work.

Provision of Contractor's Workshops and Warehouses

1.5 The Contractor shall provide workshops, warehouses, shades, and storage yards required by the Contractor for the proper and sufficient execution of the works.

Toilets

1.7 The Contractor shall provide throughout the period of construction of the Works and shall maintain and cleanse sufficient latrines for the use by his employees. He shall ensure that his employees do not foul the Site but make use of the toilets.

Contractor's Power Supply

1.8 The Contractor shall make his own arrangements for the supply of electric power for the purposes of the Contract.

Water Supply

1.9 The Contractor shall make his own arrangements for the supply of water for the purposes of the Contract. The quality of the water shall be to the approval of the Engineer and suitable for the purpose for which it is intended.

Waste water shall be disposed of clear of the Site to the satisfaction of the Engineer so as to cause no damage or complaint.

Maintenance of Site Facilities of Contractor

1.10 The Contractor shall arrange service for all of his mobilization works, fixtures and equipment including provision of all water, electricity and sewerage and disposal services, until the end of the Defects Liability Period. The Contractor shall replenish consumable items as and when required. At the end of Defects Liability Period, the contractor if required shall remove his camp and facilities and reinstate the camp area to the satisfaction of Engineer and Employer.

Survey

1.11 The Contractor shall check the levels of any existing temporary bench marks he proposes to use in setting-out the Works and shall establish additional bench marks such that no level is transferred more than 3,000 feet without being transferred to a bench mark. Bench marks shall be numbered and their construction shall be to the approval of the Engineer.

The Contractor shall supply to the Engineer, in duplicate, maps and records in an approved form, giving details of the location (including coordinates) and level of each bench mark used or established by the Contractor. Levels shall be transferred and ascribed to the bench mark within an accuracy of 0.25 inches, where m is the length in miles of the leveling circuit. Bench mark coordinates shall be determined to be within an accuracy of 1 in 4000 of the length of the leveling circuit.

Where required, the Contractor shall submit to the Engineer lists of original ground surface levels for the purpose of measurement of earthwork operations.

The method of surveying shall be to the approval of the Engineer. Field books and tabulated data shall be well maintained and made available to the Engineer for inspection when ordered.

Reference Points, Lines and Levels

1.11.1 The Engineer shall provide reference survey control stations. The Contractor shall provide his own primary control points, as needed for the Works and shall protect and maintain all survey markers and monuments.

Verification

1.11.2 The Engineer may make checks as the Work progresses to verify lines and grades established by the Contractor and to determine the conformance of the work with the requirements of the Drawings and Specification. Checking by the Engineer shall not relieve the Contractor of his responsibility to perform all work in accordance with the Drawings and Specification.

Materials and Equipment for Survey Work

1.11.3 The Contractor shall provide all materials, equipment and labour required for surveying work, including, but not limited to, instruments, stakes, spikes, steel pins, templates, platforms, and tools. Except as required to be incorporated in the work or left in place, all such materials and equipment shall remain the property of the Contractor. Surveying instruments shall be in perfect working condition and shall be subject to inspection and calibration checking and adjustment at least after every two weeks of use.

Defective instruments shall be promptly replaced or repaired.

Data

1.11.4 Survey data shall be recorded in accordance with recognised professional surveying standards. Original field notes, computations, and other surveying data shall be recorded in field books dully signed by the Engineer's representative and Contractor's representative.

Notes or data not in accordance with standard formats will be rejected. Illegible notes or data, or use of erasures on any page of a field book will be considered sufficient cause for rejection of a part or all field book. Copied notes or data will not be permitted; therefore, rejection of part or all of a field book may necessitate re-surveying. Corrections by ruling or lining out errors will be satisfactory.

Notice of Operations

1.12 The Contractor shall give full and complete written notice, of all important operations to the Engineer, sufficiently in advance to enable the Engineer to make such arrangements as the Engineer may consider necessary for inspection and for any other purpose. The Contractor shall not start any important operation without the written approval of the Engineer.

Working Hours

1.13 The Contractor shall plan his work on the basis of a six-day working week, and within the hours of 6:00 am and 6:00 pm. Should the Contractor require additional working hours, or weekend working, he shall submit a request to the Engineer for permission to work extended hours, giving full reasons for the requests. Approval to such requests will not be granted on a regular basis, but only in exceptional circumstances.

Notwithstanding the foregoing nothing in this Contract will restrict the Contractor undertaking any tasks at any time where such tasks are essential for the saving of life or property or for the safety of the Works, in which case the Contractor shall immediately advise the Engineer.

Suppliers of Materials

1.14 Before ordering a material of any description intended for the Permanent Works, the Contractor shall submit for the approval of the Engineer the name of the maker or supplier proposed and details of the place of origin and specification of the material. If requested by the Engineer, the Contractor shall supply to the Engineer for his retention a copy of any such order placed.

Independent Testing Organization

1.15 The Contractor shall have nominated an Independent Testing Organisation. The Independent Testing Organisation shall undertake all necessary tests on Materials or items of Plant for the Contract. For each manufactured Materials or item of Plant, and prior to dispatch from the manufacturer's premises, the tests shall confirm:

- a) the dimensions are correct to within specified tolerances;
- b) the specified materials have been used; and
- c) the Materials or Plant will function as specified as far as can be determined by factory test.

Prior to undertaking the tests, the Contractor shall submit to the Engineer the detailed scope of the checks and tests. The Engineer may require that additional tests be undertaken to ensure compliance with the Contract requirements.

When the Materials or Plant is delivered to Site the Independent Testing Organisation shall inspect each item to establish that the requirements of the Specification continue to be met, and to identify any damage that requires repair.

After each inspection the Independent Testing Organisation shall prepare a report detailing the tests that have been carried out and the results of such tests, and including any comments on the Materials or item of Plant and/or the manufacturer's procedures and facilities.

Natural Materials

1.16 The Contractor shall make all arrangements for the location, selection and processing of natural materials to comply with the Specification. The Contractor shall also be responsible for obtaining any specific approvals and permission for the excavation/abstraction of all materials. Before commencement of any works or request for approval from the appropriate authority the contractor shall submit to the Engineer full set of material and source information regarding the proposed location for approval. This information should be submitted to the Engineer, well-in advance of commencement of working of the material. Approval of a source shall not imply that all the material in that source is approved.

Disruption of Local Communities and Maintenance of Existing utilities

1.17 The Contractor shall take all measures necessary to avoid nuisance and disruption to local communities. In particular the Contractor shall ensure no damage is done to crops, pasture or woodland and outside the area for which the Engineer's approval for bush clearance has been given, that all irrigation & other supplies to such areas are maintained and that the Contractor's operations do not cause flooding or pollution hazards.

The Employer permits public access to parts of the inspection and non-inspection paths. The contractor shall allow for the continued public use of these paths, where permitted by the Employer, during the period of the Contract.

The contractor shall ensure that road and pedestrian access across the river is maintained at all locations where existing crossings are present or in a reasonable location close to the existing crossing.

Archaeological Findings

1.18 The Contractor or any of his employees in the performance of the Contract discovers evidence of possible scientific, pre-historical, historical, or archaeological materials will notify the Engineer

immediately in writing giving the location and nature of the findings. Where appropriate by reason of a discovery, the Engineer may order delays in the time of performance and / or changes in the work.

The Contractor shall not trespass, excavate in or otherwise disturb graveyards whether shown on Drawings or not. In the case of unidentified graveyards or burial sites, the Contractor shall notify the Engineer in writing and the Engineer shall make such design changes as required.

Landscape Preservation

The Contractor shall exercise care to preserve the natural landscape and shall conduct his construction operations so as to prevent any unnecessary destruction, scarring or defacing of the natural surroundings in the vicinity of the work. Except where clearing is required for permanent works, for approved construction of roads and for excavation operations, all trees, native shrubbery, vegetation, fences and walls shall be preserved and protected from damage which may be caused by the Contractor's construction and restoration operations and equipment. Movement of crews and equipment within the river reservation and over routes provided for access to the work shall be performed in a manner to minimize damage to grazing land, crops or property.

Water Pollution

1.19 The Contractor shall comply with applicable regulations concerning the control and abatement of water pollution as follows:

(a) The Contractor's construction activities shall be performed by methods that will prevent entrance or accidental spillage, of solid matter, contaminants, debris and other objectionable pollutants and wastes into flowing streams, flowing or dry watercourses, lakes and underground water sources. Sanitary wastes shall be disposed of in the soil by burial at approved sites or by other approved methods.

(b) The Contractor will provide suitable sanitary facilities for the use of his personnel.

Disposal of Waste

1.20 Waste materials including, but not restricted to, refuse, garbage, sanitary wastes, industrial wastes, and oil and other petroleum products shall be disposed of by the Contractor. Proper storage and connection should be arranged in the residential camps, workshops, material storages and all the other solid waste generating locations. Best management practices should be adopted to minimize the solid waste generation and for that three "R" policy i.e., Reduce, Re-cycle and Re-use policy should be adopted. A site specific solid waste management system should be developed by the Contractor for the safe disposal of solid waste during construction.

The contractor shall comply with air quality requirements as set by law and shall not burn any materials which may lead to the release of toxic or hazardous substances. All waste materials shall be handled, stored and disposed of in compliance with the Environmental Management Plan in relation to Pakistan legal requirements. If the contractor subcontracts the collection and disposal of waste from any sites or

camps this does not relieve him of this duty of care and it is the contractor's responsibility to ensure that the contractor disposes of all waste materials in a manner which is not detrimental to the environment and is in accordance with Pakistan Environmental Legislation.

Disposal of material by removal from the construction area shall be accomplished prior to the completion of any section of the Works. All materials removed except trees, shall become the property of the Contractor. Materials to be disposed of by dumping shall be hauled to an approved dump. It shall be the responsibility of the Contractor to make any necessary arrangements.

Trees and bushes cleared from the construction area shall be placed at the edge of the construction area or canal reservation. The Employer shall arrange the use and disposal of the wood. Where large trees are to be removed then the Engineer will determine how the trees are to be cut and removed and at the same time try not to impede the progress of the Works. All trees, tree roots and bushes not required by the Employer will be burned or removed from the Construction area at the Contractor's expense.

Grazing of Livestock

1.21 The Contractor shall provide reasonable care by hiring watchmen to ensure that livestock are not allowed within the river jurisdiction during the operations.

Wildlife

1.22 The Contractor shall take all necessary precautions to prevent danger to wildlife. The Contractor shall fully cooperate and assist as necessary with any protection plans developed by state authorities to avoid damage to or disturbance of wildlife.

Construction Camps/Camp Sites

- 1.23 The project will seek to avoid sitting camps where their presence might contribute to any conflicts with locals; Waste Management Plan will be implemented to ensure safe handling, storage, collection and disposal of construction wastes and the training of employees who handle waste.

Health and Safety

1.24 All work executed by or on behalf of the Contractor in the performance of this Contract shall be in accordance with an agreed Health and Safety Plan. The Contractor shall observe high standards of safety for men and machines at all times and with regard to safety, and shall comply with local laws and ensure strict adherence to the following:

- (a) The Contractor shall take appropriate precautions where personnel are required to work in confined spaces and other hazardous areas, and to only permit employees to work in confined spaces or other hazardous areas when there are adequate and continuous communication links with colleagues equipped to provide emergency assistance.

(b) The Contractor shall protect men working in trenches from cave-ins by the proper shoring or sloping of trenches, and shall take special care of persons working in the trenches, and prohibit individual employees from working alone in trenches.

(c) The Contractor shall protect personnel from the moving parts of the machines by installing and maintaining proper guards.

(d) The Contractor shall not permit casual observers close to excavating operations.

(e) The Contractor shall provide adequate fencing around the working areas to the satisfaction of the Engineer.

Reporting

1.24.1 The Contractor shall submit to the Engineer on or before the seventh day of each month a safety report detailing the total work force employed during the previous calendar month, the number and character of any accidents resulting in injuries loss of time, and/or materials, plant or equipment.

Emergency Facilities

1.24.2 The Contractor shall, during the entire period of the Contract provide free of cost emergency facilities with adequate medical and surgical equipment for first aid treatment, ambulance, and approved qualified personnel including one MBBS doctor and one dispenser, to administer the treatment.

Safety Equipment

1.24.3 Contractor employees, the Engineer's authorised personnel, Employer's authorised personnel shall be provided with all necessary safety equipment and protective clothing and shall be instructed in the proper use of equipment and in safe working practices.

Safety helmets and shoes shall be provided for all personnel including all visitors to the Site.

Contractor's Health and Safety Plan

1.25 The Health and Safety Plan shall include or address the following topics:

Description of Project

Project description and programme details;
Details of the Employer, Engineer and Contractor
Extent and location of existing records and plans.

Communication and Management of the Work

- a) Management structure and responsibilities;
- b) Health and safety goals and arrangements for monitoring and review of performance;
- c) Arrangements for:

- regular liaison between parties on Site;
 - consultation with the workforce; the exchange of design information between the Employer, designers, the Engineer, Contractor and other contractors on site.
 - handling design changes during the project;
 - the exchange of health and safety information between parties;
 - security, site induction and onsite training;
 - welfare facilities and first aid;
 - the reporting and investigation of accidents and incidents including poor misses.
 - the production and approval of risk assessments and method statements;
- d) Fire and emergency procedures.

Arrangements for Controlling Significant Site Risks

a. Safety risks:

- services, including temporary electrical installations;
- working in confined spaces;
- preventing fire work with or near fragile materials;
- control of lifting operations;
- dealing with services (water, electricity and gas);
- the maintenance of plant and equipment;
- poor ground conditions;
- traffic routes and segregation of vehicles and pedestrians;
- storage of hazardous materials;
- dealing with existing unstable structures;
- accommodating adjacent land use;
- other significant safety risks.

b. Health risks:

- removal of asbestos;
- dealing with contaminated land;
- manual handling;
- use of hazardous substances;
- reducing noise and vibration; and
- other significant health risks.

Utilities

1.25.1 It shall be the Contractor's responsibility to locate on the site all utilities whether or not indicated on the Drawings and to make the necessary arrangements with the utilities authorities for any work in the vicinity of the utilities and or diversions of the utilities. All such work shall be at the cost of the Contractor.

Radio Transmitting Equipment

1.26 If the Contractor wishes to employ air wave radio transmitting equipment for communications he shall submit details of the power and frequency of transmission proposed and shall obtain prior written approval to such use.

Operation and Maintenance Instructions

1.26.1 The Contractor shall provide operating and maintenance instructions for Plant, including instrumentation, to be supplied and installed under the Contract, it is intended that these instructions will be incorporated in the Operator's Maintenance Manuals for the Works to be compiled by the Engineer and to this end they shall be in loose leaf form on paper of A4 international size. All operating and maintenance instructions shall be in English.

Operating and maintenance instructions shall be submitted as drafts for examination and approved by the Engineer prior to final issue and shall be ready for issue prior to taking over of the Works by the Employer.

Five copies of the operation and maintenance manual shall be supplied by the Contractor to the Engineer who will retain one copy and deliver the others to the Employer. Completion will not be certified until the manuals are supplied.

Manufacturer's advertising literature, and advertising catalogues will not be acceptable for operating and maintenance instructions, but may be included for information.

Operating and maintenance manuals shall generally take the following form and shall contain the following information:

- a) step-by-step procedures for any operation likely to be carried out during the life of the Plant;
- b) maintenance and troubleshooting information, including charts showing lubrication, checking, testing and replacement procedures to be carried out daily, weekly, monthly and at longer intervals;
- c) technical details;
- d) description of the installation;
- e) complete parts list.

The manuals shall have a hard cover bound with the name and title of the installation clearly marked on it. It shall contain all materials in A4 size pages in loose leaf form. The manual shall be properly indexed and contain dividers with tabs between each section. All data must be organized in a neat and concise manner. All data must also be supplied in electronic form to a format approved by the Engineer.

Measurement and Payment

Payment will be made only for those items which are specified in the B.O.Q and no separate payment shall be made for other works under this section, the cost of which shall be deemed to have been covered by the rates and prices listed in the B.O.Q for other items of work.



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Package-1A (R/S River Embankment Upper
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River Training Works & Barrages
Technical Specifications



NOT FOR USE OF BID SUBMISSION

2 EARTHWORK OF RIVER EMBANKMENT

2.1 General

2.1.1 Scope of Work

The earthwork under this Contract involves excavation, earth fill for embankments, from excavated material or from borrows; and performing all the related works consisting of, but not limited to achieve design grade, compaction and testing in accordance with the Specification - Technical Provisions and as directed by the Engineer. The stipulations and requirements herein set forth shall apply except when such stipulations and requirements are specifically modified in writing by the Engineer.

2.1.2 Plan for Management of Earthwork

The Contractor shall establish, maintain, and operate an equipment fleet sufficient, under modern earthmoving practices, to accomplish the Works under the prevailing site conditions, haul distances, and Technical Specifications. The Contractor shall furnish his plan of the earthmoving portion of the Works to the Engineer using the Mass Haul Diagram Method and a written narrative of the earth moving plan. The Mass-Haul Diagram shall begin at the first station of the Project with an ordinate of "0". If the Contractor indicates in the Construction Plan that the earthwork will be performed in independent sections, then the Mass-Haul Diagram shall be submitted separately for each section.

The Mass-Haul Diagram shall contain a legend that shows:

- a) The type of equipment, spread and haul distance for each piece of equipment.
- b) The location of each borrow area and the anticipated quantity of material to be obtained from each area.

The plan shall also include the Contractor's methodology for excavation, placement of fill and compaction of the embankment in the river (embankment and side slopes) according to the specification.

2.1.3 Levels to be Recorded

Before the surface of any part of the site is excavated or the works thereon begun, the Contractor shall take and record levels and dimensions of any such parts. The Contractor shall also take and record such other levels and dimensions as are necessary during the progress of the excavation to allow accurate measurement of the excavated quantities.

All levels and dimensions shall be taken in the presence of the Engineer and recorded in the manner specified or as agreed with the Engineer, and such levels, when agreed with the Engineer, shall form the basis for measurement.

2.1.4 Bench Marks or Datum

Any bench mark, which is used for the Works, shall be correctly related to the datum specified on approved Drawings or fixed by the Engineer and the Contractor shall establish and maintain at his own cost, all such permanent bench marks required for the proper execution of the Works in the vicinity thereof, in perfect order to the satisfaction of the Engineer.

2.1.5 Joint Survey Work

Before starting excavation for the river bed and embankment, the Contractor shall jointly conduct, record, plot and submit to the Engineer for approval, the measurements to show the existing cross-sections at every 500 feet interval and any other appropriate intervals as required by the Engineer. The excavation "pay line" shall also be indicated on these cross-sections and approved by the Engineer.

2.1.6 Setting Out

Before commencing actual execution, the center line of the embankment or excavation shall be distinctly marked with a deep furrow (dag-bel) at least 10 inches wide and 6 inches deep and pegs shall be fixed at every 100 ft along this furrow. Top and bottom edges of the excavation and toes of all embankments shall be clearly marked. All curves in the alignment shall also be properly laid and half-breadth carefully set out.

2.1.7 Profiles

Having marked the alignment, a complete profile of the embankment or cutting, as the case may be, shall be set out at 500 ft intervals or at every change of section, and also at every curve. This profile shall have a linear dimension of 10ft. It shall be excavated to the proper level, and banks constructed to the correct height and widths, and all slopes dressed to true form. The correct height of this profile shall be 10 percent more than the designed final level of the embankment so that it may take care of settlement. The ends of all the profile banks shall be stepped so that proper locking takes place at the time of construction of the banks adjoining them. All labour and implements like bamboos, stakes, strings, pegs, batter boards, etc., required for setting out profiles shall be supplied by the Contractor and the cost shall be deemed to have been included in the unit rates quoted in BOQ.

2.1.8 Class, Nature or Conditions of Soil

The Contractor shall acquaint himself with the class, condition, origin or the nature of the ground, sub-soil and also the fluctuating nature of subsurface water level, which might be encountered during Earthwork (Excavation and Earthfill). The employer does not guarantee or warrant anywhere that the material to be found in the excavation will be similar in nature to that of any samples, which might have been exhibited or indicated on the Drawings or anywhere else in the

Contract Documents. The Contractor shall assume all responsibility for deductions and conclusions as to the nature of the materials to be excavated and the difficulties of executing and maintaining the required excavation. The Employer does not guarantee that the excavation can be performed or maintained at the neat lines described in these Specifications or as shown on the Drawings. The excavation in wet soil or slushy and daldal conditions or in standing water may be encountered for which Contractor shall be deemed to have made all relevant arrangements of manpower, tools, plants, machinery, equipment or any other means necessary for excavation. Any excavation executed beyond the "pay lines" shown on the Drawings will not be considered for the payment by the Engineer, and shall be deemed to be at the expense of the Contractor.

