



# **RAVI URBAN DEVELOPMENT AUTHORITY**

**GOVERNMENT OF THE PUNJAB**



## **ENVIRONMENTAL IMPACT ASSESSMENT (EIA) OF 132kV GRID STATION AT CHAHAR BAGH CB-I & CB-II**



**June 2025**



**Mirza Associates Engineering Services  
(Pvt.) Ltd.**

## **Executive Summary**

### **Title and Location of the Project**

The 132kV Grid Station at Chahar Bagh CB-I & CB-II is a vital infrastructure project initiated by the Ravi Urban Development Authority (RUDA) to meet the electricity demands of the Chahar Bagh development area. A single grid station is being established to cater to both Chahar Bagh CB-I and CB-II. The proposed grid station is geographically located at coordinates 31°36'51.3"N, 74°26'15.4"E, and will be easily accessible via the Lahore Ring Road, ensuring convenient access for construction, operation, and future maintenance activities.

### **Name of the Project Proponent**

Ravi Urban Development Authority (RUDA) Government of Punjab is the proponent for proposed Grid Station Project.

### **Name of the Organization Preparing the Report**

RUDA has engaged M/s Mirza Associates Engineering Services (MAES) Pvt. Ltd. for the preparation of an Environmental Impact Assessment (EIA) of the proposed project.

### **Brief Introduction**

The proposed 132kV Grid Station at Chahar Bagh CB-I & CB-II, Lahore is a critical infrastructure component designed to address the growing electricity demands of the area. This initiative is being undertaken under the jurisdiction of the RUDA and forms an integral part of the Authority's broader urban development and expansion strategy.

The Environmental Impact Assessment (EIA) for the project aims to identify, evaluate, and mitigate potential environmental and social impacts, ensuring that the project complies with the requirements of the Pakistan Environmental Protection Act (PEPA), 1997, and adheres to the Punjab Environmental Quality Standards (PEQS). This assessment ensures that development proceeds in an environmentally responsible and socially inclusive manner.

### **Description of Project**

The Grid Station Project for Chahar Bagh CB-I & CB-II has been proposed by RUDA to enhance the power distribution infrastructure while keeping in view the growing electricity demand. This grid station comprises of 132kV of voltage which will play a role in improving the reliability and efficiency of the power supply network, thereby fostering regional economic development and improving the quality of life for local communities. This project will cover an area of 12 Kanals situated between CB-I & CB-II. The infrastructure investment involved in the project will be power transformers, switchgear, control rooms, and transmission lines connecting the station to the broader electrical grid. Approx 5 km new transmission line will be installed from existing 132 kV Momin Pura GS operated by LESCO to the new 132kV Chahar Bagh GS.

The project follows the Pakistan's environmental regulations, requiring an Environmental Impact Assessment (EIA). The EIA assesses potential environmental, biological, social, and economic impacts, ensuring risks are managed and mitigation measures are implemented. Through these efforts, the project aims to meet growing electricity demands sustainably while benefiting local communities and minimizing adverse impacts on the environment and society.

### **Institutional Responsibilities and Stakeholders**

Institutional responsibilities play a critical role in conducting the environmental assessments and recommending mitigation measures. Stakeholders in the EIA process include local communities, who may be impacted by the project through changes in land use, noise, or air quality. These communities will be engaged early in the process to address concerns and ensure that their rights and interests are considered. Engaging these institutions and stakeholders throughout the EIA process helps to create a transparent and accountable approach, ensuring the project aligns with both environmental and social sustainability goals.

### **Project Categorization**

According to Punjab Environmental Protection (Review of Initial Environmental Examination and Environmental Impact Assessment) Regulations 2022, The project (CB-I & CB-II) falls under SCHEDULE – II Category: A Energy, Sub-category: 2 Transmission lines more than 132 kV and Grid Station (GS). Hence, this project, i.e., 132 kV GS requires an EIA to be submitted to EPA Punjab as highlighted in ANNEX-1.

The environmental and social screening of the 132 kV Grid Station has been conducted to determine the appropriate level of impact evaluation and mitigation measures. It has minimal concerns like Road Construction, dust and noise.

To ensure a consistent, efficient, and comprehensive approach, an EIA has been prepared for Grid Station. This strategy helps in standardizing impact assessments, mitigation measures, and stakeholder consultations, ensuring compliance with EPA. By streamlining the approval process and reducing redundancy, the EIA offers a cost-effective and time-efficient framework for managing environmental and social risks. However, site-specific Environmental Management Plan is still developed where localized mitigation is required.