2.2 Preparation of Natural Ground including Clearing & Grubbing and Compaction

The Contractor shall carry out clearing and grubbing of all the areas within the right of way as shown on the Drawings or as determined by the Engineer. Such areas shall be cleared of all trees, bushes, abandoned buildings and structures, rubbish and other objectionable matter and such materials shall be removed from the site of the work, or otherwise disposed of, as approved by the Engineer. The Contractor shall remove the stumps of trees from the area to be occupied by the embankment. Tree stumps shall be uprooted using an approved rock/root or multi-application rake in such a manner that disturbance of top soil is kept to be minimum. The speed of the tractor carrying the root rake shall be sufficient low to pull the majority of long lateral roots out of ground so that the roots do not snap off at the root crown to remain in the soil. The use of bulldozer blade for uprooting trees will not be allowed.

The number of any tree stumps to be removed must be recorded. After uprooting, the stumps must be moved to an area designated by the Engineer. The area under the embankments shall then be stripped to a nominal depth of 6 inches as shown on the Drawings or as directed by the Engineer. The material removed shall be placed in spoil banks or in other approved areas designated by the Engineer. The Engineer's approval shall be obtained for location and disposal of the stripped materials stockpiled and/or wasted.

The Natural Ground or Surface ready for Construction Purpose after Clearing and grubbing or stripping up to 6 inches will be considered as Natural Ground for the purpose of this Item. The Compaction of Natural Ground shall be carried out as per specification/drawings or as directed by the Engineer.

2.2.1 Measurement and Payment

The measurement shall be made by multiplying the length, width and depth (6 inches) of the area under the embankment. The measurement of the items shall be in 1000 cubic feet. The payment under this item includes clearing and grubbing/ excavation including its disposal and compaction of Natural Ground. The payment of this item shall be made under item "Preparation of Natural Ground by its Compaction" in the given BOQ.

2.3 Excavation

2.3.1 General

- i. All excavation shall be made in accordance with the provisions of this Section and to the lines and grades shown on the Drawings or as directed by the Engineer.
- ii. During the progress of the work, it may be found necessary or desirable by the Engineer to vary the slopes or the dimensions of the excavation from those shown on the Drawings or as specified. The Contractor shall perform the work and make the required excavations to the revised and - changed slopes and dimensions in accordance with the Specification - Technical Provisions.
- iii. Where excavations are not to be covered by structures or other required construction, they shall be made to the full dimensions required and shall be finished to the prescribed lines and grades. All necessary precautions shall be taken to preserve the material below and beyond the lines of all excavation in the soundest possible condition. Any excavation made for the convenience of the Contractor for any purpose or reason, except as otherwise provided herein, shall be refilled and compacted to the satisfaction of the Engineer, where-required to-complete the work, by the Contractor at his own cost.

2.3.2 Classification of Excavation

Materials excavated will not be classified for payment, except as otherwise provided in the Specification - Technical Provisions material excavated will be measured in excavation to the lines and grades shown on the Drawings and all materials so excavation shall be paid for the unit price given in the Bill of Quantities for Excavation. No additional payment above this unit price shall be made on account of any of the material being wet or unsuitable for fill. The Contractor must assume all responsibility for deductions and conclusions as to the nature of the materials to be excavated and the difficulties of making and maintaining the required excavation.

2.3.3 Excavation in River Bed and Embankment / Foundation

- i. The river bed shall be excavated to the lines, grades and sections shown on the Drawings, or as directed by the Engineer. The slope angle shown on the drawings are tentative and may be amended by the Engineer depending on the stability of the soils encountered. Care shall be taken to prevent excavation beyond lines and grades shown on the Drawings. Initial excavation shall be carried out by heavy earthmoving plant selected by the Contractor, followed by rough trimming. This trimming will leave about 12 inches (on bed and against side slopes both) for further trimming to arrive at the final lines and grades of excavation as shown on the Drawings. Should a slide occur in an excavated slope and material fall into the open excavation or on to a structure, such material shall be removed and disposed of as approved by the Engineer. If directed by the Engineer, the slide area shall be trimmed, cleared and backfilled with approved compacted material. If the Engineer concludes that the slide was caused through the fault of the Contractor, the

removal and disposal of the slipped material and the clearance and the backfilling of the slide area shall be carried out at no additional cost to the Employer.

- ii. Where such slide occurs through no fault of the Contractor, or organic or unstable material is encountered below the slope, the Engineer will direct additional excavation to remove the material. The replacement material shall be placed and compacted as prescribed for embankments. Payment for the removal of this material shall be measured and paid for excavation and the replacement material measured and paid for as embankment fill.
- iii. Should the material forming the bottom or side of any excavation, while acceptable to the Engineer at the time of final trimming, subsequently become unacceptable due to exposure to weather conditions, flooding, or puddling, softening or loosening, during the progress of the Works, the Contractor shall remove such damaged, softened or loosened material and excavate further to sound surface and then backfill with approved compacted material as directed by the Engineer. Such further excavation and rectification shall be at the cost of the Contractor.
- iv. Stock piling of suitable excavated material where material suitable for earth fill in excess of that required to construct adjacent embankments is encountered and cannot be placed in one continuous operation, then such material shall be stockpiled within the right-of-way or as directed by the Engineer for later use. The Contractor shall be entitled to no additional allowance above the unit rates quoted in the Bill of Quantities on account of the requirement for allowing additional time for drying; for stockpiling and rehandling excavated materials which have been deposited temporarily in stockpiles; delays or increased costs due to stockpiling; poor trafficability on the excavated areas, haul roads, or the embankments; reduced efficiency of the equipment the Contractor elects to use; or on account of any other operations or difficulties caused by over-wet or slushy materials.
- v. The bottom and side slopes of excavations upon or against which structures or other required construction are to be placed shall be finished accurately to the required grade and dimensions.
- vi. All excavation shall be kept free from water from whatever source it may come, at all times to the entire satisfaction of the Engineer, except where otherwise specified or permitted in writing by the Engineer. No extra payment shall be made for dewatering by any means.
- vii. The excavated foundations shall be inspected and approved by the Engineer before foundation is laid or laying of stone apron.
- viii. The Contractor shall notify the Engineer without delay of any permeable strata, fissures or unusual ground encountered during excavation.
- ix. Sand, sandy soils and other materials which blow / drift in to the sites of the work shall be removed by the Contractor in an approved manner, and the excavated slopes and surfaces shall be completed to the original lines and grades established by the Engineer.

2.3.4 Excavated Materials

- i. Except for unsuitable materials, as determined by the Engineer, it is anticipated that all other materials from required excavations will be suitable for use in the construction of earthen river embankment and cofferdam. Where practicable, all suitable materials shall

be placed in the designated final locations direct from the excavation or as directed by the Engineer. As far as practicable, as determined by the Engineer, all materials designated for use in compacted river embankments and cofferdam shall be brought to the proper water content by sprinkling or other suitable means before and during excavation.

- ii. Where there may be an insufficient suitable material from excavation to construct the embankments, the Contractor shall obtain such material from borrow pits or as approved by the Engineer. If the Contractor proposes other borrow areas than he shall investigate the site or sites which he proposes to open up and shall provide full and detailed reports, etc. to satisfy the Engineer that the quality of the material meets Specification - Technical Provisions requirements and that the quantity is adequate for the works.
- iii. Excavated materials containing stumps, roots, vegetable matter and other objectionable materials that are otherwise unsuitable or not required for filling of river embankments and cofferdam under the Specification - Technical Provisions, shall be placed in designated spoil areas or as directed by the Engineer.

2.3.5 Measurement and Payment

- a) Except as specified herein, measurement for payment of unclassified excavation for the river bed and for cut-off channel will be made in 1000 cubic feet to the lines and grades shown on the Drawings or as prescribed by the Engineer. No payment shall be made for any additional excavation or backfilling required to adjust the levels under slope or embankment.
- b) Payment for unclassified excavation for the river bed and embankment/foundation will be made at the unit rates quoted in the Bill of Quantities for item " Earth Work Excavation".
- c) The amount tendered for the BOQ item " Earthwork Excavation " shall constitute full payment for excavation, all lead and lift, placing the material in embankments or disposed-off or as directed by the Engineer.

2.4 Formation of River Embankment

2.4.1 General

This work shall include the construction of upper step of river earthen embankment by using the excavated available suitable material and or by using material from borrowpit excavation and its compaction as per specifications and in conformity with the lines, grades, thickness shown on drawings or as directed by the Engineer.

2.4.2 River Embankment Fill Material

Material required for embankment fill not available from river bed and embankment/foundation shall be obtained from borrow areas subject to the approval of the Engineer. The Contractor must make his proposals for borrow areas with his Mass-Haul Diagram. The Contractor shall select and process embankments fill material from borrow areas or quarries as may be necessary to conform to the specified requirements. Embankments fill material shall be free of rubbish, wood and organic material and shall be approved by the Engineer. Surface of borrow areas shall be left after completion of work, in a reasonably smooth and even condition approved by the Engineer. Borrow areas shall be such as to preclude the ponding of water within the borrow area and to be free drainage over its entire area. The finished side slopes of borrow areas shall not be steeper than 4 horizontal to 1 vertical and the total depth of the finished borrow pit shall not exceed 6 feet.

2.4.3 Compacting Earth fill Material

Compaction is required of all earth fill materials for embankments. The material shall be deposited in horizontal layers of uniform thickness of 6 inches and compacted as per specifications. The excavation, placing, moistening, mixing and compacting operations shall be such that the material will be uniformly compacted throughout the required section and will be homogeneous, free from lenses, pockets, streaks, voids, laminations or other imperfections. Unless otherwise approved by the Engineer the direction of compaction rolling shall be parallel to the axis of the embankment. Fill material which does not conform after compaction to the specified requirements shall be removed and replaced or with the approval of the Engineer, may be moistened or dried out to the extent necessary and re-compacted.

2.4.4 Compaction Equipment

- a) The contractor shall mobilize to the project site sufficient equipment for successfully, orderly, and timely completion of all earthwork operations (excavation, moving, placing, compacting, grading etc.) and shall demonstrate during field trials that the equipment mobilized is suitable for on-site soils. The compaction equipment specifications contained in this section are only the guide lines to assist the contractor in the selection of the equipment. The final choice shall be the sole responsibility of the contractor and shall be based on his own assessment of the site conditions and his previous experience of similar jobs performed under similar conditions. The contractor shall assure to the satisfaction of the Engineer, during the field trials, that the equipment selected shall attain and deliver the final end results/goals set forth in this specification.

b) Rollers**I. Vibratory Rollers:**

The vibratory roller shall be steel-drum roller of either smooth drum or tamping foot type. The roller shall have a total static weight of not less than 12 tones, with at least 90% of this weight being transmitted to the ground through the drum when the roller is standing on level ground. The drum shall not be less than 1.5 m in diameter and not more than 2 m wide. The vibrating frequency of the roller during operation shall be between 1,100 and 1,500 vibrations per minute. The roller shall have a dual amplitude facility giving a high amplitude in the range 1.5 to 2.0 mm and a low amplitude. The centrifugal force developed by the roller at 1,250 vibrations per minute shall be not less than 16 tones. The power of the motor driving the vibrator shall be sufficient to maintain the specified frequency and centrifugal force under the most adverse conditions which may be encountered during compaction of the earth fill. During compaction the roller shall not travel faster than 5 km per hour. The drum shall be equipped with a suitable cleaning device to prevent the accumulation of material on the drum during rolling.

II. Sheep-foot (Tamping) Rollers

Tamping rollers shall be used for compacting the earth fill. The rollers shall meet the following requirement:

Roller Drums -- Tamping rollers shall consist of two or more roller drums mounted side by side in a suitable frame. Each drum of a roller shall have an outside diameter of not less than 5 feet and shall be not less than 5 feet nor more than 6 feet in length.

The space between two adjacent drums, when on a level surface, shall be not less than 12 inches nor more than 15 inches. Each drum shall be free to pivot about an axis-parallel to the direction of travel. Each drum ballasted with fluid shall be equipped with at least one pressure-relief valve and with at least one safety head. The safety head shall be equal to union type safety heads with rupture discs suitable for between 50- and 75-psi rupturing pressures.

The pressure-relief valve is a manually operated valve and shall be opened periodically. Personnel responsible for opening pressure-relief valves shall be instructed to ascertain that valve openings are free from plugging to assure that any pressure developed in roller drums is released at each inspection.

Tamping feet - At least one tamping foot shall be provided for each 100 square inches of drum surface. The space measured on the surface of the drum, between the centers of any two adjacent tamping feet, shall be not less than 9 inches. The length of each tamping foot from the outside surface of the drum shall be not more than 11 inches and shall be maintained at not less than 9 inches. The cross-sectional area of each tamping foot shall be not more than 10 square inches at a plane normal to the axis of the shank 6 inches from the drum surface, and shall be

maintained at not less than 7 square inches nor more than 10 square inches at a plane normal to the axis of the shank 8 inches from the drum surface.

Roller weight - The weight of a roller when fully loaded shall be not less than 4000 pounds per foot of length of drum.

The loading used in the roller drums and operation of the rollers shall be as required to obtain the specified compaction. If more than one rollers are used on any one layer of fill, all rollers so used shall be of the same type and essentially of the same dimensions. Rollers operated in tandem sets shall be towed in a manner such that the prints of the tamping feet produced by the tandem units do not overlap. The design and operation of the tamping roller shall be subject to the approval of the Engineer who shall have the right at any time during the prosecution of the work to direct such repairs to the tamping feet, minor alterations in the rollers, and variations in the weight as may be found necessary to secure optimum compaction of the earth fill materials. Rollers shall be drawn by crawler-type or rubber-tired tractors. The use of rubber-tired tractors shall be discontinued if the tires leave ruts that prevent uniform compaction by the tamping roller. Tractors used for pulling rollers shall have sufficient power to pull the rollers satisfactory when drums are fully loaded with sand and water.

At the option of the contractor, self-propelled tamping rollers conforming with the above requirements may be used in lieu of tractor-drawn tamping rollers. For self-propelled rollers, in which steering is accomplished through the use of rubber-tired wheels, the tire pressure shall not exceed 40 psi. During the operation of rolling, the spaces between the tamping feet shall be maintained clear of materials which would impair the effectiveness of the tamping rollers.

III. Rubber-tired (Pneumatic-tired) Rollers

Rubber-tired rollers shall have a minimum of four wheels equipped with pneumatic tires. The tires shall be of such size and ply as can be maintained at tire pressure between 80 and 100 pounds per square inch for a 25000-pound wheel load during rolling operations. The roller wheels shall be located abreast and be so designed that each wheel will carry approximately equal load in traversing uneven ground. The spacing of the wheels will be such that the distance between the nearest edges of adjacent tires will not be greater than 50 percent of the tire width of a single tire at the operating pressure for a 25000-pound wheel load. The roller shall be provided with a body suitable for ballast loading such that the load per wheel may be varied, as directed by the Engineer, from 18,000 to 25,000 pounds. The roller shall be towed at speeds not to exceed five miles per hour. The character and efficiency of this equipment shall be subject to the approval of the Engineer. Sheep foot rollers and pneumatic tired roller may be used for the compaction of cohesive soils. For cohesionless soil vibratory rollers shall be used.

2.4.5 Moisture Control of Fill

As far as practicable and where necessary, all material to be excavated for compacted embankments from the river bed and borrow pits, shall have its moisture content adjusted either by drying or adding water, so that it is within the specified range when the fill is compacted. The water and the fill material shall be thoroughly mixed to uniform moisture content.

The moisture content of the earth fill material during compaction shall be brought to 1% below to 2% above the OMC. Whenever possible, all water added to condition the material shall be added in one application at the borrow pit or in the channels prior to their excavation. When moisture is added to the areas to be excavated, care shall be taken to moisten the material uniformly to attain the requisite moisture content as required by this Specification. The Contractor shall control the application of water and check on the depth and amount of water penetration during application so as to avoid excess moisture.

If at any location to be excavated before or during excavation operations there is excessive moisture, steps shall be taken to reduce the moisture by excavating and placing in temporary stockpiles materials containing excessive moisture; by excavating drainage ditches; by allowing adequate additional time for drying; or by other means approved by the Engineer.

2.4.6 Material Requirement

"Material for river embankment" earthfill shall consist of suitable material excavated from river bed excavation. Borrow material will be used only when material obtained from river excavation is unsuitable or is deficient for earthfill formation.

The Contractor shall use material belonging to any of the Group Symbols SM, SP-SM, CL, ML, CL-ML of the Unified Soil Classification System ASTM D2487.

For Zone-A of River Embankment: soils shall be Lean Clay (CL) or Silty Clay (CL-ML) or Silty Clay with Sand (CL-ML) as per requirements of ASTM D2487. This material shall be plastic in nature with plasticity index (PI) more than or equal to 4 and upto 10 as per requirements of ASTM D4318.

For Zone-B of River Embankment: soils shall be Silty Sand (SM) or Poorly Graded Sand with Silt (SP-SM) as per the requirements of ASTM D2487. Stones and indurated material larger than 3 inches shall be removed from material to be used for compacted embankments. The material shall be free from all rubbish, organic matter, and other deleterious/objectionable substances and shall be approved by the Engineer.

2.4.7 Construction Requirements of River Embankment

Suitable material for earthfill shall be placed in horizontal layers and compacted with approved equipment appropriate to the type of soils and in a manner determined by the trial section. The thickness of the compacted layer shall not exceed 6 inches unless agreed otherwise by the Engineer.

For River Embankment's Zone-A, the dry density determined in accordance with ASTM D-1556, of the compacted material in the river embankment shall not be less than 95 percent of the laboratory maximum dry density determined according to Modified Proctor ASTM D-1557.

For River Embankment's Zone-B, the dry density determined in accordance with ASTM D-1556, of the compacted material in the river embankment shall not be less than 93 percent of the laboratory maximum dry density determined according to Modified Proctor ASTM D-1557.

During compaction, the moisture content of the fill material shall be maintained in accordance with the Specifications. The moisture content shall be uniform throughout each layer. Subsequent layers shall not be placed and compacted unless the previous layer has been properly compacted and approved by the Engineer. The surface of the layer shall be scarified prior to the application of the next layer unless it has been prepared by a sheep foot roller.

The Contractor shall rework the portions of the embankments which do not meet these requirements in order to achieve the specified compaction to the satisfaction of the Engineer, by following the procedures specified herein.

During dry weather, whether fill is being placed or not, the surface of the fill shall be sprayed with water to prevent cracking of the surface. Should cracking of the fill occur, the Contractor shall remove such cracked material and replace it with fresh compacted material within the specified range of moisture content.

The Contractor shall be responsible for protecting temporary fill surfaces against erosion. At the end of each working day, or if it starts to rain, the surface of the fill shall be made smooth with a drainage slope to induce runoff from the filled areas and leave non areas that can retain water. Where necessary, drainage ditches, and the like shall be formed to assist drainage and to prevent runoff from damaging placed material. Runoff from heavy rain shall be controlled to prevent gulley erosion of the placed fill. Any gulley erosion shall be repaired with material compacted in accordance with the Specifications, and eroded surfaces shall be restored and graded to ensure a proper bond with new fill placed on them. No payment shall be made for over built portion of the river section and the Contractor shall consider this fact while pricing.

2.5 Testing

2.5.1 Testing by the Contractor

The Contractor shall be responsible for carrying out all field and laboratory tests required to ensure that all fill material placed complies with the Specifications, and that the material is compacted so as to conform to the requirements. Laboratory tests of maximum dry densities and optimum moisture contents shall be on samples taken adjacent to and including in situ density test samples. Maximum dry densities and optimum moisture contents for compaction control by relative compaction shall be derived using ASTM D1557. The location of each field test or sampling point shall be to the approval of the Engineer. The minimum frequency of testing for Control Tests shall

be as set out in Test Frequencies Table. The Contractor shall inform the Engineer at least one hour before the Contractor proposes to carry out any field test or take a sample so that the Engineer may supervise the test or the taking of the sample.

Test results and copies of calculations shall be submitted to the Engineer promptly upon completion of the tests.

2.5.2 Test Frequencies and Compaction Requirement

The frequencies of Control Tests in the embankment for each material are given below. The frequencies are expressed as cubic feet of each material placed per test to be carried out on the material after placement and compaction.

Type	Compaction	Frequency (cu. ft./test)			
		Test reference letter (see below)			
		(a)	(b)	(c)	(d)
Zone-A	95%	150,000	20,000	150,000	150,000
Zone-B	93%	150,000	20,000	150,000	-

- Test
- (a) Particle-size distribution (Grading)
 - (b) In situ wet and dry density (ASTM D1556)
 - (c) Maximum Dry Density and Optimum Moisture Content (ASTM D1557)
 - (d) Atterberg limits

2.6 Measurement and Payment

2.6.1 Compaction of Earthfill Material in River Embankment

- a) Measurement for payment of compaction for earthfill materials placed in embankment shall be made in 1000 cubic feet of compacted volume of earthfill as shown on the drawings or as otherwise directed by the Engineer in accordance with the specifications.
- b) Payment for compaction of earthfill material in embankments shall be made at the unit rates quoted in the Bill of Quantities (BOQ) for compaction of earthwork in Embankments.
- c) The amount tendered shall constitute full payment for compacting earthfill material including ploughing, mixing, moistening earth to optimum moisture content, machinery for compaction, labour and/or any other activity required complete in all respects for item "Compaction of Earthfill in Embankments" in accordance with the specification or as directed by the Engineer.

2.6.2 Making River Embankment using Borrowpit Earth Excavation

- a) Measurement for payment of making embankment using Borrowpit excavated material shall be made in 1000 cubic feet of compacted volume of embankment earthfill in lines and grades as shown on the drawings or as otherwise directed by the Engineer in accordance with the specifications.
- b) Payment for item making embankment using Borrowpit excavated material shall be made at the unit rates quoted in the Bill of Quantities (BOQ) for making embankment using borrowpit excavated material.
- c) The amount tendered shall constitute full payment for making embankment by using borrowpit excavation, such payment will be deemed to include cost of earth, cost of excavation, cost of hauling including all lead and lift, compaction including spreading, laying, ploughing, mixing, moistening earth to optimum moisture content, machinery for compaction, labour and/or any other activity required to complete in all respects for item in accordance with the specifications.

NOT FOR USE OF BID SUBMISSION

03 – STONE PITCHING, STONE APRON AND FILTERS

Preparation of Formation

The contractor shall prepare the formation for river training works and structure protection works by trimming the excavation accurately to the specified dimensions. Where over-excavation occurs it shall be back filled with especially compacted fill or if a gravel bed curing is used with the gravel bed curing material all to the approved of the Engineer.

Stone Pitching

3.1) The work to be done under stone pitching consists of furnishing, transporting and placing the material in accordance with these Specifications and or as directed by the Engineer, at locations shown on the Drawings.

Materials – Base Filter Layer, Stone Pitching & Rock Spalls

3.2) Base Filter Layers: Base filter layers under stone pitching on level and on slope shall comprise of Fine Filter material and Coarse Filter material of size in range 1/8" to 4". (as given in gradation table).

3.3) Stone Pitching for River Embankment: Stone for pitching shall consist of rock fragments which are dense, sound, angular and abrasion resistant. The stones shall be generally cuboid in shape with the largest dimensions not exceeding twice the smallest dimensions. Individual fragments shall be free from cracks, seams and other defects that could tend to increase unduly their destruction by water. The stones individually shall weigh between 40-140 lbs with 50 percent weighing 90 lbs or larger but minimum 10 percent shall be 125 lbs or larger and not more than 5 percent shall weigh less than 40 lbs.

3.4) Rock Spalls: All interstices in stone pitching shall be well filled with rock spalls. The rock spalls shall be rock fragments of size between 2 inches to 4 inches.

3.5) Testing of Materials: Stone & rock spalls may be rejected if they fail to meet the following test requirements:

- a) Los Angeles abrasion test (large size Coarse Aggregate ASTM Designation: C535). If the loss exceeds ten percent, by weight, at 200 revolutions, or 40 per cent, by weight, at 1000 revolutions
- b) Los Angeles abrasion test (small size Coarse Aggregate ASTM C131). If the Loss exceeds ten percent by weight at 100 revolution or 40 percent by weight at 500 revolutions
- c) Specific gravity (ASTM Designation: C127). If the specific gravity (saturated surface-dry basis) is less than 2.60.
- d) Test for Rock Slabs to Evaluate Soundness of Rip Rap by

use of Sodium Sulfate or Magnesium Sulfate, ASTM D 5240.

- e) Test for Evaluation of Durability of Rock for Erosion Control under Wetting and Drying Conditions, ASTM D5313.

Material Sources

3.6) The Contractor shall propose the sources of base filter layer (coarse filter and fine filter materials), stone pitching and rock spalls for approval of the Engineer. The use of the materials shall always be subject to approval of the Engineer. All the requisite tests will be carried out by the Contractor under supervision of the Engineer either at Contractor's Laboratory or at any other laboratory approved by the Engineer at the cost of the Contractor.

Placement

3.7) Stone-pitching is required on water side of river earthen embankment as shown on the drawings.

The base filter layer (coarse filter material and fine filter material layers) shall be placed to a uniform thickness and finished to a reasonably smooth and even surface as shown on the Drawings or as directed by the Engineer. Before placement of the base filter layers, the surface over which the base filter layers are to be placed shall be trimmed to the proper lines and grades and shall be moistened with water and tamped or rolled with suitable tools or equipment for the purpose of forming a firm foundation.

Stone used in the stone pitching shall be hand packed and placed and bedded in such a manner that the completed stone pitching is stable and without tendency to slide. Large open spaces between the stone shall be avoided. Care shall be taken to ensure that all stone is well-bedded on its flattest surface. The stone shall be placed so as not to project above the neat lines shown on the drawings or as directed by the Engineer. All interstices in the stone pitching shall be well-filled with rock spalls. The amount of rock spalls used shall not be in excess of that required to fill the voids in the revetment stone.

Measurement and Payment

3.8) Measurement for stone pitching shall be made in hundred (%) of cubic feet as volume of the material placed over the excavated sloping surfaces as well as on level (lip portion) of river cross-section as shown on drawings.

Unit rates tendered in BOQ shall constitute full compensation for completion of work specified herein and elsewhere in these specifications and as shown on drawings for stone pitching and all other work related to the item.

3.9) Measurement for base filters (coarse filter material layer and fine filter material layer) layers shall be made in hundred (%) of cubic feet as volume of the material placed over the surface of river cross-section as shown on drawings.

Unit rates tendered in BOQ shall constitute full compensation for completion of work specified herein and elsewhere in these specifications and as shown on drawings for base filter layers (Coarse filter material and fine filter materials) and other work related to the item.

Stone Apron

3.10) The work to be done under stone apron consists of furnishing materials, transporting and placing materials according to specifications and or as directed by the Engineer at locations shown on the drawings.

Materials

3.11) Stone Apron: Stone for apron shall consist of rock fragments which are dense, sound, angular and abrasion resistant. The stones shall be generally cuboid in shape with the largest dimensions not exceeding twice the smallest dimensions. Individual fragments shall be free from cracks, seams and other defects that could tend to increase unduly their destruction by water. The stones individually shall weigh between 40-140 lbs with 50 percent weighing 90 lbs or larger but minimum 10 percent shall be 125 lbs or larger and not more than 5 percent shall weigh less than 40 lbs

3.12) Rock Spalls: All interstices in stone apron shall be well filled with rock spalls. The rock spalls shall be rock fragments of size between 2 inches to 4 inches.

3.13) Testing of Materials: Stone & rock spalls may be rejected if they fail to meet the following test requirements:

- a) Los Angeles abrasion test (large size ASTM Designation: C535). If the loss exceeds ten percent, by weight, at 200 revolutions, or 40 per cent, by weight, at 1000 revolutions;
- b) Los Angeles abrasion test (small size Coarse Aggregate ASTM C131). If the Loss exceeds ten percent by weight at 100 revolution or 40 percent by weight at 500 revolutions;
- c) Specific gravity (ASTM Designation: C127). If the specific gravity (saturated surface-dry basis) is less

than 2.60.

Material Source

3.14) The Contractor shall propose the source of materials for stone apron and rock spalls for approval of the Engineer. The use of the materials shall always be subject to approval of the Engineer. All the requisite tests, will be carried out by the Contractor either at Contractor's Laboratory under the supervision of the Engineer or at any other laboratory approved by the Engineer at the cost of the Contractor.

Placement

3.15) The area designated for placement of stone apron shall be excavated to the lines and grades shown on the drawings or as directed by the Engineer to form a trough.

The stone apron's top 1.5 ft thickness of stone shall be hand-packed in such a manner that open spaces between stones are avoided.

At locations where stone apron in the trough is to be placed below ground water level, the water in the trough shall be pumped out and water level to be brought at-least 1 ft. below the formation level to form a stabilized bed for stone apron.

After excavation, the trough section shall be formed to the proper lines and grades and shall be tamped or proof rolled with suitable equipment to form a firm foundation for stone apron.

Where the Natural surface line (NSL) is higher than the proposed apron level, NSL will be excavated to proposed levels and loose dumping will be carried out except top layer of 1.5 ft which will be hand packed.

Measurement and Payment

3.16) Measurement for payment for stone apron shall be made by volume, within outlines of the stone in place and on the basis of their thickness shown on the drawings. No separate measurement for preparing trough, dewatering if required and all costs on their account shall be deemed to be included in the unit rate for the BOQ item stone apron.

Unit rate tendered in BOQ shall constitute full compensation for completion of work specified herein and elsewhere in these specifications and on drawings.

4. Timelapse and Real Time Progress Monitoring

4.1 Setting Up High Resolution Cameras:

- 4.1.1 The contractor will put up a number of High-resolution QUANTAM Cameras to take live images with variable Time Lapses from various angles while positioned on fixed, established, and completed facilities throughout the site, examining the various project assets from multiple perspectives.

4.2 Real Time Web Based Progress Centre & Feature Wall Setup:

- 4.2.1 The contractor shall document the entire project development and project assets from various static angles by placing several Time lapse QUANTAM Cameras. capturing various assets/ activities. The cameras shall be programmed to take ultra-high-definition quality images (4K output resolution) every 30 minutes or so, which shall also stream live content from the static locations around the site looking at the projects. The Contractor shall establish a single panel / feature wall where management shall be able to see live images from all the Time lapse QUANTAM Cameras. A domain name, username and password shall be shared with RUDA for the access of all cameras, that RUDA can access using any computer, tablet or smart phone.
- 4.2.2 The Quantum cameras shall live stream JPEG images and save RAW images directly every 30 minutes and RUDA should be able to use features such as: download, zoom, email, split screen comparison, calendar date/ image selection etc.
- 4.2.3 Cameras should be zoomed and panned into the minutest of detail on the image selected. Cameras should be remotely adjusted (shooting intervals, image format, size & quality etc.).
- 4.2.4 All images and videos accessed in the Progress Centre (web-based centre) with no limitation on the number of users to access the website concurrently. The screen resolution of the video output should be minimum 1980 X 1080i. Each image should be approximately 4272 X 2848 pixels in size (4K resolution).

4.3 Web Based Progress Centre:

Web based progress centre should be included with following;

- 4.3.1 Progress Dashboard with Project Wise segregation.
4.3.2 Option for Live Lapsee
4.3.3 Compare tool
4.3.4 WhatsApp integration

- 4.3.5 24 Hour Support
- 4.3.6 API integration for progress wall setup
- 4.3.7 Option for BIM integration
- 4.3.8 Responsive, cross-platform access on desktop and mobile devices.
- 4.3.9 Quick Switch feature to switch between different cameras or projects
- 4.3.10 Real Time Weather widget
- 4.3.11 Live Time Lapse feature that generates a downloadable Time Lapse in a video-format (mp4)
- 4.3.12 Multi Image Viewing and comparison
- 4.3.13 Mobile Apps on Google and Apple store with factor authentication, single dashboard, multiple project/camera view.
- 4.3.14 Mobile app shall be capable of Managing users, requesting configuration change, and contacting support
- 4.3.15 Integration to display progress on RUDA Website / Application
- 4.3.16 All Time Lapse images, weekly, monthly as well as any time-to-time imagery and edits from construction photography etc. of the projects/assets should be available on a secure interactive web portal (Progress Centre) with Login URL for the RUDA team to be able to access, view, share and download anytime, anywhere, 24x7.
- 4.3.17 All data / information shall be proprietary right protected and shall be sole property of RUDA. Final data record shall be handed over to RUDA on conclusion of the contract.
- 4.3.18 Progress Centre would be a project collaboration interactive secured cloud-based web platform and a project monitoring tool developed in-house by the Contractor. RUDA shall receive a username and a password for their designated Admin user. The admin can then create unlimited number of RUDA users and assign privileges as required between various internal and external teams such as Engineering/Marketing/IT/CEO Office so on and so forth.
- 4.3.19 A detailed training session and manual will be provided by the Contractor on the usability of the Progress Centre.

4.4 Built-in Solar Power and Internet Connection Cameras:

- 4.4.1 Cameras should be specially designed and engineered to withstand the worst weather conditions that are faced on a day-to-day basis. The cameras shall run on solar energy, which allow the equipment to function without any power supply or cable connection (in case of adverse weather/ fog, the Contractor shall ensure that the cameras have appropriate battery life/ backup). The cameras should have a built-in 4G- sim card slot that serves as the internet connection for live image streaming and thus there are no requirements for any internet or Wi-Fi connection from the RUDA on site.
- 4.4.2 The structures for placing cameras shall be provided by the contractor. The locations of such structures shall be decided by the Contractor with consultation of RUDA. Contractor's crew shall access the cameras as and when required for any maintenance purposes under intimation to RUDA.
- 4.4.3 Ultra-High-definition sequence videos shall be created from the data captured from the time-lapse cameras and an UHD Edited Time Lapse video sequence from each camera will be provided at project completion and intervals agreed with RUDA, showing the progress of the construction assets. All materials will be shared on ultra-high definition that can be further used for progress meetings, PR and marketing activities.

4.5 Drone Video Progress Documentary:

- 4.5.1 The contractor shall document the entire project development from various positions and capture a complete video documentary on monthly basis with high resolution drone cameras.
- 4.5.2 Properly identifying areas / segments of the project with a comprehensive progress video as required by the Client.

4.6 Mobilization and Readiness:

- 4.6.1 All Time Lapse Quantam Cameras and Drone Cameras should be ready and operational at the start of the project.
- 4.6.2 Contractor would be responsible for the maintenance of the cameras and would make sure that cameras are working smoothly 24x7 during the entire project's duration.

4.7 Security of Cameras:

Contractor must ensure necessary insurance of Cameras and make necessary arrangement for security and safety of camera thereof.

4.8 Deliverable:

- a) Time Lapse & Real-Time Web Based Progress Centre:
The Contractor shall document the entire development and project assets from various static angles by placing several Time-Lapse High Resolution Cameras and setup an un-interrupted web based progress center.
- b) Drone Video Progress Documentary:
The Contractor shall document the entire project development from various positions and capture a complete video documentary on monthly basis with high resolution drone cameras. Properly identifying areas / segments of the project with a comprehensive progress video as required by the Client / Consultant.

4.9 Measurement and Payment:

Pursuant to Sub-Clause 60.2 of the General Condition of Contract, the Engineer shall, upon receiving monthly statement for said Works, certify to the Employer, the amount of payment to the Contractor at the quoted rate as given in the BOQ against this item which the Engineer considers due and payable in respect of such statement.

NOT FOR SALE OF BID SUBMISSION

5 QUALITY CONTROL (QC) AND QUALITY ASSURANCE (QA)

5.1 Scope of Work

- i. The Contractor shall be responsible for providing all Quality Control (QC) and Quality Assurance (QA) measures to ensure compliance of the Works with the Drawings or as stated in the Contract Documents or as directed by the Engineer.
- ii. The Engineer may perform independently or ask the Contractor to perform under Engineer's supervision all such tests and analyses as are necessary for verification of QC test results and QA programme analysis under Contractor's QA programme.
- iii. In case of any difference between QA and QC results, the QA results/analysis shall be considered valid and final.
- iv. Construction undertaken without the Engineer's approval shall not be verified/accepted and no payments shall be made to the Contractor for quantities of construction works which are not accepted by the Engineer. The Contractor shall dismantle/remove the rejected work at his own cost but to the satisfaction of the Engineer.

5.2 Contractor's Quality Assurance Plan

5.2.1 General

- i. The Contractor's Quality Assurance Plan shall include a detailed description of the organization, procedures and facilities proposed to ensure that the construction is carried out in accordance with the Contract, Specifications and Drawings. This plan shall also be applicable to work performed by any sub-contractor or piece rate workers.
- ii. The Contractor shall submit his Quality Assurance Plan to the Engineer for review and approval prior to the commencement of the work. The Contractor's Quality Assurance Plan shall be periodically reviewed as the work proceeds.
- iii. The Quality Assurance Plan shall include, but not be limited to, detailed procedures, instructions or statements covering the following items.

5.2.2 Organization

The Quality Assurance Plan shall describe the Contractor's organization and delineate the responsibility and authority of the various personnel and groups involved. The Quality Assurance Department's internal structure and relationship with other departments shall be defined. An organizational chart shall be prepared showing lines of authority and communication.

5.2.3 Personnel

- i. The Contractor shall employ properly trained and qualified personnel to procure samples for testing, to conduct tests and analyze samples of soils, stone, and other construction materials. The Contractor shall provide for the duration of the Contract,

- competent, suitably qualified Engineers' whose sole duties shall consist of material location, testing and control in accordance with the Specifications.
- ii. The Contractor shall employ properly trained and qualified personnel to prepare construction drawings as required. Drawings, when prepared by the Contractor, will include all information and data required for preparation by the Engineer of As-Built Drawings. The Contractor shall provide properly trained and qualified surveyors and survey crews and all necessary survey equipment as may be required to perform all construction survey activities, measurement of quantities, and any surveys required for preparation of As-Built Drawings by the Engineer.
 - iii. The above personnel and their replacements will be subject to approval by the Engineer. The Engineer may require removal with drawl of incompatible staff.
 - iv. The Contractor shall provide labour, equipment and materials to the Engineer for examining, measuring, and testing any works.

5.2.4 Document Control

The Quality Assurance Plan shall assure that the Specification requirements are correctly translated into and included in the Contractor's procedures, documents and drawings. The Plan shall further assure that the latest approved documents, including changes, are available to and used by the required manufacturing, inspection, and test personnel.

5.2.5 Source Approval

- i. The Contractor shall obtain source approval of all materials prior to their use in the Works. Source approval submittals shall include the names and addresses of all manufacturers and suppliers, recent test results showing complete, compliance with the Specifications and specified standards, the date of manufacture, storage conditions and shelf life if appropriate. In addition, the Contractor shall provide representative samples of the material of a sufficient size that the Engineer may perform all specified tests. Source approval shall not be deemed as a blanket approval for use of material from that source which, otherwise, does not meet contract specifications. Source approval shall not be considered to include a source which, otherwise, does not meet contract specifications. Once source approval has been granted by the Engineer all deliveries of the material to the site must in turn be submitted for approval accompanied by all relevant test reports to show full compliance of the material with specifications.
- ii. Where the required tests cannot be performed at the Site Quality Control Laboratory, the Contractor shall arrange for independent testing, at a laboratory approved by the Engineer, to be performed to show that the material complies with the specified standards. Cost of such testing will not be reimbursed.
- iii. The Contractor's procurement process shall assure that purchased items comply with the requirements of the Specifications.

5.2.6 Processed Material Control

The Quality Assurance Plan shall provide assurance that procured and subsequently processed material complies with the Specifications. Material identification shall be provided and maintained. Control shall be provided for the documentation and disposal of non-conforming material, and their subsequent rework or repair and reinsertion. The programme shall also provide for the prior notification to the Engineer of proposed rework or repair or non-conformance for his evaluation and approval.

5.2.7 Special Processes

Special Processes such as sandblasting, curing, installation of elastomeric sealant, welding, etc., shall be performed in accordance with documented process procedures and by qualified personnel. The procedure shall describe the process sequence and methods, process prerequisites, equipment, qualification of personnel and equipment, and acceptance criteria. The procedures shall describe the preparation and retention of documents used to record the results of Special Processes.

5.2.8 Inspection

The Quality Assurance Plan shall provide for the inspection of activities and completed items of work by the Contractor to assure compliance with the Specifications prior to its submittal to the Engineer. Examination or measurements shall be performed at each applicable work operation.

5.2.9 Calibration

Procedures shall be established to assure that test and measuring devices used to test, or accept materials or components are calibrated at specified intervals to maintain the proper accuracy. Devices used shall be of a proper range, type and sensitivity to reliably measure the parameters being evaluated. The calibration of such devices shall be documented and shall be performed using certified measurement standards and submitted to the Engineer for approval.