### **Physical Baseline**

The physical baseline of the proposed 132kV Grid Station for Chahar Bagh CB-I & CB-II encompasses critical environmental and geographic features essential for informed project planning and sustainable infrastructure development.

The project site is located in the Indus Alluvial Plain, a geologically young and fertile region formed by the sedimentary activity of the Ravi River and its tributaries. The subsurface is composed primarily of unconsolidated alluvial deposits, including layers of sand, silt, and clay, indicative of fluvial processes over thousands of years. This sediment composition provides moderate to high permeability and contributes to the area's agricultural fertility.

The terrain is flat to gently undulating, typical of riverine plains, with well-drained soils. The land is primarily used for mixed agriculture and urban expansion. The biological baseline for the proposed 132kV Grid Station for Chahar Bagh CB-I & CB-II soil texture is predominantly loamy to silty, supporting vegetation and farming, though some areas may be prone to seasonal waterlogging without adequate drainage systems.

The ambient air quality in the Chahar Bagh area generally reflects rural to peri-urban standards, with low concentrations of industrial pollutants. Background levels of particulate matter and vehicular emissions are moderate, with potential episodic increases near transport corridors such as Lahore Ring Road.

The acoustic environment is largely quiet and stable, owing to its semi-urban setting. Elevated noise levels are noted only in the vicinity of the Lahore Ring Road, where vehicular traffic contributes to intermittent spikes in sound intensity. Otherwise, the area maintains ambient noise levels within national permissible limits for residential zones.

Chahar Bagh falls under a semi-arid to sub-humid climatic zone, characterized by hot summers and mild winters. The site receives monsoonal rainfall, primarily from July to September. Groundwater is the primary source of water supply and lies at moderate depths, influenced by seasonal variations and local abstraction rates.

The region is located in a low to moderate seismic zone (Zone 2B), as per the Building Code of Pakistan (BCP), necessitating standard structural design precautions but not posing high seismic risk.

### **Biological Baseline**

The biological baseline for the proposed 132kV Grid Station for Chahar Bagh CB-I & CB-II reflects the existing ecological conditions of the project site, which consists primarily of agricultural fields and waste land. These areas fall within a semi-arid ecological zone, where natural vegetation is sparse due to prolonged agricultural use and land degradation.

The flora around the grid station site includes a mix of cultivated crops and scattered trees typically planted for shade and soil conservation. Notable species observed include Peepal (*Ficus religiosa*), Neem (*Azadirachta indica*), and Acacia spp., commonly found along field boundaries and rural settlements. Wheat and other seasonal crops dominate the actively farmed plots.

Faunal diversity in the vicinity is low, consisting of common and adaptable species. Birds such as crows and sparrows are frequently observed, while amphibians and reptiles, including various toads are present but in low densities, likely due to limited natural habitat.

To minimize ecological disturbance, the design and routing of associated transmission lines have been carefully aligned to avoid direct interference with sensitive habitats, nesting areas, and potential wildlife movement corridors. This approach helps ensure the protection of local biodiversity and reduces the likelihood of habitat fragmentation.

### **Socioeconomic Baseline**

The socioeconomic baseline for the proposed 132kV Grid Station for Chahar Bagh CB-I & CB-II provides an overview of the social, economic, and cultural characteristics of the project area. The location is primarily semi-urban, where agriculture remains the dominant livelihood source, with wheat being the main cultivated crop.

The local population largely comprises middle- to low-income households, many of whom depend on subsistence farming or daily wage labor. Employment opportunities are limited, and income levels are generally modest. Access to education and healthcare varies, with better facilities available in nearby urban centers. The literacy rate is moderate, though gender disparities persist in both education and employment opportunities.

Housing in the area includes a mix of semi-permanent and permanent structures. Land ownership is an important socioeconomic factor, with most households either owning or leasing agricultural plots. Basic services such as electricity and clean drinking water are available, but in many instances, the supply is inadequate or inconsistent.

The transmission line associated with the grid station is aligned along RUDA-owned and land adjacent to roadways, ensuring that no agricultural lands, commercial areas, or residential settlements are adversely affected. This alignment helps prevent displacement and maintains continuity of local livelihoods and land use.