5.2.10 Documentation

The Quality Assurance Plan shall include a system to ensure that the documentation necessary to attest the completion of any phase of the work, use of correct materials, completion of required inspections and tests, and acceptability of results generated, reviewed, maintained and submitted to the Engineer at the required time. The system shall ensure that such documentation is reviewed by the Contractor for legibility, completeness, validity of data, traceability of document to activity or equipment and acceptability of results.

The documentation to be issued and maintained shall include:

- Test reports for material
- Survey and layout procedures, Records/Plans;
- Survey and layout records/plans;
- Inspection and test procedures;
- Inspection and test reports;
- Final Inspection Reports; and

5.2.11 Submittal of Contractor's Documents

- i. The Contractor shall submit a draft of the Quality Assurance Plan for review by the Engineer within 28 days of the commencement date. The final version shall be submitted within 28 days of receipt of the Engineer's comments.
- ii. The Contractor's quality Assurance Plan shall be periodically reviewed and revised as the work proceeds.

5.3 Contractor's Quality Control Test Programme

5.3.1 General

The Contractor shall submit his Quality Control Test Programme as part of his Quality Assurance Plan to the Engineer for review and approval prior to the commencement of work. The Contractor's Test Programme shall be suitably documented to assure that the required materials and component testing is properly performed, the test programme shall address pertinent test prerequisites, such as test instrumentation selection and calibration, acceptance criteria, documentation of test results, and evaluation of test results by qualified personnel. The Quality Control Test Programme shall include, but not be limited to, location of facilities, type number and capacity or equipment plant layout drawings, staff, vehicles, and procedures.

The Contractor shall ensure that the proper number and types of samples are obtained, identify the tests and analyses required, and ensure that tests and analyses conducted are in accordance with accepted procedures and standards. The Engineer shall be invited to be present during the test or inspection. If the Engineer not to be present, the work may proceed. The Engineer shall supervise as necessary tests performed by the Contractor both in the field and in the Contractor's laboratories. The Engineer may himself perform such independent tests and analyses as are necessary to verify the result of all tests and analyses conducted by the Contractor.

5.3.2 Quality Control Testing Facilities

As a part of the construction materials' Quality Control Programme, the Contractor shall set up laboratories in full working order suitably equipped and staffed to carry the sampling, and testing to the extent and frequency necessary to ascertain that the work complies with the Specifications. The Contractor's laboratories shall include sufficient office space and furniture for the Engineer's supervisory personnel.

5.3.3 Quality Control Tests to be Performed by the Contractor

All samples and tests shall be taken by the Contractor at such locations and in such a manner as approved by the Engineer. The sampling frequency may vary as directed by the Engineer.

The Contractor shall inform the Engineer well in advance but at least 4 hours before he proposes to carry out any field test or at least 1 hour before any laboratory test so that Engineer may supervise the test or the taking of the sample.

If in the opinion of the Engineer the test results are anomalous, 2 additional tests shall be made by the Contractor under the supervision of the Engineer and the average of the 2 additional tests shall be adopted as the true representative value.

Tests required to be performed shall include, the following.

i.

Soil Tests

Auger Sampling	(ASTM D 1452)
Liquid Limit (LL)	(ASTM D 4318)
Plastic Limit (PL)	(ASTM D 4318)
Visual Classification, Dilatancy	(ASTM D 2488)
Toughness, Dry Strength	(Earth Manual E 3)
Grain Size Analysis	(ASTM C 136)
Hydrometer Test	(ASTM D 422)
Moisture Density Relationship	(ASTM D 1556)
Moisture Density Relationship	(ASTM D 1557)
Relative Density of Granular Soil	(ASTM D4253 and D 4254)
Shrinkage Limit	(ASTM D 427)
Permeability of compacted samples	(ASTM D 3385)
Proctor Needle Penetration	(ASTM D 1558)
Moisture Content	(ASTM C 566)
In-place Soil Density	(ASTM D 1556, ASTM D-2167 and ASTM D-2937)
Soluble Salts	(Earth Manual E 8)
Specific Gravity of soil	(ASTM D 854)
Direct Shear of soil	(ASTM D 3080)

5.3.4 Contractor's Quality Control Test Results

All test results from the field and laboratories conducted as part of the Quality Control procedure shall be submitted to the Engineer. The test results must show full compliance with the Specifications, in order for the Works to be approved. The

materials and test reports submitted to the Engineer shall include, but shall not be limited to, the following:

Soil reports showing location, material source, material type, density, moisture content, density-moisture content relationship.

The numbering system to be used for recording tests and test results shall be subject to the Engineer's approval.

5.4 Quality Assurance by the Engineer

5.4.1 General

The Engineer may himself perform such independent tests and analyses as are necessary to verify the results of all tests and analyses conducted by the Contractor. In addition, cross check tests will be performed by the Engineer.

5.4.2 Standards

The Contractor shall furnish to the Engineer latest available editions of two complete sets of relevant Manuals and Standards.

5.5 Submittals

5.5.1 Contractor's Equipment

Contractor will re-submit his equipment list from the Bid Documents, giving details for each phase of the work. Equipment list shall match his technical proposal, work plan, construction schedule and cash flow.

5.5.2 Method Statements

Within 28 days before starting any aspect of the Works, the Contractor shall submit to the Engineer for approval detailed method statements describing complete details of the operation including plant, equipment, materials, testing, personnel, schedule and organization. The work items requiring submission of method statements shall include, but not be limited to the following:

- setting out the works
- care of water including dewatering
- surveying
- excavation
- foundation preparation
- filling in embankments
- backfilling of structures

5.6 Measurement and Payment

5.6.1 Contractor's Quality Control and Quality Assurance Programme

No separate payment shall be made for the Contractor's Quality Assurance Plan, Quality Control Test Programme, or Engineer's Quality Assurance Plan, Provisions of Manuals and standards and all other standards. The cost of adopting the Quality Control Programme including supply and maintenance of the Contractor's laboratories and furniture, equipment, manuals, and standards, and for running the tests in connection thereof shall be deemed to be included in the unit rates tendered for various items of works in the Bill of Quantities.

5.7 Testing Frequencies

MINIMUM TEST FREQUENCIES FOR DIFFERENT TESTS TO BE PERFORMED BY THE CONTRACTOR UNDER QUALITY CONTROL TEST PROGRAMME

TEST	DESIGNATION	TESTING FREQUENCY
SOIL		
Grain Size Analysis	ASTM C-136	1 per 150,000 Cft
Hydrometer	ASTM D-422	1 per 150,000 Cft
Liquid Limit	ASTM D-4318	1 per 150,000 Cft
Plastic Limit	ASTM D-4318	1 per 150,000 Cft
Shrinkage Limit	ASTM D-427	1 per 150,000 cft
Specific Gravity	ASTM D-854	1 per 150,000 cft
Moisture Density Relationship	ASTM D-1557	1 per 150,000 cft
Moisture Density Relationship	ASTM D-698	1 per 150,000 cft
Field Density: Compacted Fill	ASTM D-1556	1 per 20,000 cft
Field Density: Structural backfill	ASTM D-1556	1 per 10,000 cft
Field Density: Gravel Base	ASTM D-1556	1 per 10,000 cft
Relative Dry Density	ASTM D-4253 and D-4254	1 per 10,000 cft

Note: For field density tests a minimum of 2 tests per layer of compacted earthwork/ filter material/gravel base for each area prepared, shall be performed.

COARSE AGGREGATE

Sieve Analysis	ASTM C- 136	1 per 10,000 cft
Material Passing #200 Sieve	ASTM C-117	1 per 10,000 cft
Unit Weight	ASTM C-29	1 per 15,000 cft
Specific Gravity	ASTM C-127	1 per 15,000 cft
Absorption	ASTM C-127	1 per 15,000 cft
Moisture Content	ASTM C-566	1 per 15,000 cft
Soundness	ASTM C-88	1 per 50,000 cft

Los Angeles Abrasion	ASTM C-131	1 per 50,000 cft
Clay Lumps & Friable Particles	ASTM C-142	1 per 50,000 cft
Lightweight Particles	ASTM C-123	1 per 50,000 cft
Petrography Analysis	ASTM C-295	3 no. per source for initial approval. Once every 3 months after approval per source.
Mortar Bar Test for Potential Alkali Reactivity	ASTM C-227	As required by the Engineer.

FINE AGGREGATE

Sieve Analysis	ASTM C- 136	1 for 5,000 cft
Material Passing #200 sieve	ASTM C- 117	1 for 5,000 cft
Unit Weight	ASTM C- 29	1 for 10,000 cft
Specific Gravity	ASTM C- 128	1 for 10,000 cft
Absorption	ASTM C- 128	1 for 10,000 cft
Moisture Content	ASTM C- 566	1 for 10,000 cft
Soundness	ASTM C- 88	1 for 50,000 cft
Clay Lumps & Friable Particles	ASTM C- 142	1 for 30,000 cft
Sand Equivalent	ASTM C- 2419	1 for 30,000 cft
Organic Impurities	ASTM C- 40	5 per source for initial approval: 1 per month after approval per source 1 or 50,000 cft
Lightweight Particles	ASTM C- 123	1 for 50,000 cft
Petrography Analysis	ASTM C-295	3 no. per source for initial approval. Once every 3 months after approval per source.
Mortar Bar Test for Potential Alkali Reactivity	ASTM C-227	As required by the Engineer.

06 – CLEANING AND CLEAN-UP

Scope of Work

The work to be done under Cleaning and Clean-up covers furnishing of all labour, materials, equipment and services and performing all operations necessary for and incidental to clean-up during construction and final cleaning of structures and the site prior to acceptance of the Works by the Employer as specified herein and elsewhere in the Contract.

Clean-up during Construction

It is required that the entire site be kept in a neat and orderly condition and the Engineer may, at any time during construction, order a general clean-up of the site as part of the work under this section.

Contractor shall dispose of waste, trash, and debris in an acceptable manner, in accordance with applicable laws and as prescribed by the Engineer or authorities having jurisdiction. Burying of waste material on the site and/or burning of trash and debris on the site will not be permitted, unless approved by the Engineer.

Location of dump of trash and debris and its haul will be Contractor's responsibility.

Final Cleaning of Structures and Equipments

Prior to final inspection by the Engineer and Employer and after all construction work is essentially complete, the Contractor shall thoroughly clean structures and equipment as required or appropriate.

The Contractor shall follow the recommendations of the manufacturers of materials, equipment and items to be cleaned, for all cleaning and other recommended treatments.

Final Site Clean-up

Also prior to final inspection, the Contractor shall thoroughly clean the entire site and put it into a neat, acceptable condition. He shall remove from the entire site all construction waste and unused materials, loose rock and stones, waste earth and debris of any description resulting from the work.

Measurement and Payment

No separate measurement or payment will be made for work required under this Section. All costs in connection with the work specified herein shall be included in the various items of work in the Bill of Quantities.

07 DRAWING AND DOCUMENTS

Contract Drawings (Bid Drawings)

The Drawings as defined in General Conditions of Contract 1.1. and included in the Contract documents on the award of Contract will comprise the bid drawings and shall show the scope of the work to be performed by the Contractor. The Drawings shall not be used as a basis for fabrication or construction but, subject to the Engineer's approval, may be used as a basis for placing preliminary orders for materials, subject to corrections based on the future issue of Drawings.

Construction Drawings and Modified Civil Drawings (Issued for Construction)

The Drawings Issued for Construction will generally comprise the Drawings included in the Contract at the award of Contract plus any additional and/or modified drawings that the Engineer considers necessary to define the Civil Works.

Any Drawings Issued for Construction that show changes from the Drawings or the Specification will be reviewed by the Engineer for his determination of any variation to the Contract in accordance with the provisions of Clause 51 of the General Conditions of Contract.

Two prints of each Drawing will be issued to the Contractor free of charge. Additional copies will be provided upon written request of the Contractor at cost of reproduction.

Checking of Drawings

The Contractor shall check the Drawings and Specification carefully and inform the Engineer, in writing, of any ambiguities, discrepancies, errors or omissions. Full instructions will be furnished to the Contractor should any ambiguities, discrepancies, errors or omissions be found. The Contractor shall be required to perform the work in accordance with such further instructions. Although the Drawings are prepared to scale, work shall be based upon dimensions shown on the Drawings and not on dimensions scaled from the Drawings.

Right to Change

When additional information regarding the geological formations, or other conditions becomes available as a result of excavation, testing, model studies, or exploratory work, the Engineer may find it necessary to change dimensions or design of one or more of the features of the Works to conform to the newly disclosed conditions. Towards this end the Engineer reserves the right to make such reasonable changes, and the Contractor's Plant shall be laid out and his operations shall be conducted so as to accommodate any such reasonable changes in the Works with no increase in cost to the Employer.

Contractor's Proposal

The 'Contractor's Proposal' means the documents which the Contractor submitted with the Letter of Tender (Bid) as included in the Contract to define the Contractor's proposals for the provision of Mechanical Gates and Gearing works.

Within twenty eight (28) days after the commencement date, the Contractor shall supply one soft copy and three (3) additional copies of the drawings and documents comprising the Contractor's Proposal as may be required by the Engineer.

The Contractor's Proposal shall be used only as a basis for the development of the design and no drawing or document shall be used for the execution of the work until submitted and approved by the Engineer in accordance with the specified approval procedures.

Contractor's Documents

All drawings and documents (Contractor's Documents) submitted by the Contractor shall be complete and shall be submitted for the Engineer's approval in due time and in logical order to facilitate proper coordination.

The approval of Contractor's Documents by the Engineer shall not be construed as a complete check but will indicate only that the general method of construction and detailing is considered satisfactory. Approval shall not absolve the Contractor from his responsibilities including his responsibility for the accuracy or for the design, construction, performance and safety of the Works defined therein.

Unless otherwise specified or approved by the Engineer, method statements, working drawings and shop drawings shall be submitted at least 28 days prior to starting construction of the respective works.

Unless otherwise specified one soft copy and five (5) prints of each document shall be submitted to the Engineer for approval.

Contractor's Submittals**(i) Submission Schedule**

Within twenty one (21) days after the Commencement Date, the Contractor shall submit for approval with a copy to the Employer a complete schedule showing the proposed date of submittal of the Contractor's Documents that the contractor proposes to submit to the Engineer for approval.

Submittals shall be made under an approved document (Transmittal Form), in an orderly sequence with outline drawings preceding detail drawings, and schematics and description of operation.

Subject to the submittal being made in accordance with the approved schedule, Contractor shall allow twenty eight (28) days for approval of submittals by the Engineer, from the date of receipt by the Engineer.

Documents submitted out of sequence or not in accordance with the schedule may not be reviewed by the Engineer within the specified time period for review.

Time required for submission, revisions and re-submittal of documents to gain the Engineer's approval shall be allowed for in the Contractor's scheduling of the Works and shall not entitle the Contractor to any claim for delay.

(ii) Form of Submittal

The documents shall be in formats approved by the Engineer and shall include as applicable, identification of the structure, the Contract, the supplier and subcontractor or supplier, identification of the corresponding drawings and, reference to details of the transmittal form and to the corresponding sections of the Specification. A space for the Engineer's approval stamps and initials shall be provided.

Revision number, the date of revision and a brief description of any revision made shall be shown on all documents submitted.

Symbols shall be in accordance with approved standards. Drawings shall conform to ISO paper sizes A0 to A4. Title blocks and numbering shall be subject to approval by the Engineer.

(iii) Units

Documents shall be in the English language and dimensions shall be in the FPS system.

For metric conversions B.S. 350 "Conversion Factors and Tables" shall be used.

(iv) Manufacturers' Data

Catalogue information shall include not only the sheets detailing



the components but also the general pages of the catalogue showing notes, engineering information such as recommended rating, and other data applicable to the component. If a catalogue sheet includes different types of components, variations, or optional features, the Contractor shall mark on each copy the type and any optional features that are intended to be supplied. The Contractor shall draw attention to any variation with regard to the application of the product to the Contract.

NOT FOR USE OF BID SUBMISSION



**Approval of
Contractor's
Documents**

One copy of the submittal documents annotated with the Engineer's comments and marked "APPROVED," "APPROVED EXCEPT AS NOTED," "REJECTED" or "RETURNED FOR CORRECTION" will be returned to the Contractor.

If a document is returned to the Contractor stamped "APPROVED EXCEPT AS NOTED" he may proceed with the work taking into account, the corrections and comments noted on the document. The Contractor shall revise the document as required and resubmit for approval.

If a document is returned to the Contractor stamped "RETURNED FOR CORRECTION" he shall not proceed with the relevant portion of the work but shall make the changes and corrections or prepare a new document and resubmit it to the Engineer for approval.

Any "APPROVED" document that is subsequently revised by the Contractor shall be resubmitted to the Engineer for approval.

**Approved
Documents**

The Contractor shall provide three prints and one soft copy of the Approved documents.

NOT FOR USE OF BID SUBMISSION

Working Drawings and Shop Drawings

The Contractor shall prepare and submit to the Engineer such working drawings and shop drawings as may be necessary to illustrate his proposed designs and method of working. Working and shop drawings shall be include, but not limited to:

(i) Shop Drawings

All shop drawings required for the Works including field erection and layout and construction detail drawings as are necessary to complete any part of the Work shall be prepared and submitted by the Contractor to the Engineer for approval.

(ii) Formwork Drawings

Formwork drawings including lift or other placement drawings shall be to an appropriate scale as to show clearly all recesses, grooves, block-outs, openings and embedded work, including embedded structural, mechanical items, in each lift in sufficient detail for proper installation and carrying out of the work.

(iii) Contractor's Facilities Drawings

Facility drawings shall show the locations of the principal components of the construction facilities; offices; workshops, storage buildings; accommodation facilities and storage areas and yards which the Contractor proposes to construct at the Site and elsewhere.

(iv) Aggregate Processing and Concrete Batching Plant

The drawings shall show the capacity of each major feature of the facilities, including the rated capacity of the aggregate processing, transporting, storage and reclaiming facilities; volume of aggregate storage; capacity of cement storage; rated capacity of the concrete batching and mixing plant; rated capacity of the concrete transporting and placing plant and rated capacity of plant for pre-cooling of concrete.

The contractor shall note that during the course of the contract, information will be given by the Engineer in respect of individual structures to be constructed in accordance with issued drawings which show typical structures of the same form. It shall be the contractor's own responsibility to prepare from this information such working drawing as required for the proper setting out and construction of such structures. Work shall not commence on an individual structure until the relevant working drawing has been approved by the Engineer.

These working drawings and shop drawings shall:

- a) be prepared to appropriate scales and include plans, elevations and sections;
- b) consist of an electronic copy of the drawing (if available), one print and one copy of design calculations, specification and parts catalogues;
- c) be signed by a qualified engineer responsible for the design, checked and approved by the Contractor prior to submission;
- d) bear the title of the contract package.

Within 28 Days of receiving such working drawing and shop drawings the Engineer shall signify his approval or request modifications. The Contractor shall modify the designs and drawings, as may be required by the Engineer.

The Works shall be constructed in accordance with the approved working Drawings and shop Drawings and a copy of such Drawings shall be kept on the Site at all times until the completion of the Contract. All Drawings, on which changes are made, shall have the revisions clearly marked and dated.

Construction, fabrication or manufacture of any portion of the Works shall not commence until the design and drawings have been approved in writing by the Engineer and thereafter no change shall be made to any Drawings so approved without the permission of the Engineer. Permission to make such changes shall be treated as a new submission and the requirements (a) through (d) above shall be met.

As Built Drawings

The contractor shall be responsible for the preparation of all record or as built drawings as the works proceed. These drawing shall include all deviations from the shop drawings. These drawing shall be for the permanent record of the Employer and shall be in the form of soft and hard copies (black line/monochrome). The number of prints shall be five (5) along with one soft copy on DVD. The drawings shall be readable. The quality and format of these drawings shall be subject to the approval of the Engineer.

The Contractor shall be responsible for preparing the As-Built Drawings. The price of such Drawings shall be deemed to be included in the Contract Price.

**General
Requirements for
Drawings**

Unless otherwise specified or approved all drawings shall be of A3 size measuring approximately 11 inch x 17 inch.

All drawings shall be on durable paper with dark lines on a white background. All legends on drawings shall be in English.

Each drawing shall have following particulars in the lower right hand corner in a form approved by the Engineer in addition to the Contractor's name, date, scale, number and title of the drawing:

Employer's Name:

Project Name:

When the print of a drawing is folded to A4 size, its number and revision suffix shall be visible.

**Contractor's
Equipment**

The Contractor shall submit a list and details of the Contractor's Equipment with bid. The list shall be updated monthly to show actual equipment on Site and the planned movement of equipment to and from Site.

Datum of Levels

For the purpose of this Contract the datum to be used for levels shown on the Drawings shall be as described in Special Provisions.

**Measurement and
Payment**

No separate payment shall be made for complying with the provisions of Clauses and Sub-Clauses of Conditions of Contract inclusive of the Specifications, unless otherwise stated in the Bill of Quantities.



ENVIRONMENTAL MANAGEMENT PLAN

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NOT FOR USE OF BID SUBMISSION

8 ENVIRONMENTAL MANAGEMENT PLAN

8.1 GENERAL

Environmental Management Plan (EMP) is a tool for the implementation of all the suggested measures to make the project environmentally sustainable. It provides an overall approach for managing and monitoring the environmental, ecological and socio-economic issues of the proposed Project as well as health and safety aspects, and describes the institutional framework and reporting mechanism to implement EMP for the Project.

8.2 EMP COMPONENTS

The EMP comprises following main components:

- EMP Objectives;
- Scope of the EMP;
- Policy, Legal and Administrative Framework;
- Inclusion of EMP in Bidding/Contract Documents;
- Institutional Arrangements;
- Environmental Mitigation and Management Matrix;
- Environmental Monitoring Plan;
- Planning for EMP Implementation;
- Occupational Health and Safety Provisions for Contractors;
- Capacity Building/Strengthening;
- Communication & Documentation;
- Environmental, Social, Health and Safety Management Plans;
- Change Management Plan
- Tree Plantation Plan;
- Chance Find Procedure;
- Codes of Practices;
- Audits and Annual Review of EMP;
- Non-Compliance of EMP; and
- Budget for Implementation of EMP.

8.3 EMP OBJECTIVES

The main objectives of the EMP are:

- Provide project impacts along with the proposed mitigation measures, and a corresponding implementation phase for the proposed mitigation measures;
- To ensure that all necessary corrective actions are carried out in time to counter any adverse environmental and social impacts;
- To ensure the regular monitoring of those factors which may affect the safety of the environment, workers and community under a systematic monitoring approach;

- Define the roles and responsibilities of the Project Proponent (RUDA), Supervision Consultant (SC) and Construction Contractor (CC) in the existing setup of proponent in order to effectively communicate environmental and social issues among them;
- Provide a procedure for timely action in the face of unanticipated situation;
- Identify training requirements at various levels including RUDA, SC and CC;
- Provide a monitoring mechanism in the form of an environmental and social monitoring plan, which includes monitoring parameters, monitoring frequency to ensure that all the mitigation measures are completely and effectively implemented;
- Identify the resources required to implement the EMP and outline the corresponding financing arrangements;
- Define the requirements necessary for documenting compliance with EMP and communicating it to all the concerned regulatory agencies; and
- Provide other plans considering the project specific requirements.

8.4 SCOPE OF THE EMP

The scope of the EMP includes the construction phase of the proposed Project Package 1A: upper promenade of right side embankment starting from RD 0+000 to RD 10+500. All the activities performed during the implementation phases will be controlled and monitored according to this EMP.

8.5 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

The applicable policies, legislation, acts and guidelines are discussed in detail in Chapter 2 of Environmental Impact Assessment (EIA) Report. However, following is the list of the applicable policies, laws, regulations and guidelines related to the proposed Package:

8.5.1 National and Provincial Requirements:

- National Conservation Strategy (NCS), 1992
- National Environmental Policy (NEP), 2005
- National Climate Change Policy, 2012
- National Drinking Water Policy, 2009
- National Water Policy 2018
- National Forest Policy, 2001
- Pakistan Labour Policy, 2010
- National Resettlement Policy, 2002
- National Disaster Risk Reduction Policy, 2013
- National Action Plan for Covid-19 Pakistan
- Punjab Environmental Protection Act, 1997 (as Amended up to 2017)
- Punjab Environmental Protection Agency, (Review of IEE and EIA) Regulations, 2022
- Punjab Environmental Quality Standards (PEQS), 2016
- Guidelines for the Preparation and Review of Environmental Reports, 1997

- Guidelines for Environmental Assessment
- Ravi Urban Development Authority Act 2020
- Pakistan Climate Change Act, 2017
- National Clean Air Act, 2000
- Land Acquisition Act (LAA), 1894 Including Later Amendments
- Punjab Wildlife Act, 1974
- Punjab Plantation and Maintenance of Trees Act, 1974
- Pakistan Antiquities Act 1975 & Punjab Antiquities Amendment Act 2012
- The Punjab Special Premises (Preservation), Ordinance, 1985
- Pakistan Penal Code, 1860
- Labour Laws as part of Constitution of Pakistan 1973
- Punjab Municipal Water Act, 2014
- The Punjab Water Act, 2019
- Punjab Hazardous Substances Rules 2019
- Punjab Environmental Protection (Motor Vehicles) Rules, 2013
- The Punjab Occupational Safety And Health Act, 2019
- Punjab Restriction on Employment of Children Act, 2016
- Punjab Protection of Women against Violence Act, 2016
- Electricity Act, 1910
- Cutting of Trees (Prohibition) Act, 1975
- Punjab Forest Act (Amended), 2016
- The Punjab Protected Areas Act, 2020
- The Punjab Heritage Foundation Act, 2005
- The Punjab Emergency Services Act, 2006
- National Disaster Management Act, 2010
- Seismic Building Code of Pakistan 2007 & 2021

8.5.2 International Convention, Protocols and Obligations:

- UNESCO Convention on the Protection of the World's Cultural and Natural Heritage, 1972
- The Rio Declaration, 1992
- Kyoto Protocol, 1992
- Convention on Biological Diversity, 1994
- UN Convention to Combat Desertification (UNCCD), 1994
- Stockholm Convention on Persistent Organic Pollutants (POPs), 2004
- Paris Agreement, 2015
- Millennium Development Goals (MDGs)

8.6 INCLUSION OF EMP IN BIDDING/ CONTRACT DOCUMENTS

The EIA including EMP will be included in the bidding/contract documents and its implementation will be a contractual binding for the contractors.

8.7 INSTITUTIONAL ARRANGEMENTS

The institutional requirements for the implementation of the proposed Project are provided in below sections.

8.7.1 Institutional Arrangements for Implementation of EMP

The key players involved during implementation phase of the proposed Project RUDA as employer/proponent (including its environmental and social specialists), Environmental Protection Department (EPD) Punjab, SC, Monitoring and Evaluation Consultant (MEC) and the Contractor. The roles and responsibilities of these organizations are outlined below.

The following staff will be involved in the implementation of EMP:

- RUDA - Proponent/Employer (including Environmental and Social Staff);
- MEC;
- SC Environmental and Social Staff; and
- Contractor's Environmental, Social, Health and Safety Staff.

The employer RUDA will make Contractor bond through contract documents to implement the EIA including EMP and other terms and conditions of the Environmental Approval/NOC issued by the EPD Punjab. The whole EMP will be included as a clause of the contract documents. Construction camps will be established after necessary approvals and submission of Site-Specific EMPs to be developed in the light of the relevant agency requirements, before commencement of new works.

The proposed organizational structure for the implementation of the EMP is presented in **Figure 8.1**.

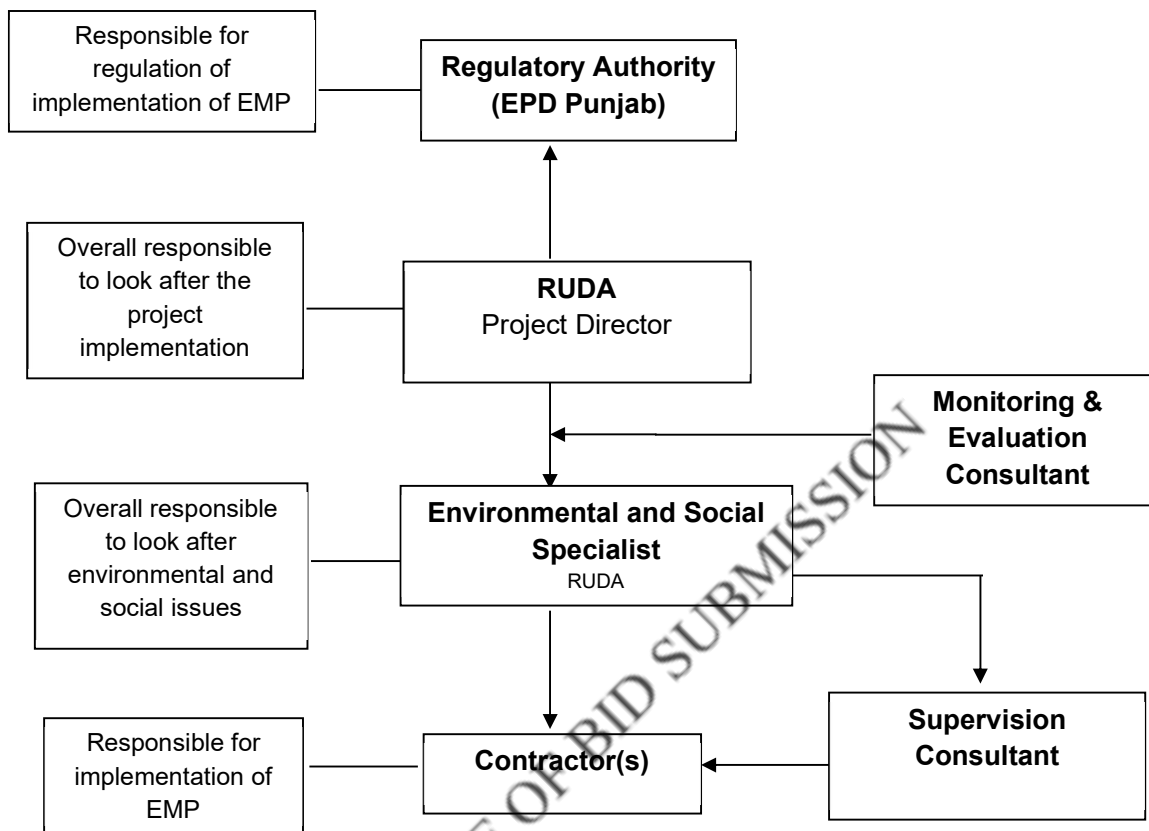


Figure 8.1: Institutional Arrangement for Implementation of EMP

RUDA will monitor and coordinate all project implementation activities. The Project Director, will be responsible for all aspects of project implementation including financial management, procurement, recruitment of staff, consultants and contractors, and overseeing the implementation of EMP.

8.7.2 Roles and Responsibilities

Environmental and Social Specialists- RUDA

Following staff will be hired or engaged under RUDA, for the implementation of EMP:

- Environment Specialist
- Social Development Specialist

Overall responsibilities include:

- To ensure implementation of mitigation measures proposed in EMP during the construction and operational phase of the Package;

- To organize monitoring of ambient air quality, water and noise. In case, the noise and emission levels exceed the acceptable levels; a penalty or ban must be enforced;
- To develop operational guidelines and implementation schedule;
- Receiving complaints from nearby community and assisting the local authority including liaison with EPD Punjab;
- Ensuring availability of committed human resources and sufficient budget for successful implementation of EMP;
- To ensure that the proposed project is implemented in an environment friendly manner,
- Maintaining interface with the other lined departments/stakeholders; and
- Reporting to the EPD Punjab on status of EMP implementation.

Supervision Consultant

Overall responsibilities of Supervision Consultant include:

- Supervising, facilitating and coordinating implementation of environmental and social plans including EMP;
- Ensuring that contractors follow EPD Punjab regulations, and other requirements mentioned in the EMP;
- Identifying any issues of non-compliance and maintain a record;
- Suggesting mechanisms to link contractor performance in relation to the EMP to the timing of financial payments, incentives or penalties;
- Interacting with stakeholders for their concerns about the construction activities.
- Assisting Project Director in addressing and resolving environment-related complaints and grievances;
- Identifying and preparing environmental training materials and conducting environmental trainings; and
- Reviewing EMP and revising it if required.

Contractor(s)

Contractor(s) are also required to appoint the following staff for the implementation of EMP in the field, particularly the mitigation measures.

- Environment Specialist
- Social Development Specialist
- Health and Safety Specialist

The contractor(s) will develop site specific management Plans addressing towards health, safety and environment and social issues including gender and get them approved by the RUDA. The contractor will also be responsible training its staff in the environmental/social and gender issues before the commencement of the construction works in consultation with RUDA. The construction contract will have appropriate clauses to bind the contractor for the above obligations

Monitoring and Evaluation Consultant (MEC)

MEC will be recruited by RUDA to carry out independent monitoring of implementation of EMP. The MEC will have environmental, and social experts and shall carry out third party monitoring of the project. MEC will also carry out regular observation of implementation of EMP carried out by the contractor.

8.8 ENVIRONMENTAL MITIGATION AND MANAGEMENT MATRIX

The impacts, mitigation measures, monitoring indicators, frequency and responsibility has been documented in EMP and given in **Table 8.1**.

Table 8-1: ENVIRONMENTAL MITIGATION AND MANAGEMENT MATRIX

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
Construction Phase					
1.	Soil Erosion Due to the proposed construction activities such as construction of river channelization, soil erosion and contamination may occur. Soil erosion may occur on River Ravi and at contractors' camps as a result of uncontrolled run-off from equipment washing yards and excavation of earth/cutting operations.	Use of stone pitching or riprap will be provided in the design at appropriate places especially	Visual observation and photographic record Waste Management plan implementation	CC CC stands for Construction Contractor	Proponent
2.	Soil Contamination The soil contamination occurs at all construction	The Contractors will be required to instruct and train their workforce in the storage handling and management of	Visual observation and photographic record Waste Management	CC	Proponent

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	stages. Land may be contaminated due to the spillage of chemicals, fuels, solvents, oils, paints, concrete, solid waste generated at campsites etc. This normally happens when these materials are transported in open or loosely capped containers. Various types of machinery will be used at the construction sites.	materials and chemicals that can potentially cause soil contamination	plan implementation		
3.	Borrow / Open Pits Borrow/ open pits and associated excavation activities may result in land disputes, soil erosion, loss of potential cropland, loss of vegetation and landscape degradation. Borrow/ Open pits may also become potential sources of mosquito breeding and may prove hazardous to humans, livestock and wildlife. This will also degrade hygienic condition of the Project	Necessary permits will be obtained for any borrow pits from the competent authorities; In borrow pits, the depth of the pits will be regulated so that the sides of the excavation will have a slope not steeper than 1: 4. Borrow Area management plan shall be prepared by the contractor and approval shall of this plan shall be granted by the supervision consultant's	Visual observation and photographic record Waste Management plan implementation	CC	Proponent

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	Area				
4.	Air Quality and Dust Construction of the project building will affect air quality. Air sensitive receptors (ASR) will be adversely affected by the construction activities. The air quality of the project area will be affected by the exhaust emissions (NO ₂ , SO ₂ , CO and PM ₁₀) produced from the construction machinery and equipment and fugitive dust. All these including PM ₁₀ are considered as pollution indicators	All vehicles, machinery, equipment and generators used during construction activities should be kept in good working condition and be properly tuned and maintained in order to minimize the exhaust emissions.	Visual observation and photographic record Waste	CC	Proponent
5.	Noise/ Vibration The noise and vibration will be produced due to the operation of construction machinery and equipment. Sources of noise and vibration during construction are heavy machinery such as bulldozers, excavators, stabilizers,	Selection of up-to-date and well maintained construction equipment with reduced noise levels ensured by suitable in-built damping techniques or appropriate muffling devices.	Noise monitoring and visual checks.	CC	Proponent

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	concrete mixing plant, pneumatic drills, stone crushers, asphalt plants and other equipment's. The above machinery is expected to generate noise levels that would be severe in the project area.				
6.	Surface and groundwater contamination The surface water including River Ravi may get contaminated due to the surface runoff during construction phase. Construction activities may result in debris entering water body resulting in sedimentation. Storage and transport of construction material may also result in spills of chemical and contamination of water bodies	Construction camps will be established in areas with adequate natural drainage channels in order to facilitate the flow of the treated effluents after ensuring that PEQS are met.	Water Sampling and Testing from EPD Approved Laboratory. Visual Checks.	CC	Proponent
7.	Traffic Management The proposed Project area is approached through various	Movement of vehicles carrying construction materials and equipment/machinery will be restricted during the daytime	Vehicle maintenance record Training record Implementation of TMP Regular visual	CC	Proponent

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	major roads (Ravi road, Grand Trunk road (N-5), Bund road, Ring road and Sialkot-Lahore Motorway. These roads serve as main approach roads to the proposed Project Area and due to the proposed construction activities and movement of heavy Project vehicles for construction material supply; traffic problems may arise for the commuters and transporters travelling to the project area. The problems will include traffic jams and inconvenience to the public passing through the Project Area	Traffic Management Plan will be implemented to avoid traffic accidents, jams/public inconvenience.	observations		
8.	Resource Conservation Resources involved in the construction of proposed Project would include water, fuel and construction materials. Excessive consumption of	A good camp design and an efficient worksite management plan can help the contractor to reduce the water demand, wastewater and solid waste volumes to the lowest levels.	Work site management plan Resource conservation plan and its implementation Regular visual observations	CC	Proponent

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	these resources by the construction staff may stress the resources in the project area and in certain cases may disturb the existing supplies.				
9.	Visual Impact and Aesthetics Possible visual impacts during construction phase activities are likely to arise from fugitive dust generated from site preparation, on-site storage of construction material and storage of construction debris, physical presence and operation of labor camp, etc.	The area demarcated for proposed project should be fenced and all the construction activities should be restricted within the demarcated site;	Regular visual observations	CC	Proponent
10.	Construction Camps/Camp Sites Due to the construction camps, loss of vegetation and dis-satisfaction of rehabilitation measures during and after completion of construction phase may occur. These impacts	Operate equipment in a manner sympathetic to the ambient noise environment. Do not leave equipment idling unnecessary.	Visual observation and photographic record sanitation plan for the construction camp implementation	CC	Proponent

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	may include waste, soil pollution, groundwater pollution, dust, etc				
11.	Wastewater Generation at Construction Camps Wastewater will be generated at the construction camps by the workers. If the generated wastewater is not properly treated or disposed of, this may contaminate the surface water sources such as river Ravi, water channels, etc. apart from soil contamination. The wastewater generation is estimated to be 6,400 liters/day for 200 construction workers during construction phase of the proposed Project.	Domestic and chemical effluents from the construction camp will be disposed by the development of on-site sanitation systems i.e., septic tanks.	Visual observation Regular environmental monitoring, sampling and testing reports Waste Management plan implementation	CC	Proponent
12.	Solid Waste Generation at Construction Camps Considering the laborers (about 200 in numbers) residing in the construction camp and the locally	All the solid waste from the camps will be properly collected at source by placing containers and disposed of through proper solid waste management system. Contractor shall	Visual observation and photographic record. Waste Management plan implementation	CC	Proponent

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	available labour, an average solid waste generation rate of 0.612 kg/capita/day ¹ is adopted for the estimation of solid waste generation. Based on this assumption, a total of about 122.4 kg/day of solid waste will be generated from construction camps on daily basis.	prepared solid waste management plan and approval shall be granted from the SC.			
13.	Waste water generation at construction site The construction waste will include wastewater, oil spillage from machinery and solid waste (damaged or spoiled materials, temporary and expendable construction materials etc.). The handling and storage of oil and other hazardous waste will be a source of environmental	The site will be restored back to its original conditions after construction completion as per agreement with land owner of camp site. Site Restoration Plan shall be prepared by the contractor and approval shall be granted by the SC.	Visual Observation and Environmental Monitoring, Sampling and Testing through an EPD approved laboratory	CC	Proponent

¹ Climate and Clean Air Coalition Municipal Solid Waste Initiative Report, 2021

https://www.waste.ccacoalition.org/sites/default/files/files/laure_city_profile.pdf

(Lahore: 0.612 kg/capita/day)

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	pollution during the excavation, foundation, leveling, carpeting and pavement activities. The quantification of construction material waste is not available but it is anticipated that less amount of such waste will be generated along the route length.				
14.	Emergency Response to Natural and Man-made Disasters Construction of the proposed project may encounter emergency situations. Natural Disasters such as earthquakes & flooding and other disasters triggered by humans/human error such as act of terror, fire etc. may occur, and must be considered to avoid or minimize their impacts.	Emergency Response Plan will be implemented in close consultation with the District Rescue Service, fire-fighting department, bomb disposal squad and paramedics. In addition, training of the staff/employees regarding the emergency procedures/plans should be regularly conducted.	Emergency Response Plan implementation	CC	Proponent
15.	Climate Change and Green House Gas Abatement The main sources of Greenhouse Gases (CO ₂ , CH ₄ ,	Integration of careful planning on construction equipment activities with appropriate equipment selection could contribute to the reduction of	Regular maintenance of construction equipment and machinery. Visual observations and	CC	Proponent