### **Stakeholder Consultation**

Consultation is an inclusive process that ensures meaningful engagement with stakeholders throughout the project lifecycle. This requires open and transparent interaction with all relevant stakeholders during project planning, implementation, and operation stages.

The consultation process was conducted from April to May 2025. The feedback from the consultations was largely supportive of the project from both local communities and government agencies. However, there was a general request to maximize the project's benefits for local communities.

Key concerns raised during the consultations—such as skill development, employment opportunities for unskilled labor from the project area, assistance with local mobility, pollution from construction machinery, community safety awareness campaigns, approval from Environmental Protection Agency (EPA), tree plantation, and effluent disposal—have been acknowledged and incorporated into the EIA.

### **Environmental Impacts**

The anticipated impacts during the construction phase include localized increases in dust, noise, and emissions, as well as the potential for soil and water contamination. These impacts are temporary and can be mitigated with proper environmental management practices. During the operational phase, waste management and electromagnetic field (EMF) exposure are identified as key concerns, both of which are manageable through the proposed mitigation measures.

### **Construction Phase Impacts and Residual Impacts**

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### **Soil and Groundwater Pollution:**

- Risk from wastewater discharges, fuel/oil spills, and poor material storage.
- Residual Impact: Minor, if proper drainage, spill containment, and material handling practices are implemented.

### **Sediment Runoff During Earthworks:**

- Site preparation and foundation activities during rain can carry sediment to nearby areas.
- Residual Impact: Low, with erosion control, sediment traps, and scheduling during dry periods.

### **Air and Noise Emissions:**

- Dust and noise from machinery and vehicles may temporarily disturb nearby communities (residences ~50 m away).
- Residual Impact: Low, with use of water sprinkling, noise control equipment, and scheduling of work hours.

### **Waste Generation from Construction and Camps:**

- Waste from construction debris and workers' camps (up to 60 kg/day for 100 workers).
- Residual Impact: Low, if waste is segregated, safely stored, and regularly collected for disposal or recycling.

### **Traffic and Road Safety:**

- Increased movement of heavy vehicles may impact local roads and expose communities to accidents.
- Residual Impact: Moderate, unless traffic management, speed control, and signage are enforced.

### **Minor Vegetation Clearing:**

- Only minor clearance of ground vegetation at GS site; no trees or sensitive flora/fauna affected.
- Residual Impact: Negligible, with restoration of cleared areas post-construction.

### **Community Health and Safety Risks:**

- Influx of labor may lead to social conflict, communicable disease risks, and increased traffic hazards.

- Residual Impact: Low, with health screening, awareness campaigns, local labor hiring, and traffic safety measures.

### **Operation Phase Impacts and Residual Impacts**

#### **Bird Electrocutation and Collision:**

- Not expected due to no migratory bird zones and adequate spacing between 132 kV conductors (>10 m).
- Residual Impact: Negligible, due to standard line design and lack of sensitive avian habitats.

#### **Operational Waste Generation:**

- Waste from broken equipment, used oil, and solid waste from office and employee colony.
- Residual Impact: Low, if hazardous and general waste is managed under a structured disposal system.

#### **Community Health (Restricted Access):**

- Minimal public exposure due to restricted site access.
- Residual Impact: None to negligible.

#### **Employee Welfare (Water, Sanitation, Drainage):**

- Potential health risks due to inadequate facilities.
- Residual Impact: Minor, with adequate provision and maintenance of utilities and hygiene infrastructure.

#### **EMF and Noise Emissions:**

- Potential long-term impact on nearby receptors if levels exceed safe limits.
- Residual Impact: Low, if design complies with international EMF and noise exposure standards and is regularly monitored.

### **Environmental Management Plan**

The Environmental Management Plan (EMP) outlines mitigation measures to address the environmental and social impacts associated with the construction of the grid station and transmission line. These measures include:

- Implementation of dust and noise control strategies to minimize air and noise pollution during excavation, foundation work, and equipment installation.
- Proper disposal and management of construction and operational waste, including hazardous materials such as transformer oil and insulating materials, to prevent environmental contamination.