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	NO _x etc.) during the construction activities of the proposed Project will include both mobile and stationary sources. The mobile sources will be the construction and transportation vehicles while the stationary source will be the batching and asphalt plants. Emission of greenhouse gases cause global warming and other climatic changes on regional and global scale.	carbon gas emissions as well as savings of construction cost	Environmental Monitoring, Sampling and Testing through an EPD approved laboratory.		
16.	Flora The project may involve destruction of vegetation cover on construction areas. It is initially examined that is approximately 2,524 number of trees/saplings will be disturbed (14Km). The provided number of trees is approximate and tentative. Moreover, small plants will be removed due the	Incorporate technical design measures to minimize removal of trees, if possible; Cutting of trees and disturbance shall be avoided, as far as possible so, that negative effects on the process of natural regeneration of species are minimized and possible alternate route must be considered for proposed road, in which minimum ecological and environmental	Tree compensation record Visual observations Regular monitoring, audit and checks	CC	Proponent

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	layout of the project.	losses are expected.			
17.	Fauna During construction phase the existing population of mammals and reptiles of the construction areas will be affected due to disturbance arising from construction activities involving excavation, movement of machinery and vehicular traffic, movement of labor, camping, etc. The existing animals will leave the directly affected areas due to construction activities and human intervention. Some animals particularly reptiles may get killed during the earthworks operations. Moreover, the movements of the mammals and reptiles will be restricted during the construction phase.	Care shall be taken during construction activities for avoiding purposely or chance killing of animals; If any wild species and habitat is found during construction, it must be dealt carefully and local wildlife department officials should be informed;	Departmental consultation record Visual observations Regular monitoring, audit and checks	CC	Proponent
18.	Aquatic Ecology	Proper facilities for	Departmental	CC	Proponent

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	Availability of the suitable approach is must for any project before its start. Presently there are no proper roads in the bed of river for the transport of heavy machinery to the site. So the construction of the approach roads will cause noise and dust pollution in the area. These activities will disturb the water quality and also aquatic life therein.	regular monitoring of fish stock and water quality will be provided in shape of a trained team equipped with necessary equipment.	consultation record Visual observations Regular monitoring, audit and checks		
19.	Occupational Health and Safety Occurrence of accidents / incidents and other natural emergencies during the construction stage is a common phenomenon and workers as well as locals will be more prone to serious accidents. Other physical hazards are exposure to weather elements, noise, work in confined spaces,	Safety precautions for the construction workers. Training of workers in construction safety procedures and use of Personnel Protective Equipment (PPE) will mitigate this impact. First Aid Facility shall be available within the construction camp.	Implementatio n of OHS Plan Use of PPEs Training Records Work permits Implementatio n of Emergency response plan and disaster management plan in case of natural disaster occurrence	CC	Proponent

Sr. No.	Impacts	Mitigation Measure	Performance Monitoring Indicators	Responsibility	
				Implementation	Monitoring
	trenching, contact with overhead power lines, falls from machinery or structures, and risk of falling objects).				
20.	Community Health and Safety Community health and safety issues may include dust, noise, and vibration from construction vehicle transit, and communicable disease associated with the influx of temporary construction labor.	The World Bank/IFC EHS Guidelines, 2007, defines community health and safety in terms that guarantee as-built infrastructure conforms to acceptable standards (structural safety, flood and fire risk), water supply sources are of suitable potable quality, emergency response planning is in place for built environments, traffic safety provisions are enforced alongside transport hazard assessment and mitigation, and disease prevention measures are taken.	Implementation of HSE Plan Use of PPEs Community concerns record Medical reports of worker	CC	Proponent

8.9 ENVIRONMENTAL MONITORING PLAN

Environmental monitoring provides timely and useful information to the project management and implementation agencies. Conceptually, “monitoring” means to check and balance, on a regular basis, the status of the project activities and realization of various developmental targets during implementation phase. It helps in timely identification/analysis and removal of the bottlenecks and expedites actions. Certain parameters (physical, ecological and social) are selected and quantitative analysis is carried out. The results of analysis are compared with the guidelines; standards and pre-project condition to investigate whether the EMP and

its implementation are effective for the mitigation of impacts or not. The objectives of environmental and social monitoring plan during the construction phase will be as follows:

- Monitor the actual project impacts on physical, ecological and socio-economic receptors;
- Recommend mitigation measures for any unforeseen impact or where the impact level exceeds the anticipated level in the EIA;
- Ensure compliance with legal and community obligations including safety during construction phase;
- Ensure the safe disposal of excess construction materials, solid waste, water, wastewater and gaseous emissions;
- Appraise the adequacy of the EIA with respect to the project's predicted long-term impacts on the area's physical, ecological and socio-economic environment;
- Evaluate the effectiveness of the mitigation measures proposed in the EMP and recommend improvements in EMP, if required; and
- Compile periodic incidents/accidents data to support analyses that will help to minimize future risks.

8.9.1 Monitoring Mechanism

Safeguard monitoring is an essential tool for assessing whether the adopted environmental and social management measures are meeting their stated objectives. Two, complementary methodology shall be applied to monitor the proposed actions under the EMP:

- Compliance monitoring: To check the compliance of actions proposed by the EMP by visual observation, photographic documentation and the use of checklists etc.; and
- Effects monitoring: To monitor the consequences of program/activities on the biophysical and social environment; as applicable, the effects are repeatedly measured by applying selected indicators.

Monitoring will be carried out to ensure that the mitigation plans are regularly and effectively implemented. It will be performed at three levels. RUDA will ensure EMP monitoring regularly to ensure that the mitigation plans are being effectively implemented. Monitoring and Evaluation Consultant will monitor regularly the mitigation plans are being effectively implemented. At contractor's level, the environmental monitoring checklist will be filled on daily basis by their environmental manager.

8.9.2 Monitoring Strategy

Under the proposed monitoring strategy, it is recommended that Contractor should be responsible for all the instrumental Environmental Monitoring activities. All the findings and results in the form of monitoring report will be finally shared with the Employer and the employer will share it with EPD Punjab. The monitoring program has been designed carefully considering the identified impacts and some additions or deletions probably in

frequency may be taken up. **Table 8.2** provides environmental monitoring schedule for construction stage of the proposed package.

Table 88-2: Environmental Monitoring Plan

Sr. #	Parameter	Location	Monitoring Mechanism/Parameters	Frequency
A. DESIGN/PRE-CONSTRUCTION PHASE				
1.	Land acquisition	Project Area	Confirm that all acquisition has been completed and compensation paid to affectees as per RAP	Monthly
2.	Tree cutting	Project Area	Comply with the Project Area tree plantation plan as and when required	Monthly
3.	Drinking Water	Water being used for drinking purposes by workers and nearby communities	Discrete grab sampling and laboratory testing of groundwater according to PEQS	Once (Two samples of drinking water from the workers' camp and other from nearby villages)
4.	Wastewater	Workers' camp	Effluent discharges from workers' camp to be tested for all 32 parameters mentioned in PEQS	Once
5.	Noise Levels	Active construction sites and workers' camp(s)	Noise level monitoring (Day and Night) according to PEQS	Once (Once prior to the start of construction)
6.	Ambient Air	Near project site, access roads and settlements	Visual checks and monitoring of SO ₂ , NO, NO ₂ , CO, Suspended Particulate Matter, PM ₁₀ , PM _{2.5} according to PEQS	Once
B. CONSTRUCTION PHASE				
1.	Drinking Water	Water being used for drinking purposes by workers and nearby communities	Discrete grab sampling and laboratory testing of groundwater according to PEQS	Quarterly (Two samples of drinking water from the workers' camp and other from nearby villages)
2.	Wastewater	Workers' camp	Effluent discharges from workers' camp to be tested for all 32 parameters mentioned in PEQS	Quarterly

Sr. #	Parameter	Location	Monitoring Mechanism/Parameters	Frequency
3.	Noise Levels	Active construction sites and workers' camp(s)	Noise level monitoring (Day and Night) according to PEQS	Weekly (Once prior to the start of construction and then weekly throughout the construction period)
4.	Ambient Air	Near project site, access roads and settlements	Visual checks and monitoring of SO ₂ , NO, NO ₂ , CO, Suspended Particulate Matter, PM ₁₀ , PM _{2.5} according to PEQS	Quarterly
5.	Solid Waste	Workers' camps and active construction sites	Visual Checks for assessment of condition of waste generation, segregation, storage, collection and disposal.	Fortnightly
6.	Health and Safety	Workers' camps, batching plant, and active construction sites	All HSE related activities to be monitored including Tool Box Talks, safety signage, PPEs, first aid boxes, dispensary, medical check-ups, etc.	Daily
7.	Communicable Diseases	Labor camp / project colony	Medical check-ups and routine safety check-ups of the communicable diseases and accidents	Quarterly
8.	Ecological aspects	At and around project site or in the whole Study Area	Illegal hunting of fauna / avifauna	Weekly
9.	Environmental Audit	Whole Project Area	Auditor's checklists & performs	Annually

8.10 PLANNING FOR EMP IMPLEMENTATION

8.10.1 NOC and Other Approvals

The EIA report duly reconciled with RUDA is to be submitted to EPD Punjab for obtaining NOC. A demand draft of required EIA review fee has to be deposited along with the report by the Proponent to EPD Punjab for initiating the review and EIA approval process. The approval from EPD Punjab is the mandatory requirement before commencement of the proposed Project activities.

8.10.2 Stakeholder Coordination

Notwithstanding the efforts so far put in for public participation, this activity will have to be pursued through the forthcoming implementation phases of the Project. In particular, the focus will be on the improvement and modification of the proposed intervention designs.

Participation mechanisms facilitate the consultative process and include information sharing and dissemination, disclosure, and participation of affected people and other stakeholders in the proposed Project related activities. In the peculiar social set-up of the Project Area, it is also important to involve the religious leaders as representatives of the public as well as part of effective communication process. They can provide a very effective medium to bring information to the affected male population through Friday prayers. Local business community, especially the affected one, should also be brought into the process of awareness and participation.

The related institutional arrangements should also be in place for continuous consultation throughout the process of planning and implementation. During construction, RUDA will have to implement the EMP.

8.11 OCCUPATIONAL HEALTH AND SAFETY PROVISIONS FOR CONTRACTORS

8.11.1 Contractor OHS Policy

Contractor OHS policy shall be intended to: help prevent accidents, illnesses and injuries; increase safety awareness; meet requirements of environmental, occupational health, and safety local and international laws and regulations; reduce institutional liability; and establish safety responsibilities for staff/workers at the project site and local community. Contractor OHS policy outlines safety responsibilities and training requirements to ensure individual and institutional compliance with relevant environmental health and safety laws, regulations, policies, and guidelines.

It shall be the Contractor(s) policy to perform work in the safest practicable manner, consistent with good local and international best practice. The Occupational health and safety of the staff, workers and all those likely to be affected by the pre-construction, construction and operations activities is the responsibility of the Contractor(s); in addition to, adequate resources shall be made available to ensure the success of this policy. It shall be the duty of the Contractor(s) to provide safe systems of work and do everything practicable to prevent injuries, property damage, loss of life and ill health by controlling the risks arising out of construction activities. Equally it shall be the duty of each worker/staff to exercise personal responsibility for his or her own safety and that of others and co-operate with his or her worker/staff in matters of health, safety.

It shall be the Contractor(s) policy to adhere completely to the local/applicable legal requirements.

8.11.2 Contractor OHS Criteria

The Contractor OHS Criteria shall comply with the following sections:

Environment

- Contractor shall have implemented EMP described in main EIA report of proposed Project through an effective Environmental Management System. If a system is not in place, a commitment to comply with the standard in the future is required; and
- Contractor shall monitor amount and type of discharges according to requirements, such as accidental discharges and planned and permitted discharges (PEQS).

Health

- Contractor shall ensure access to an Occupational Health Service for follow up of sick leave, occupational illness/injury and other focus areas within occupational health and working environment; and
- Contractor shall present periodic checks of basic medical such as hearing, eyesight etc. on all staff working under controlled environmental conditions.

Emergency Preparedness

Contractor shall ensure duty numbers to contact Persons are available at any time by means of a phone answering service in case of an emergency.

8.11.3 Personal Protective Equipment

PPEs are equipment worn to minimize exposure to a variety of hazards which cannot be avoided due to engineering measure (residual impact). It includes gloves, foot and eye protection, protective hearing devices (earplugs, muffs) hard hats, respirators, full body suits etc. Contractor shall be responsible to provide PPEs to working staff and ensure its use. Contractor shall adhere to Client's OHS requirements related to "Personal Protective Equipment (PPEs)" in respect of personal protective equipment. Contractor shall, at its own expense, provide Personnel for duty staff with all necessary protective clothing and equipment suitable for working conditions. List of PPEs has been provided in the **Table 8-3**.

Table 88-3: Personal Protective Equipment

Sr. No	Type of Protection	Workplace Hazard	Suggested PPEs
1	Over All, Exterior garments	Entanglement, chemical spill safeguard etc.	Long pants, shirt with sleeves (no tank tops or shorts)
2	High Visibility Vests	Accidental hazard etc.	A reflective vest will be worn outside of any other garments
3	Foot protection	Falling or rolling objects, pointed objects. Corrosive or hot liquids	Safety toed footwear / boots/ shoes

Sr. No	Type of Protection	Workplace Hazard	Suggested PPEs
4	Eye and Face Protection	Flying particles, molten metal, liquid chemicals, gases or vapors, light radiation	Safety Glasses, Spectacles and Goggles. Spectacles with side shield. Prescription Lenses. Sun Glasses. Special Helmets or shields/ Face shields.
5	Head Protection	Falling objects, inadequate height clearance, and overhead power cords.	Hard hats with top and side impact protection. Hard hats shall be worn with the brim pointed forward.
6	Hearing protection	Noise, ultra-sound	Earplugs, muffs
7	Hand Protection	Hazardous materials, cuts or lacerations, vibrations, extreme temperature	Gloves (Plastic, leather, fireproof and rubber)
8	Breathing Protection	Dusts, fogs, fumes, mists, gases, smokes, vapors	Facemasks
9	Toxic Gases Protection	Health and ailment etc.	SCBA (if applicable)
10	Falling Hazard Protection	Injury and death etc,	Safety Belt/Chains, Locks

Source: General IFC- Environmental, Health, and Safety (EHS) Guidelines

8.11.4 Work Permit Provisions

Importance of work permit system in any construction projects cannot be neglected. A work permit is a written form used to authorize jobs that expose workers to serious hazards. Permits only allow authorized personnel to perform those serious hazard activities at specified times and in a way set out in the permit and referenced documents. It identifies the work to be done, the hazards involved, and the necessary preparation and precautions for the job. A permit to work might be required for activities such as:

- Electrical works;
- Hot works;
- Excavation;
- Lone working;
- Lifting operations;
- Work in confined spaces;
- Work to high risk spaces such as laboratories, or industrial plant;
- Work at height;

- Work to roofs;
- Temporary works;
- Work with asbestos;
- Demolition; and
- Work to high pressure systems.

8.12 CAPACITY BUILDING/STRENGTHENING

The environmental and social trainings will help to ensure that the requirements of the EMP are clearly understood and followed by all project personnel. The primary responsibility of providing these trainings to all project personnel will be that of the contractor and RUDA. The trainings will be provided to different professional groups separately such as managers, skilled personnel, unskilled labors, and camp staff. Capacity building will be aimed at strengthening the operational staff in the field of environmental management and social development. The contractor will be required to provide environmental and social trainings to its staff, to ensure effective implementation of the EMP. The training plan shall include a program for periodic training, to cover the subjects included in **Table 8.4**. Training should be carried out initially at induction of staff and repeated throughout the project.

Table 8-4 : Training Subjects for Inclusion in Contractors Training Plan

Training Activity	Participants	Type of Training	Content	Scheduling
Awareness workshop regarding Covid-19 and other vector borne diseases	Contractor Staff	Presentation	Risk, Prevention and available treatment	Biannually
Pollution prevention practices	Contractor Staff	Lecture	Awareness and importance of Practices to be adopted for pollution preventions	Biannually
Sensitivity to local culture	Contractor Staff	Lecture	Awareness of local culture and practices	Biannually
Awareness on vector borne diseases	Contractor Staff	Presentation	Risk, Prevention and available treatment	Biannually
Driver safety	Contractor Staff	Lecture	Risks, safe practices and responding to accidents	Biannually
Waste Management	Contractor Staff	Lecture	Awareness associated with waste Storage, collection and safe disposal	Biannually
Emergency Response	Contractor Staff	Workshop	Potential natural and other hazard / emergencies and dealing	Biannually

Training Activity	Participants	Type of Training	Content	Scheduling
			with emergency to minimize damage	
Ecological Conservation	Contractor Staff	Lecture	Awareness on regulations wild life and forest and penalties against violation of laws. Importance of protection of endangered species	Biannually
EPD Regulation	Managerial Staff of Contractor	Lecture	Awareness on EPD rules, guidelines, regulation and standards for satisfactory compliance	Biannually

8.13 COMMUNICATION AND DOCUMENTATION

8.13.1 Data Recording and Maintenance

All forms to be used for recording information during the environmental monitoring will follow a standard format which will correspond to the data base in to which all the gathered information will be placed. Check boxes will be used as much as possible to facilitate data entry. Tracking system will be developed for each form. Moreover, a database will also be prepared. The database may include the following information:

- Training programs;
- Staff deployment;
- Non-compliances;
- Corrective actions
- List of environmental and social data to be maintained:
 - Soil and land pollution;
 - Disposal of waste;
 - Water resources ;
 - Fuel oil and chemical spills;
 - Vegetation record;
 - Noise pollution;
 - Air and dust pollution;
 - Socio-economic data; and
 - Ecological sensitivities.

8.13.2 Meetings and Reporting

Monthly meetings will be held at site during the construction phase. The purpose of these meetings will be to discuss the routine activities, non-compliances and their remedial measures.

The Contractor will prepare monthly reports covering various aspects of the EMP implementation including compliance and effects monitoring, capacity building, and grievance redressal during project implementation. MEC will prepare quarterly, biannual and annual reports during construction period. List of reports to be prepared during implementation stages are presented in **Table 8.5**.

Table 8-5: Reporting during Implementation Stages

Report	Contents	Prepared by	Distribution
Monthly Progress Report for EMP Compliance	Non-Compliances observed on sites and actions required	Contractor	RUDA, SC, MEC,
Quarterly Progress Report for EMP Compliance	Quarterly review on implementation of EMP including compliance and monitoring, capacity building, and grievance redressal	CC, SC	RUDA, MEC, EPD Punjab
Annual Report for EMP Compliance	Results of effects monitoring Independent review of environmental and social performance on site Recommended actions required by all parties	SC	RUDA, MEC, EPD Punjab

8.13.3 Complaint Management

The Contractor will maintain a register of complaints record from local communities and measures taken to mitigate these concerns.

8.14 ENVIRONMENTAL, SOCIAL, HEALTH AND SAFETY MANAGEMENT PLANS

8.14.1 Site Specific Environmental and Social Management Plans

Contractor shall prepare Site-Specific Environmental Management Plan (SSEMP). As a part of this plan, mitigation and management subplans shall also be prepared on the basis of the detailed impact assessment and recommended measures. These subplans shall be project-specific and shall be prepared by contractor prior to the commencement of construction activities. These plans will be reviewed and approved by RUDA. A brief description of each of these subplans is provided below:

Erosion and Drainage Control Plan will be prepared by the contractor on the basis of the mitigation measures given in EMP. The Plan will be submitted to RUDA for review and approval before contractor mobilization.

Pollution Prevention Plan will be prepared and implemented by the Contractor on the basis of WBG EHS Guidelines (2007), as well as the mitigation plans given in EMP. The Plan will be submitted to the RUDA for review and approval before contractor mobilization.

Waste Disposal and Effluent Management Plan will be prepared and implemented by the Contractor on the basis of WBG EHS Guidelines (2007), as well as the mitigation plans given in EMP. The Plan will be submitted to the RUDA for review and approval before contractor mobilization.

Traffic Management Plan will be prepared by the Contractor on the basis of the mitigation plans given in EMP, after discussion with RUDA and authorities responsible for roads and traffic. The Plan will be submitted to the RUDA for their review and approval before contractor mobilization.

Borrow Area Management and Restoration Plan for management and restoration of borrow areas will be prepared by the Contractor on the basis of requirements described in the mitigation plans. This Plan will aim at minimizing the environmental and social impacts during borrowing activities and restoring as much as possible the original natural situation of these sites by various measures (refill, leveling or smoothening). Restoration methodologies will be included in the Plan. The Plan will be approved by the RUDA.