- Strict safety protocols to protect workers and nearby communities from risks related to high-voltage equipment, heavy machinery, electrocution hazards, and working at heights.
- Establishment of buffer zones and safe clearance distances from settlements to minimize health and safety risks associated with electromagnetic fields (EMF) from transmission lines.
- Implementation of soil erosion and sediment control measures, particularly in areas where transmission towers are installed on slopes or near water bodies.
- Vegetation management, including controlled tree trimming and replantation programs, to mitigate deforestation and habitat disruption along the transmission line corridor.
- Continuous stakeholder engagement to ensure community concerns are addressed, particularly regarding compensation, and potential livelihood impacts.
- Establishment of a Grievance Redress Mechanism (GRM) to handle complaints related to construction activities, safety concerns, and environmental impacts throughout the project lifecycle.

## Conclusion

The environmental impact assessment of the proposed RUDA Chahar Bagh CB-I & CB-II 132 kV Grid Station and associated transmission line shows that the project is largely benign in terms of its location and scale. The Grid Station will be built on land already owned by RUDA, and the transmission line will not require private land. The project does not intersect with any environmentally sensitive areas, protected forests, or wildlife sanctuaries. No tree cutting is anticipated ; instead, the project includes tree plantation within the Grid Station boundaries to improve ecological conditions.

## Recommendations

Nevertheless, the construction phase may cause temporary negative impacts such as dust, noise, water and soil contamination, and risks to occupational and community health and safety. These impacts are typical of infrastructure development and are not expected to persist beyond the construction period. They can be effectively mitigated through the adoption of best construction practices and implementation of the Environmental Management Plan (EMP). On the positive side, the project is expected to significantly enhance electricity transmission reliability and create short-term employment opportunities, contributing to local socio-economic uplift.

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## Table of Abbreviations

• AIS:	Air Insulated Substation
• AOI:	Area of Influence
• BCP:	Building Code of Pakistan
• BOD:	Biochemical Oxygen Demand
• BSH:	Basic Sanitation and Hygiene
• CB-I:	Chahar Bagh-I
• CB-II:	Chahar Bagh-II
• CBOs:	Community Based Organizations
• CC:	Consulting Company
• CCPO:	Capital City Police Officer
• CMP:	Construction Management Plan
• CO:	Carbon Monoxides
• dB:	Decibel
• DC:	Deputy Commissioner
• DCO:	District Coordination Officer
• DESCOS:	Distribution Electric Supply Companies
• DO:	Divisional Officer
• DP:	Displaced Person
• DR:	Disaster Risk
• EIA:	Environmental Impact Assessment
• EMDS:	Environmental Monitoring Data Sheet
• EMF:	Electromagnetic Field
• EMP:	Environmental Management Plan
• EPA:	Environmental Protection Agency
• EPC:	Engineering, Procurement and Construction
• FMC:	Field Monitoring Committee
• GIS:	Gas Insulated Substation
• GoP:	Government of Punjab
• GS:	132 kV Grid Station
• HAZCHEM:	Hazardous Chemicals
• HH:	Household
• HSE:	Health, Safety, and Environment
• ICNIRP:	International Commission on Non-Ionizing Radiation Protection
• ICWIRP:	Integrated Community Water Infrastructure Rehabilitation Project
• IUCN:	International Union for Conservation of Nature
• LDL:	Lowest Detection Limit
• LESCO:	Lahore Electricity Supply Company
• LOR:	Limit for Reporting
• mg/m <sup>3</sup> :	Milligrams per Cubic Meter

- MLL: Minimum Livelihood Level
- MSDS: Material Safety Data Sheet
- ND: Not Detecting
- NEPRA: National Electric Power Regulatory Authority
- NEQS: National Environmental Quality Standards
- NGOs: Non-Governmental Organization
- NOC: No Objection Certificate
- NO<sub>x</sub>: Nitrogen Oxides
- O & M: Operation and Maintenance
- ODSS: Occupational Disease Surveillance System
- OHS: Occupational Health and Safety
- PAPs: Project Affected Persons
- PCBS: Polychlorinated Biphenyls
- PEPA: Pakistan Environmental Protection Act
- PEPCO: Pakistan Electric Power Company
- PEQs: Punjab Environmental Quality Standards
- PHA: Parks and Horticulture Authority
- PM: Particulate Matter
- POPs: Persistent Organic Pollutants
- PPE: Personal Protection Equipment
- RoW: Right of Way
- RUDA: Ravi Urban Development Authority
- SF<sub>6</sub>: Sulfur Hexafluoride
- SMOG: Smoke and Fog (Air Pollution)
- SMP: Social Management Plan
- SO<sub>2</sub>: Sulphur Dioxide
- SPSS: Package for the Social Sciences
- SSEMP: Site-Specific Environmental Management Plan
- T/Ls: Transmission Lines
- TC: Tehsil Council
- TDS: Total Dissolved Solids
- TEPA: Traffic Engineering & Planning Agency
- UC: Union Council
- WAP: Worker Accommodation Plan
- WHO: World Health Organization
- µg/m<sup>3</sup>: Micrograms per Cubic Meter