Drinking Water Supply and Sanitation Plan: Separate water supply and sanitation provisions will be needed for the temporary facilities, labor camps and workshops, in order not to cause shortages and/or contamination. The Plan will be submitted to the RUDA for review and approval before contractor mobilization.

Construction Camp Management Plan will be prepared by the Contractor on the basis of the mitigation plans given in EMP. The Plan will include the camp layout, details of various facilities including supplies, storage, and disposal. The Plan will be submitted to the RUDA for review and approval before camp establishment.

Fuel and Hazardous Substances Management Plan will be prepared by the Contractor on the basis of mitigation plans given in EMP and in accordance with the standard operating procedures, relevant guidelines, and where applicable, material safety data sheets. The Plan will include the procedures for handling oils and chemical spills. The Plan will be submitted to the RUDA for review and approval before contractor mobilization.

Emergency Preparedness Plan will be prepared by the Contractor after assessing potential risks and hazards that could be encountered during construction of road. The Plan will be submitted to the RUDA for review and approval before contractor mobilization.

Communication Plan will be prepared by the contractor to demonstrate how they will communicate with local community leaders, provide details regarding employment opportunities, and traffic management throughout the construction period. The contractor's communication plan should define a process for receiving, recording and responding to

complaints and also monitoring of the success of any responsive action taken to prevent the escalation of any conflicts.

Camp Site Restoration and Rehabilitation Plan will be prepared by the contractor. The main areas to be considered for site restoration & rehabilitation include the construction area, campsite area, temporary tracks; land used for vehicles, material stores etc. These areas should be restored to their original condition with the maximum possible effort. The restoration work comprises the removal of temporary construction works and removal of any fences installed and levelling of the area (wherever required) etc. The following procedures will be adopted for the restoration of the project site and nearby sites:

- All temporary construction built for the site development will be removed;
- Site for construction camps will be restored to its original (pre-construction) condition as much as possible;
- All the toxic and hazardous chemicals/materials will be completely removed from the site. Efforts will be made to completely remove the oils and chemical spills which occurred during the construction stage;
- Any debris from the construction site will be removed properly from the site and disposed of in an environmentally friendly manner; and
- All fencing and gates will be removed and pits will be backfilled; and
- Whole of the site will be covered with the original soil and plantation will be done, wherever required.

To achieve the above objectives, the Contractor will prepare a Camp Site Restoration & Rehabilitation Plan well before the completion of the construction activities and submit to RUDA through the SC for approval. Finally, after the completion of the restoration process, RUDA through the representatives of the community members will inspect the site and give restoration clearance to the Contractor.

Spoil Disposal Areas Management and Restoration Plan will be prepared by the Contractor. The Plan will describe the procedures for spoil management, transportation and disposal at the selected site(s). The Plan will also describe the procedures for systematically disposing the spoil at the disposal site. This Plan would aim at minimizing the environmental and social impacts during disposal activities and restoring as much as possible the original natural situation of these sites by various measures (landscaping, leveling or smoothening). The Plan will include measures to avoid land/soil erosion and landslides. Restoration methodologies will be included in the Plan. The Plan would be approved by the SC and a landscape architect assigned by RUDA.

8.15 CHANGE MANAGEMENT PLAN

The present EMP has been carried out on the basis of the Project information available at this stage. It is however possible that the changes are made in some components of the project during the design and construction phases. In order to address the environmental and social implications of these changes, a simple framework has been devised, which is

described in this section. The change management framework recognizes the three broad categories (A, B & C) of the changes in the Project as detailed below:

8.15.1 Category 'A' Change

The 'Category A' change is one that will lead to a significant departure from the project described in the EMP and consequently requires a reassessment of the environmental and socioeconomic impacts associated with the change. In such an instance, Client will be required to conduct a fresh EMP of the changed aspect of the Project design and send the updated report to the relevant agencies for approval.

8.15.2 Category 'B' Change

The category 'B' change is one that will entail project activities not significantly different from those described in the EIA, which may result in the project effects with overall magnitude to be similar to the assessment made in this report. In case of such changes, the EIA will be required to reassess the environmental and socio-economic impacts of the activity, specify additional mitigation measures, if necessary and report the changes to the relevant agencies.

8.15.3 Category 'C' Change

A Category-C change is one that is of little consequence to the EMP findings such as change in alignment. This type of change does not result in effects beyond those already assessed in the EMP; rather it may be made onsite to minimize the impact of an activity, such as re-aligning a particular section to avoid cutting a tree or relocating construction campsites to minimize clearing vegetation. The only actions required for such changes are informing all the key personnel and document the change.

8.16 TREE PLANTATION PLAN

The basic purpose of afforestation/plantation of suitable species in the project area is to reduce the risk been made due to cutting of trees for the proposed project and to enhance green cover and improve the overall environment of the area. Afforestation will not only reduce the risk been made but will also increase the carrying capacity of the area regarding many positive aspects.

Plantation will be done after the removal of trees during the construction work immediately. Plantation of indigenous trees species is highly important to maintain the biodiversity and ecological balance. It is also important to prevent global warming, soil erosion and pollution. Afforestation purifies the environment and helps in reducing the carbon dioxide level. The afforestation activity will further help in enhancing the socio-economic condition of the area and project sustainability. It is estimated that around 2,524 trees will be cut due to the implementation of the proposed Package. Total Number of 25,240 trees shall be provided as an environmental enhancement measure.

Note: The rates and calculations shall be made according to the standard rates of concerned Forest Departments/Implementing Agency, during implantation stage.

8.17 CHANCE FIND PROCEDURE

The purpose of these guidelines is to address the possibility of archaeological deposits, finds and features becoming exposed during earth removing and ground altering activities to provide procedures to follow in the event of a chance archaeological find. The guidelines for chance find procedure of archaeological deposits is provided in the EIA Report.

8.18 CODES OF PRACTICES

Contractor will follow the following Environmental Codes of Practices during the implementation of the proposed package.

8.18.1 Waste Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
General Waste	Soil and water pollution from the improper management of wastes and excess materials from the construction sites.	The Contractor shall - Develop waste management plan for various specific waste streams (e.g., reusable waste, flammable waste, construction debris, food waste etc.) prior to commencing of construction and submit to SC for approval. - Organize disposal of all wastes generated during construction in an environmentally acceptable manner. This will include consideration of the nature and location of disposal site, so as to cause less environmental impact. - Minimize the production of waste materials by 3R (Reduce, Recycle and Reuse) approach. - Segregate and reuse or recycle all the wastes, wherever practical. - Prohibit burning of solid waste - Collect and transport non-hazardous wastes to all the approved disposal sites. Vehicles transporting solid waste shall be covered with tarps or nets to prevent spilling waste along the route - Train and instruct all personnel in waste management practices and procedures as a component of the environmental induction

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		process. • Provide refuse containers at each worksite. • Request suppliers to minimize packaging where practicable. • Place a high emphasis on good housekeeping practices. • Maintain all construction sites in a cleaner, tidy and safe condition and provide and maintain appropriate facilities as temporary • Storage of all wastes before transportation and final disposal.
Hazardous Waste	Health hazards and environmental impacts due to improper waste management practices	The Contractor shall • Collect chemical wastes drums (or similar sealed container), appropriately labeled for safe transport to an approved chemical waste depot. • Store, transport and handle all chemicals avoiding potential environmental pollution. • Store all hazardous wastes appropriately in bunded areas away from water courses. • Make available Material Safety Data Sheets (MSDS) for hazardous materials on-site during construction. • Collect hydrocarbon wastes, including lube oils, for safe transport off-site for reuse, recycling, treatment or disposal at approved locations. • Construct concrete or other impermeable flooring to prevent seepage in case of spills

8.18.2 Fuels and Hazardous Goods Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Fuels and hazardous goods.	Materials used in construction have a potential to be a source of contamination. Improper storage and handling of fuels, lubricants, chemicals and hazardous goods/materials on-site, and potential spills from these	The Contractor shall • Prepare spill control procedures and submit the plan for SC approval. • Train the relevant construction personnel in handling of fuels and spill control procedures. • Store dangerous goods in bunded areas on a top of a sealed plastic sheet away from watercourses; and also under a rainwater

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
	goods may harm the environment or health of construction workers.	shed (to prevent contact with rainwater). • Refueling shall occur only within bunded areas. • Make available MSDS for chemicals and dangerous goods on- site. • Transport waste of dangerous goods, which cannot be recycled, to a designated disposal site approved by EPD Punjab or sold to EPD Punjab registered vendors. • Provide absorbent and containment material (e.g., absorbent matting) where hazardous material are used and stored and personnel trained in the correct use. • Provide protective clothing, safety boots, helmets, masks, gloves, goggles, to the construction personnel, appropriate to materials in use. • Make sure all containers, drums, and tanks that are used for storage are in good condition and are labeled with expiry date. Any container, drum, or tank that is dented, cracked, or rusted might eventually leak. Check for leakage regularly to identify potential problems before they occur. • Put containers and drums in temporary storages in clearly marked areas, where they will not be run over by vehicles or heavy machinery. The area shall preferably slope or drain to a safe collection area in the event of a spill. • Put containers and drums in permanent storage areas on an impermeable floor that slopes to a safe collection area in the event of a spill or leak. • Take all precautionary measures when handling and storing fuels and lubricants, avoiding environmental pollution. • Avoid the use of material with greater potential for contamination by substituting them with more environmentally friendly materials. • Return the gas cylinders to the supplier. However, if they are not empty prior to their return, they must be labeled with the name of the material they contained or contain, information on the supplier, cylinder serial

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		number, pressure, their last Hydrostatic test date, and any additional identification marking that may be considered necessary.

8.18.3 Water Resources Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Hazardous Material and Waste	Water pollution from the storage, handling and disposal of hazardous materials and general construction waste, and accidental spillage	The Contractor shall - Follow the management guidelines proposed in ECPs 1 and 2. - Minimize the generation of sediment, oil and grease, excess nutrients, organic matter, litter, debris and any form of waste (particularly petroleum and chemical wastes). These substances must not enter waterways, storm water systems or underground water tables
Discharge from construction sites	Waste waters from construction sites and work camps. The construction works will modify groundcover and topography changing the surface water drainage patterns of the area including infiltration and storage of storm water.	The Contractor shall - Minimize the amount of exposed soil at any one time (only clear vegetation immediately before construction is about to begin) - Install temporary drainage works (channels and bunds) in areas required for sediment and erosion control and around storage areas for construction materials - Install temporary sediment basins, where appropriate, to capture sediment-laden run-off from site - Divert runoff from undisturbed areas around the construction site - Stockpile materials away from drainage lines - Prevent all solid entering waterways by collecting solid waste, oils, chemicals, bitumen spray waste and wastewaters from brick, concrete and asphalt cutting and transport to an approved waste disposal site or recycling depot - Collect, transport and discharge the septic tank waste from the construction camps in the nearby municipal waste water treatment plants

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		Ensure that tires of construction vehicles are cleaned in the washing bay (constructed at the entrance of the construction site) to remove the mud from the wheels. This shall be done in every exit of each construction vehicle to ensure the local roads are kept clean.
Soil Erosion and siltation	Soil erosion and dust from the material stockpiles will increase the sediment and contaminant loading of surface water bodies.	The Contractor shall - Ensure that sealed roads used by construction vehicles are swept regularly to remove sediment. - Water the material stockpiles, access roads and bare soils on an as required basis to minimize dust. Increase the watering frequency during periods of high risk (e.g. high winds)

8.18.4 Drainage Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Excavation and earth works, and construction yards	Lack of proper drainage for rainwater/liquid waste or wastewater owing to the construction activities harms environment in terms of water and soil contamination, and mosquito growth.	The Contractor shall - Prepare a program for prevent/avoid standing waters, which SC will verify in advance and confirm during implementation - Provide alternative drainage for rainwater if the construction works/earth-fillings cut the established drainage line - Establish local drainage line with appropriate silt collector and silt screen for rainwater or wastewater connecting to the existing established drainage lines already there - Rehabilitate road drainage structures immediately if damaged by contractors' road transports. - Build new drainage lines as appropriate and required for wastewater from construction yards connecting to the available nearby recipient water bodies. Ensure wastewater quality conforms to the relevant standards provided by PEQS, before it being discharged into the recipient water bodies.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		- Ensure the internal roads/hard surfaces in the construction yards/construction camps that generate has storm water drainage to accommodate high runoff during downpour and that there is no stagnant water in the area at the end of the downpour. - Construct wide drains instead of deep drains to avoid sand deposition in the drains that require frequent cleaning. - Provide appropriate silt collector and silt screen at the inlet and manholes and periodically clean the drainage system to avoid drainage congestion - Protect natural slopes of drainage channels to ensure adequate storm water drains. - Regularly inspect and maintain all drainage channels to assess and alleviate any drainage congestion problem. - Reduce infiltration of contaminated drainage through storm water management design
Ponding of water	Health hazards due to mosquito breeding	- Do not allow ponding of water especially near the waste storage areas and construction camps - Discard all the storage containers that are capable of storing of water, after use or store them in inverted position

8.18.5 Soil Quality Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Storage of Hazardous and toxic chemicals	Spillage of hazardous and toxic chemicals will contaminate the soils	The Contractor shall - Strictly manage the wastes management plans proposed in ECP1 and storage of materials in ECP2 - Construct appropriate spill contaminant facilities for all fuel storage areas - Establish and maintain a hazardous materials register detailing the location and quantities of hazardous substances including the storage, use of disposals - Train personnel and implement safe work

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		practices for minimizing the risk of spillage - Identify the cause of contamination, if it is reported, and contain the area of contamination. The impact may be contained by isolating the source or implementing controls around the affected site - Remediate the contaminated land using the most appropriate - available method to achieve required commercial/industrial guideline validation results
Construction material stock piles	Erosion from construction material stockpiles may contaminate the soils	The Contractor shall Protect the toe of all stockpiles, where erosion is likely to occur, with silt fences, straw bales or bunds

8.18.6 Erosion and Sediment Control

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction activities and material stockpiles	The impact of soil erosion are (i) Increased run off and sedimentation causing a greater flood hazard to the downstream, (ii) destruction of aquatic environment in nearby lakes, streams, and reservoirs caused by erosion and/or deposition of sediment damaging the spawning grounds of fish, and (iii) destruction of vegetation by burying or gullyng.	The Contractor shall - Locate stockpiles away from drainage lines - Protect the toe of all stockpiles, where erosion is likely to occur, with silt fences, straw bales or bunds - Remove debris from drainage paths and sediment control structures - Cover the loose sediments and water them if required - Divert natural runoff around construction areas prior to any site disturbance - Install protective measures on site prior to construction, for example, sediment traps - Observe the performance of drainage structures and erosion controls during rain and modify as required.

8.18.7 Top Soil Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Land clearing and earth works	Earthworks will impact the fertile top soils that are enriched with nutrients required for plant growth or agricultural development.	The Contractor shall - Strip the top soil to a depth of 15 cm and store in stock piles of height not exceeding 2m. - Remove unwanted materials from top soil like grass, roots of trees and similar others. - The stockpiles will be done in slopes of 2:1 to reduce surface runoff and enhance percolation through the mass of stored soil. - Locate topsoil stockpiles in areas outside drainage lines and protect from erosion. - Construct diversion channels and silt fences around the topsoil stockpiles to prevent erosion and loss of topsoil. - Spread the topsoil to maintain the physico-chemical and biological activity of the soil. The stored top soil will be utilized for covering all disturbed area and along the proposed plantation sites - Prior to the re-spreading of topsoil, the ground surface will be ripped to assist the bunding of the soil layers, water penetration and revegetation
Transport	Vehicular movement outside right of way of existing roads or temporary access roads will affect the soil fertility of the agricultural lands	- Limit equipment and vehicular movements to within the approved construction zone - Construct temporary access tracks to cross concentrated water flow lines at right angles - Plan construction access to make use, if possible, of the final road alignment - Use vehicle-cleaning devices, for example, ramps or wash down areas

8.18.8 Topography and Landscaping

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Land clearing and earth works	Construction activities especially earthworks will change topography and disturb the natural rainwater/flood water drainage as well as will change the local landscape.	The Contractor shall - Ensure the topography of the final surface of all raised lands (construction yards, approach roads, access roads, etc.) are conducive to enhance natural draining of rainwater/flood water; - Keep the final or finished surface of all the

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		raised lands free from any kind of depression that insists water logging - Undertake mitigation measures for erosion control/prevention by grass-turfing and tree plantation, where there is a possibility of rain-cut that will change the shape of topography. - Cover immediately the uncovered open surface that has no use of construction activities with grass-cover and tree plantation to prevent soil erosion and bring improved landscaping

8.18.9 Air Quality Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction vehicular traffic	Air quality can be adversely affected by vehicle exhaust emissions and combustion of fuels.	The Contractor shall - Fit vehicles with appropriate exhaust systems and emission control devices. Maintain these devices in good working condition. - Operate the vehicles in a fuel efficient manner - Cover haul vehicles carrying dusty materials moving outside the construction site - Impose speed limits on all vehicle movement at the worksite to reduce dust emissions - Control the movement of construction traffic - Water construction materials prior to loading and transport - Service all vehicles regularly to minimize emissions - Limit the idling time of vehicles not more than 2 minutes
Construction machinery	Air quality can be adversely affected by emissions from machinery and combustion of fuels.	The Contractor shall Fit machinery with appropriate exhaust systems and emission control devices. Maintain these devices in good working condition in accordance with the specifications defined by their manufacturers to maximize combustion efficiency and minimize the contaminant emissions. Proof or maintenance register shall be required by the equipment suppliers and contractors/subcontractors

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		- Focus special attention on containing the emissions from generators - Machinery causing excess pollution (e.g. visible smoke) will be banned from construction sites - Service all equipment regularly to minimize emissions - Provide filtering systems, duct collectors or humidification or other techniques (as applicable) to the concrete batching and mixing plant to control the particle emissions in all its stages, including unloading, collection, aggregate handling, cement dumping, circulation of trucks and machinery inside the installations
Construction activities	Dust generation from construction sites, material stockpiles and access roads is a nuisance in the environment and can be a health hazard.	- Water the material stockpiles, access roads and bare soils on an as required basis to minimize the potential for environmental nuisance due to dust. Increase the watering frequency during periods of high risk (e.g. high winds). Stored materials such as gravel and sand shall be covered and confined to avoid their being wind-drifted - Minimize the extent and period of exposure of the bare surfaces - Reschedule earthwork activities or vegetation clearing activities, where practical, if necessary to avoid during periods of high wind and if visible dust is blowing off-site - Store the cement in silos and minimize the emissions from silos by equipping them with filters. - Establish adequate locations for storage, mixing and loading of construction materials, in a way that dust dispersion is prevented because of such operations - Crushing of rocky and aggregate materials shall be wet-crushed, or performed with particle emission control systems

8.18.10 Noise and Vibration Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction vehicular traffic	Noise quality will be deteriorated due to vehicular traffic	The Contractor shall • Maintain all vehicles in order to keep it in good working order in accordance with manufactures maintenance procedures • Make sure all drivers will comply with the traffic codes concerning maximum speed limit, driving hours, etc. • Organize the loading and unloading of trucks, and handling • operations for the purpose of minimizing construction noise on the work site
Construction machinery	Noise and vibration may have an impact on people, property, fauna, livestock and the natural environment.	The Contractor shall • Appropriately site all noise generating activities to avoid noise pollution to local residents • Use the quietest available plant and equipment • Modify equipment to reduce noise (for example, noise control kits, lining of truck trays or pipelines) • Maintain all equipment in order to keep it in good working order in accordance with manufactures maintenance procedures. Equipment suppliers and contractors shall present proof of maintenance register of their equipment. • Install acoustic enclosures around generators to reduce noise levels. • Fit high efficiency mufflers to appropriate construction equipment • Avoid the unnecessary use of alarms, horns and sirens
Construction activity	Noise and vibration may have an impact on people, property, fauna, livestock and the natural environment.	The Contractor shall • Notify adjacent landholders prior any typical noise events outside of daylight hours (6 pm to 7 am) if the construction works are being carried out near residential areas • Educate the operators of construction equipment on potential noise problems and the techniques to minimize noise emissions • Employ best available work practices on-site to minimize occupational noise levels • Install temporary noise control barriers where appropriate

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		- Notify affected people if major noisy activities will be undertaken, - e.g. pile driving - Plan activities on site and deliveries to and from site to minimize impact - Monitor and analyze noise and vibration results and adjust construction practices as required. - Avoid undertaking the noisiest activities, where possible, when working at night (6pm to 7 am) near the residential areas

8.18.11 Protection of Flora

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Vegetation clearance	Local flora are important to provide shelters for the birds, offer fruits and/or timber/fire wood, protect soil erosion and overall keep the environment very friendly to human-living. As such damage to flora has wide range of adverse environmental impacts.	The Contractor shall - Reduce disturbance to surrounding vegetation - Use appropriate type and minimum size of machine to avoid disturbance to adjacent vegetation. - Get approval from supervision consultant for clearance of vegetation. - Make selective and careful pruning of trees where possible to reduce need of tree removal. - Control noxious weeds by disposing of at designated dump site or burn on site. - Clear only the vegetation that needs to be cleared in accordance with the plans. These measures are applicable to both the construction areas as well as to any associated activities such as sites for stockpiles, disposal of fill and construction of diversion roads, etc. - Before excavation, mark the trees that must remain on the site and cannot be removed. - Do not burn off cleared vegetation – where feasible, chip or mulch and reuse it for the rehabilitation of affected areas, temporary access tracks or landscaping. Mulch provides a seed source, can limit embankment erosion, retains soil moisture and nutrients, and

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		encourages re-growth and protection from weeds. - Return topsoil and mulched vegetation (in areas of native vegetation) to approximately the same area of the roadside it came from. - Avoid work within the drip-line of trees to prevent damage to the tree roots and compacting the soil. - Minimize the length of time the ground is exposed or excavation left open by clearing and re-vegetate the area at the earliest practically possible. - Ensure excavation works occur progressively and re-vegetation done at the earliest - Provide adequate knowledge to the workers regarding nature protection and the need of avoid felling trees during construction - Supply appropriate fuel in the work caps to prevent fuel wood collection

8.18.12 Protection of Fauna

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Vegetation clearance	Clearance of vegetation may impact shelter, feeding and/or breeding of animals	The Contractor shall - Restrict the tree removal to the minimum required. - Retain tree hollows on site, or relocate hollows, where appropriate - Leave dead trees where possible as habitat for fauna - Identify the trees that require specific attention (e.g the hollow bearing trees) and fell them in a manner which reduces the potential for fauna mortality. Felled trees will be inspected after felling for fauna and if identified and readily accessible will be removed and relocated or rendered assistance if injured. After felling, hollow bearing trees will remain unmoved overnight to allow animals to move of their own volition.
Construction	Illegal poaching	Provide adequate knowledge to the workers

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
camps		regarding protection of flora and fauna, and relevant government regulations and punishments for illegal poaching.