# 1 INTRODUCTION

## 1.1 Description of Project

The Client of Grid Station Project for Chahar Bagh CB-I & CB-II is Ravi Urban Development Authority (RUDA), which aims to enhance the power distribution infrastructure while considering the growing electricity demand. The proposed project falls under the administrative jurisdiction of District Lahore. The proposed GS will cover almost 12 Kanal. The project is geographically located within the Chahar Bagh and it can be accessible through Lahore Ring Road. Location Map of the 132 kV Grid Station (GS) with the co-ordinates of 31°36'51.3"N, 74°26'15.4"E is shown in Figure 1-1. The new 132 kV GS will be connected with existing Moninpura GS through 11 kV feeder with a help of approximately 5 km long transmission line (TL). The co-ordinates of Momin Pura GS are 31°35'26.8"N 74°26'14.7"E as shown in Figure 1-2.

The site is primarily vacant land designated for infrastructure development, with nearby agriculture land, residential and commercial plots. The key components of the project include the GS, control room, transformers, switchgear, and a distribution system. Transmission lines and poles will be installed to ensure connectivity and power distribution. Additional components include access roads, perimeter fencing, drainage systems, and waste management facilities to ensure operational efficiency and environmental sustainability.

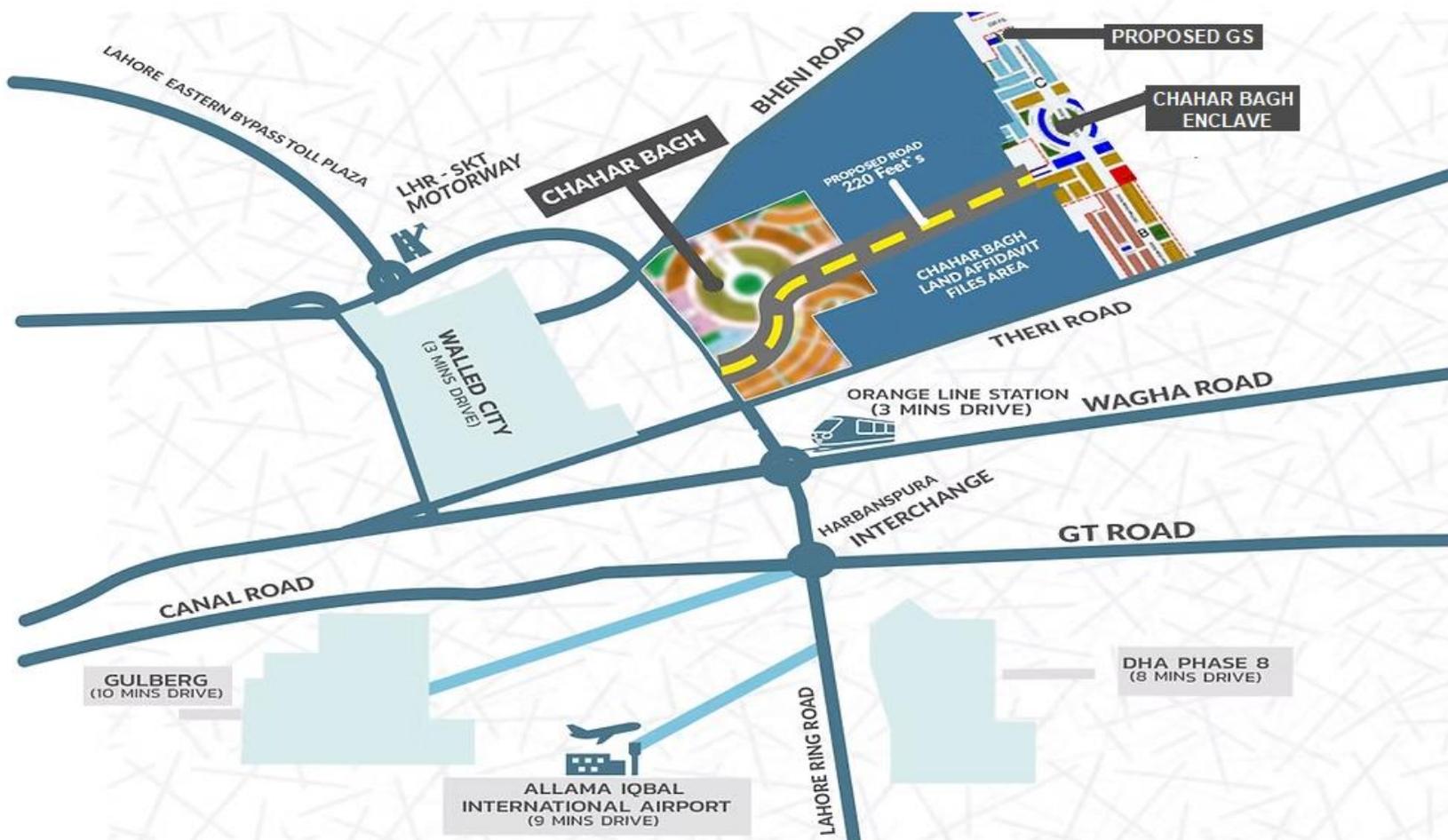


Figure 1-1 Location of Proposed G



Figure 1-2 Existing 132kV GS Momin Pura LESCO GS

The transmission line which will cover approximately 5 km distance along the Chahar Bagh society and along the roadside. The connectivity plan of GS with 132kV GS Momin Pura, LESCO is shown below in Figure 1-3.



Figure 1-3 Connectivity Plan of GS with Momin Pura GS

The proposed project components include the layout of the grid station, construction of a boundary wall, designated entry and exit points, and internal circulation arrangements. While the access road is part of the broader Chahar Bagh development, for which the EIA has already been conducted and approved, it will facilitate connectivity to the grid station site. The project will also include arrangements for labor and contractor staff, including temporary offices and accommodation facilities within the project area. Nearest waste disposal site and water source have been identified to support construction and operational needs. The setup will further include the installation of necessary instruments and supporting infrastructure such as labor camps, storage areas, and other ancillary buildings within the project premises.

## **1.2 Environmental Assessment of the Project**

This Environmental Impact Assessment (EIA) has been prepared by the close coordination of RUDA, the Client and MAES, consultants and submitted to the EPA for the Project NOC. Environmental Assessment of the GS project has been carried out in accordance with the EPA guidelines with an objective to: (i) ensure all relevant environmental and social issues are mainstreamed into the design and implementation of the proposed project, (ii) consider in an integrated manner the potential environmental and social risks, benefits and impacts of the proposed project and identify measures to avoid, minimize and manage risks and impacts, while enhancing benefits, and (iii) ensure compliance with national requirements.

## **1.3 EIA Study Methodology**

EIA is a critical component of the GS which will be installed by RUDA. This study establishes the existing environmental conditions of the areas surrounding each proposed grid station to assess potential environmental and social impacts effectively.

### **1.3.1 Key Components of the EIA/Baseline Study Area**

#### **1.3.1.1 Geographical Scope:**

The study area includes the land designated for the construction of the GS and surrounding areas likely to be affected during construction and operational phases. Typically, a radius of 500 metres around the site is considered to capture direct and indirect impacts.

#### **Environmental Baseline:**

- **Topography and Soil:** Identification of terrain, soil types, and land use patterns at each site.
- **Air Quality and Noise Levels:** Measurements of current air pollution and noise levels to compare post-project changes.
- **Water Resources:** Assessment of surface and groundwater quality and availability.
- **Flora and Fauna:** Survey of local biodiversity to identify any endangered or sensitive species.

#### **Social and Economic Baseline:**

- **Demographics:** Analysis of population density, age distribution, and ethnic composition in nearby communities.
- **Livelihoods:** Evaluation of primary economic activities, such as agriculture, trade, or services.
- **Land Ownership and Use:** Documentation of current land use and ownership patterns, including any communal or culturally significant lands.
- **Infrastructure and Services:** Overview of existing infrastructure like roads, schools, healthcare facilities, and utilities in the vicinity.

#### 1.3.1.2 Cultural and Archaeological Aspects:

Documentation of any culturally or historically significant sites within the study area to ensure their preservation.