8.18.13 Road Transport and Road Traffic Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction vehicular traffic	Increased traffic use of road by construction vehicles will affect the movement of normal road traffics and the safety of the road-users.	The Contractor shall • Prepare and submit a traffic management plan to the SC for their approval before commencement of construction. • Include in the traffic management plan to ensure uninterrupted traffic movement during construction: detailed drawings of traffic arrangements showing all detours, temporary road, temporary bridges temporary diversions, necessary barricades, warning signs/ lights, and road signs. • Provide signs at strategic locations of the roads complying with the schedules of signs contained in the Pakistan Traffic Regulations. • Install and maintain a display board at each important road intersection on the roads to be used during construction, which shall clearly show the following information in local language: ○ Location: chainage and village name ○ Duration of construction period ○ Period of proposed detour / alternative route ○ Suggested detour route map ○ Name and contact address/telephone number of the concerned personnel ○ Name and contact address / telephone number of the Contractor ○ Inconvenience is sincerely regretted.
Construction vehicular traffic	Accidents and spillage of fuels and chemicals	• Restrict truck deliveries, where practicable, to day time working hours (7 am to 6 pm). • Restrict the transport of oversize loads. • Operate road traffics/transport vehicles, if possible, to non-peak periods to minimize

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		traffic disruptions. Enforce on-site speed limit

8.18.14 Construction Camp Management

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Siting and Location of construction camps	Campsites for construction workers are the important locations that have significant impacts such as health and safety hazards on local resources and infrastructure of nearby communities.	The Contractor shall - Locate the construction camps within the proposed site - Consider the location of construction camps away from communities in order to avoid social conflict in using the natural resources such as water or to avoid the possible adverse impacts of the construction camps on the surrounding communities. - Submit to the SC for approval a detailed layout plan for the development of the construction camp showing the relative locations of all temporary buildings and facilities that are to be constructed together with the location of site roads, fuel storage areas (for use in power supply generators), solid waste management and dumping locations, and drainage facilities, prior to the development of the construction camps. - Local authorities responsible for health, religious and security shall be duly informed on the set up of camp facilities so as to maintain effective surveillance over public health, social and security matters
Construction Camp Facilities	Lack of proper infrastructure facilities, such as housing, water supply and sanitation facilities will increase pressure on the local services and generate substandard living standards and health hazards.	Contractor shall provide the following facilities in the campsites - Housing facilities for all the non-local workers hired by the contractor - Safe and reliable water supply. - Hygienic sanitary facilities and sewerage system. The toilets and domestic waste water will be collected through a common sewerage. Provide separate latrines and bathing places for males and females with total isolation by wall or by location. The minimum number of

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		toilet facilities required is one toilet for every ten persons. • Treatment facilities for sewerage of toilet and domestic wastes • Storm water drainage facilities. Both sides of roads are to be provided with shallow v drains to drain off storm water to a silt retention pond which shall be sized to provide a minimum of 20 minutes retention of storm water flow from the whole site. Channel all discharge from the silt retention pond to natural drainage via a grassed swale at least 20 meters in length with suitable longitudinal gradient. • Paved internal roads. Ensure with grass/vegetation coverage to be made of the use of top soil that there is no dust generation from the loose/exposed sandy surface. Pave the internal roads of at least haring-bond bricks to suppress dusts and to work against possible muddy surface during monsoon. • Provide child crèches for women working construction site. The crèche shall have facilities for dormitory, kitchen, indoor and outdoor play area. Schools shall be attached to these crèches so that children are not deprived of education whose mothers are construction workers • Provide in-house community/common entertainment facilities. dependence of local entertainment outlets by the construction camps to be discouraged/prohibited to the extent possible.
Disposal of waste	Management of wastes is crucial to minimize impacts on the environment	The Contractor shall • Ensure proper collection and disposal of solid wastes within the construction camps • Insist waste separation by source; organic wastes in one pot and inorganic wastes in another pot at household level. • Store inorganic wastes in a safe place within the household and clear organic wastes on daily basis to waste collector. Establish waste collection, transportation and disposal systems with the manpower and equipment/vehicles needed. • Dispose organic wastes in a designated safe

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		place on daily basis. At the end of the day cover the organic wastes with a thin layer of sand so that flies, mosquitoes, dogs, cats, rats, are not attracted. One may dig a large hole to put organic wastes in it; take care to protect groundwater from contamination by leachate formed due to decomposition of wastes. Cover the bed of the pit with impervious layer of materials (clayey or thin concrete) to protect groundwater from contamination. • Locate the garbage pit/waste disposal site min 500 m away from the residence so that peoples are not disturbed with the odor likely to be produced from anaerobic decomposition of wastes at the waste dumping places. Encompass the waste dumping place by fencing and tree plantation to prevent children to enter and play with. • Do not establish site specific landfill sites. All solid waste will be collected and removed from the work camps and disposed in approval waste disposal sites.
Fuel supplies for cooking purposes	Illegal sourcing of fuel wood by construction workers will impact the natural flora and fauna	The Contractor shall • Provide fuel to the construction camps for their domestic purpose, in order to discourage them to use fuel wood or other biomass. • Made available alternative fuels like natural gas or kerosene on ration to the workforce to prevent them using biomass for cooking. • Conduct awareness campaigns to educate workers on preserving the protecting the biodiversity and wildlife of the project area, and relevant government regulations and punishments on wildlife protection.
Health and Hygiene	There will be a potential for diseases to be transmitted including COVID 19, heat stroke, malaria, exacerbated by inadequate health and safety practices. There will be an increased risk of work crews spreading sexually transmitted infections and HIV/AIDS.	The Contractor shall • Provide adequate health care facilities within construction sites. • Provide first aid facility round the clock. Maintain stock of medicines in the facility and appoint fulltime designated first aider or nurse. • Provide ambulance facility for the laborers during emergency to be transported to nearest hospitals. • Initial health screening of the laborers coming

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		from outside areas - Train all construction workers in basic sanitation and health care issues and safety matters, and on the specific hazards of their work - Provide COVID 19, heat stroke and HIV awareness programming, including STI (sexually transmitted infections) and HIV information, education and communication for all workers on regular basis - Complement educational interventions with easy access to condoms at campsites as well as voluntary counseling and testing - Provide adequate drainage facilities throughout the camps to ensure that disease vectors such as stagnant water bodies and puddles do not form. Regular mosquito repellent sprays during monsoon. - Carryout short training sessions on best hygiene practices to be mandatorily participated by all workers. Place display boards at strategic locations within the camps containing messages on best hygienic practices
Safety	In adequate safety facilities to the construction camps may create security problems and fire hazards	The Contractor shall - Provide appropriate security personnel (police / home guard or private security guards) and enclosures to prevent unauthorized entry in to the camp area. - Maintain register to keep a track on a head count of persons present in the camp at any given time. - Encourage use of flameproof material for the construction of labor housing / site office. Also, ensure that these houses/rooms are of sound construction and capable of withstanding wind storms/cyclones. - Provide appropriate type of firefighting equipment suitable for the construction camps - Display emergency contact numbers clearly and prominently at strategic places in camps. - Communicate the roles and responsibilities of laborers in case of emergency in the monthly meetings with contractors.
Site	Restoration of the construction	The Contractor shall

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Restoration	camps to original condition requires demolition of construction camps.	- Dismantle and remove from the site all facilities established within the construction camp including the perimeter fence and lockable gates at the completion of the construction work. - Dismantle camps in phases and as the work gets decreased and not wait for the entire work to be completed - Give prior notice to the laborers before demolishing their camps/units - Reuse the demolition debris to a maximum extent. Dispose remaining debris at the designated waste disposal site. - Handover the construction camps with all built facilities as it is if agreement between both parties (contractor and land-owner) has been made so. - Restore the site to its condition prior to commencement of the works or to an agreed condition with the landowner. - Not make false promises to the laborers for future employment in O&M of the project.

8.18.15 Socio-Cultural and Religious Issues

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Construction activities near residential areas	Disturbance from construction activities (dust, noise, traffic, conflicts with contractor's work force etc.)	The Contractor shall - Establish a system for receiving complaints from the community and address them (the community can also make complaints to the GRM established under the project) - Shall ensure all the construction workers follows the following code of conduct: - All workers are strictly forbidden to establish any kind of relationship with local women bring any un-related women to the project site. - All workers should avoid sexual harassment and child abuse. - All workers must not leave the camps or

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		work sites unless a written authorization is issued by the respective supervisor The contractors will advise and prohibit the local population and its authorities or representatives not to enter the project operation areas (camp sites, colonies, etc.) in order to minimize the potential risk of incidents related to the operations.
Construction activities near Religious and cultural sites	Disturbance from construction works to the cultural and religious sites, and contractors lack of knowledge on cultural issues cause social disturbances.	The Contractor shall - Communicate to the public through community consultation and newspaper announcements regarding the scope and schedule of construction, as well as certain construction activities causing disruptions or access restriction. - Do not block access to cultural and religious sites, wherever possible - Restrict all construction activities within the foot prints of the construction sites. - Stop construction works that produce noise (particularly during prayer time) shall there be any mosque/religious/educational institutions close to the construction sites and users make objections. - Take special care and use appropriate equipment when working next to a cultural/religious institution. - Stop work immediately and notify the site manager if, during construction, an archaeological or burial site is discovered. It is an offence to recommence work in the vicinity of the site until approval to continue is given by the SC/RUDA. - Provide separate prayer facilities to the construction workers. - Show appropriate behavior with all construction workers especially women and elderly people - Allow the workers to participate in praying during construction time - Resolve cultural issues in consultation with local leaders and supervision consultants - Establish a mechanism that allows local people to raise grievances arising from the construction process.

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		Inform the local authorities responsible for health, religious and security duly informed before commencement of civil works so as to maintain effective surveillance over public health, social and security matters

8.18.16 Worker Health and Safety

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
Best practices	Construction works may pose health and safety risks to the construction workers and site visitors leading to severe injuries and deaths. The population in the proximity of the construction site and the construction workers will be exposed to a number of (i) biophysical health risk factors, (e.g. noise, dust, chemicals, construction material, solid waste, waste water, vector transmitted diseases etc), (ii) risk factors resulting from human behavior (e.g. COVID 19, heat stroke, STD, HIV etc) and (iii) road accidents from construction traffic.	The Contractor shall - Implement suitable safety standards for all workers and site visitors which shall not be less than those laid down on the international standards (e.g. International Labor Office guideline on 'Safety and Health in Construction; World Bank Group's 'Environmental Health and Safety Guidelines') and contractor's own national standards or statutory regulations, in addition to complying with the national standards of the Government of Pakistan (- Provide the workers with a safe and healthy work environment, taking into account inherent risks in its particular construction activity and specific classes of hazards in the work areas, - Provide personal protection equipment (PPE) for workers, such as safety boots, helmets, masks, gloves, protective clothing, goggles, full-face eye shields, and ear protection. Maintain the PPE properly by cleaning dirty ones and replacing them with the damaged ones. - Safety procedures include provision of information, training and protective clothing to workers involved in hazardous operations and proper performance of their job - Appoint an environment, health and safety manager to look after the health and safety of the workers - Inform the local authorities responsible for health, religious and security duly informed

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		before commencement of civil works and establishment of construction camps so as to maintain effective surveillance over public health, social and security matters
Best practices	Child and pregnant labor	The Contractor shall not hire children of less than 16 years of age and pregnant women or women who delivered a child within 8 preceding weeks, in accordance with the national Labor Laws
Accidents	Lack of first aid facilities and health care facilities in the immediate vicinity will aggravate the health conditions of the victims	- Provide health care facilities and first aid facilities are readily available. Appropriately equipped first-aid stations shall be easily accessible throughout the place of work - Document and report occupational accidents, diseases, and incidents. - Prevent accidents, injury, and disease arising from, associated with, or occurring in the course of work by minimizing, so far as reasonably practicable, the causes of hazards. In a manner consistent with good international industry practice. - Identify potential hazards to workers, particularly those that may be life-threatening and provide necessary preventive and protective measures. - Provide awareness to the construction drivers to strictly follow the driving rules - Provide adequate lighting in the construction area and along the roads
Construction Camps	Lack of proper infrastructure facilities, such as housing, water supply and sanitation facilities will increase pressure on the local services and generate substandard living standards and health hazards.	The Contractor shall provide the following facilities in the campsites to improve health and hygienic conditions as mentioned in ECP 14 Construction Camp Management - Adequate ventilation facilities - Safe and reliable water supply - Hygienic sanitary facilities and sewerage system. The toilets and domestic waste water will be collected through a common sewerage. - Treatment facilities for sewerage of toilet and domestic wastes - Storm water drainage facilities. - Recreational and social facilities - Safe storage facilities for petroleum and other chemicals in accordance with ECP 2

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		- Solid waste collection and disposal system in accordance with ECP1. - Arrangement for trainings - Paved internal roads. - Security fence at least 2 - 3 m height. - Sick bay and first aid facilities
Water and sanitation facilities at the construction sites	Lack of Water sanitation facilities at construction sites cause inconvenience to the construction workers and affect their personal hygiene.	The contractor shall provide portable toilets at the construction sites, if about 25 people are working the whole day for a month. Location of portable facilities shall be at least 6 m away from storm drain system and surface waters. These portable toilets shall be cleaned once a day and all the sewerage shall be pumped from the collection tank once a day and shall be brought to the common septic tank for further treatment. Contractor shall provide bottled drinking water facilities to the construction workers at all the construction sites.
Other ECPs	Potential risks on health and hygiene of construction workers and general public	The Contractor shall follow the following ECPs to reduce health risks to the construction workers and nearby community ECP 2: Fuels and Hazardous Goods Management ECP 4: Drainage Management ECP 9: Air Quality Management ECP 10: Noise and Vibration Management ECP 13: Road Transport and Road Traffic Management
Trainings	Lack of awareness and basic knowledge in health care among the construction workforce, make them susceptible to potential diseases.	The Contractor shall - Train all construction workers in basic sanitation and health care issues (e.g., how to avoid malaria, Dengue, heat stroke, COVID-19 and transmission of sexually transmitted infections (STI) HIV/AIDS. - Train all construction workers in general health and safety matters, and on the specific hazards of their work. Training shall consist of basic hazard awareness, site specific hazards, safe work practices, and emergency procedures for fire, evacuation, and natural disaster, as appropriate. - Commence the malaria, Dengue heat stroke, COVID-19, HIV/AIDS and STI education campaign before the start of the construction phase and complement it with by a strong condom marketing, increased access to

Project Activity/ Impact Source	Environmental Impacts	Mitigation Measures/ Management Guidelines
		condoms in the area as well as to voluntary counseling and testing. Implement malaria, COVID-19, heat stroke, HIV/AIDS and STI education campaign targeting all workers hired, international and national, female and male, skilled, semi- and unskilled occupations, at the time of recruitment and thereafter pursued throughout the construction phase on ongoing and regular basis. This shall be complemented by easy access to condoms at the workplace as well as to voluntary counseling and testing.

8.19 AUDITS AND ANNUAL REVIEW OF EMP

Internal environmental and social audits will be held with an objective to review the effectiveness of environmental management of the project. RUDA will carry out annual review of the appropriateness and adequacy of EMP in the light of its own monitoring and supervision as well as on the basis of the third party monitoring and audits. RUDA will revise the EMP in case substantial gaps and shortcomings are identified in these plans.

External third party environmental audits will be held with an objective to review the effectiveness of environmental and social management of the project independently. It is proposed that third party carry out these audits on yearly basis. These audits would be used to re-examine the continued appropriateness of the EMP and to provide advice on any updates required.

8.20 NON-COMPLIANCE OF EMP

The implementation of the proposed EMP involves inputs from various functionaries. The Contractor will be primarily responsible for ensuring implementation of the mitigation measures proposed in the EIA including EMP and Environmental Permit from EPD Punjab, which will be part of the contract documents. The provision of the environmental mitigation cost will be made in the total cost of Project, for which the Contractor will be paid on the basis of monthly compliance reports. However, if the Contractor fails to comply with the implementation of EIA including EMP and Environmental Permit from EPD Punjab and submission of the monthly compliance reports, deductions will be made from the payments to the Contractor claimed under the heads of environmental components.

8.21 BUDGET FOR IMPLEMENTATION OF EMP

8.21.1 Cost for Testing of Ambient Air, Noise, Water

Testing and analysis for soil, ambient air, noise, water and wastewater shall be undertaken during pre-construction and construction to ensure the effectiveness of the proposed mitigation measures. Certain environmental parameters shall be selected and quantitative analysis shall be carried out. The results of analysis must be compared with the guidelines; standards and pre-project conditions to investigate whether the EMP and its implementation are effective for the mitigation of impacts or not. Parameters to be analyzed during pre-construction and construction of the project and responsibilities for monitoring and reporting have been discussed in the **Table 8.6**.

NOT FOR USE OF BID SUBMISSION

Table 8-6: Environmental Monitoring and Testing Cost Estimate

Sr. No.	Parameter	Mechanism	Frequency	Quantity	Remarks
A	Pre- Construction Phase				
1	Water / Wastewater	Discrete grab sampling and laboratory testing of water/wastewater samples by EPD approved Laboratory for monitoring.	Once from each source	08 (04 drinking water and 04 wastewater)	One-time monitoring shall be carried out before the construction commencement.
2	Noise Levels	dBA Leq. as per PEQS by EPD approved Laboratory	Once	04	
3	Ambient Air Monitoring	Monitoring of CO, SO _x , NO _x , and PM _{2.5} PM ₁₀ by EPD approved Laboratory	Once	04	
B	Construction Phase				
1	Water / Wastewater	Discrete grab sampling and laboratory testing of water/wastewater samples by EPD approved Laboratory for monitoring.	Quarterly from each source	03 (01 drinking water and 01 wastewater and 1 surface water)	The Contractor shall quote quarterly monitoring cost for the one-year construction period and will be updated each year based on latest rates during construction timeline of the proposed Project.
2	Noise Levels	dBA Leq. as per PEQS by EPD approved Laboratory	Quarterly	02	
3	Ambient Air Monitoring	Monitoring of CO, SO _x , NO _x , and PM _{2.5} PM ₁₀ by EPD approved Laboratory	Quarterly	02	