#### 1.3.1.3 Stakeholder Perceptions:

Collection of feedback from local communities and stakeholders; their concerns, expectations, and potential impacts of the project.

#### 1.3.1.4 EIA Study Steps

The methodology followed in preparing the EIA consists of the following steps:

- Review of available details of the proposed project and meetings/discussions with various stakeholders including local communities.
- Review of the policy and regulatory requirements.
- Field investigations to collect baseline data using structured questionnaires, and sampling and analysis for air, noise and groundwater.
- Visits to the existing 132 kV Grid Station at project sites to understand grid station development and operation in Pakistan.
- A detailed assessment of potential impacts of the Project activities and prepare detailed mitigation measures.
- Preparing an Environmental and Social Management Plan (EMP) as part of EIA.
- Consultations with various stakeholders including affected communities.

## 1.4 Contents of the EIA Report

**Chapter 1: Introduction:** This first chapter of the Environmental Impact Assessment (EIA) serves as an introduction to the overall study, providing the foundational context for the project and its assessment process.

**Chapter 2: Review of Relevant Policies and Regulatory Framework:** This chapter provides a comprehensive review of the prevailing national and provincial regulatory frameworks, including Pakistan's Environmental Protection Act, Punjab Environmental Quality Standards (PEQS), and other applicable laws and guidelines. The chapter identifies compliance requirements, approval procedures, and key provisions necessary for aligning the project with both international and national regulations. This ensures that the project adheres to best practices for environmental and social sustainability.

**Chapter 3: Project Description:** This chapter offers a detailed description of the project, including its objectives, scope, and technical components. It highlights the geographical location, design features, construction requirements, and operational aspects relevant to environmental assessment. The chapter also identifies associated activities such as land preparation, resource utilization, and potential ancillary developments. By providing this foundational understanding, the chapter establishes the context for assessing the environmental and social impacts of the project.

**Chapters 4: Baseline Environmental Conditions:** These chapters present a detailed analysis of the existing baseline conditions in the project area, categorized into physical, biological, and socioeconomic aspects:

**Chapter 5: Environmental Impact Assessment and Mitigations:** This chapter evaluates the potential environmental and social impacts of the project during construction, operation, and decommissioning phases. It identifies both positive and negative impacts and provides a detailed analysis of their significance. Appropriate mitigation measures to address adverse impacts, such as pollution control, habitat restoration, and community support programs, are discussed comprehensively. The chapter emphasizes the need for proactive management to minimize risks and ensure sustainable project implementation.

**Chapter 6: Environmental Management Plan (EMP):** This chapter presents summary of the Environmental Management Plan (EMP), prepared as a standalone volume. The EMP outlines detailed mitigation measures, monitoring frameworks, and institutional responsibilities for managing environmental and social impacts. It includes cost estimates, timelines, and capacity-building initiatives to ensure effective implementation of the proposed measures. The EMP serves as a practical tool to guide the project team in achieving environmental and social compliance.

**Chapter 7: Stakeholder Consultations and Disclosure:** This chapter details the consultations conducted with various stakeholders, including local communities, government authorities, and other relevant entities. It highlights the process followed, the concerns raised, and how these have been incorporated into the environmental and social assessment. Additionally, the chapter outlines the disclosure mechanisms used to share project-related information with stakeholders, ensuring transparency and fostering community engagement.

**Chapter 8: Conclusions and Recommendations:** The final chapter summarizes the key findings of the Environmental Impact Assessment (EIA) and provides recommendations for project implementation. It highlights the importance of adhering to the mitigation measures outlined in the EMP and emphasizes the need for continuous stakeholder engagement, monitoring, and adaptive management. The chapter concludes by affirming the project's feasibility from an environmental and social perspective, provided that the recommended measures are effectively implemented.

## 2 Legal and Administrative Framework

### 2.1 Constitutional Context

The development of statutory and other instruments for environmental management has steadily gained priority in Pakistan since the late 1970s. Pakistan Environmental Protection Ordinance (PEPO), 1983 was the first piece of legislation designed specifically for the protection of the environment. The promulgation of this ordinance was followed, in 1984, by the establishment of the Pakistan Environmental Protection Agency (Pak-EPA), the primary government institution at that time dealing with environmental issues. Significant work on developing the environmental policy was carried out in the late 1980s, which culminated in the drafting of the Pakistan National Conservation Strategy. Provincial environmental protection agencies were also established at about the same time. The National Environmental Quality Standards (NEQS) were established in 1993. In 1997, the Pakistan Environmental Protection Act (PEPA) 1997 was enacted to replace the 1930 Ordinance. PEPA conferred broad-based enforcement powers to the environmental protection agencies. This was followed by the publication of the Pakistan Environmental Protection Agency Review of Initial Environmental Examination and Environmental Impact Assessment Regulations 2000 which provided the necessary details on the preparation, submission, and review of initial environmental examinations (IEE) and environmental impact assessments (EIA).

Before the 18th Amendment to the Constitution of Pakistan in 2010, the legislative powers were distributed between the federal and provincial governments through two 'lists' attached to the Constitution as Schedules. The Federal list covered the subjects over which the federal government had exclusive legislative power, while the 'Concurrent List' contained subjects regarding which both the federal and provincial governments could enact laws. The subject 'environmental pollution and ecology' was included in the Concurrent List and hence allowed both the national and provincial governments to enact laws on the subject. However, as a result of the 18th Amendment, this subject is now in the exclusive domain of the provincial government. The main consequences of this change were as follows:

The Ministry of Environment at the federal level was abolished. Its functions related to the national environmental management were transferred to the provinces. To manage the international obligations in the context of the environment, a new ministry—the Ministry of Climate Change—was created at the federal level.

The PEPA 1997 ceased to apply directly to the provinces. The provinces were required to enact their own legislation for environmental protection. However, to ensure legal continuity PEPA 1997 continued to be the legal instrument for environmental protection in the provinces till the enactment of the provincial law.

All four provinces have enacted their environmental protection laws. These provincial laws are largely based on PEPA 1997 and, hence, provide the same level of environmental protection as the parent law.

### 2.1.1 Punjab Environmental Protection Act 2012

The Punjab Environmental Protection Act of 2012 is the provincial version of the Pakistan Environmental Protection Act, 1997 (PEPA) relevant to the Project. Responsibility for administration and implementation of the PEPA was transferred from the Ministry of Environment to the provincial governments by an amendment to the PEPA in 2012. The provincial versions continue to remain materially the same as the PEPA except when it comes to the designation of the responsible governmental bodies.

The following key features of the provincial Acts have a direct bearing on the Project:

- Section 11 (Prohibition of Certain Discharges or Emissions) states that “Subject to the provisions of this Act and the rules and regulations made thereunder, no person shall discharge or emit, or allow the discharge or emission of, any effluent or waste or air pollutant or noise in an amount, concentration or level which is in excess of the Environmental Quality Standards”.
- Section 13-1 (Initial Environmental Examination and Environmental Impact Assessment) requires that “No proponent of a project shall commence construction or operation unless he has filed with the Federal Agency an IEE or, where the project is likely to cause an adverse environmental effect, an EIA, and has obtained from the Federal Agency approval in respect thereof.”
- Section 13-2b (Review of IEE and EIA): “The Environmental Protection Agency shall review the EIA report and accord its approval subject to such conditions as it may deem fit to impose, or require that the EIA be re-submitted after such modifications as may be stipulated or rejected, the project as being contrary to environmental objectives”.
- Section 15 (Handling of Hazardous Substances) requires that “Subject to the provisions of this Act, no person shall generate, collect, consign, transport, treat, dispose of, store, handle, or import any hazardous substance except (a) under a license issued by the EPA and in such manner as may be prescribed; or (b) in accordance with the provisions of any other law for the time being in force, or of any international treaty, convention, protocol, code, standard, agreement, or other Instrument to which Pakistan is a party.” Enforcement of this clause requires the EPA to issue regulations regarding licensing procedures and to define ‘hazardous substance.’
- Section 16 (Regulation of Motor Vehicles): “Subject to provision of this clause of the Act and the rules and regulations made there under, no person shall operate a motor vehicle from which air pollutants or noise are being emitted in an amount, concentration or level which is in excess of the PEQS, or where the applicable standards established under clause (g) of subsection (1) of Section-6 of the Act”.
- Section 18 (Penalties): “Whoever contravenes or fails to comply with the provisions of Section 11, 12, 13, or Section 16 or any order issued thereunder shall be punishable with fine which may extend to one million rupees, and in the case of a

continuing contravention or failure, with an additional fine which may extend to one hundred thousand rupees for every day during which such contravention or failure continues: Provided that if contravention of the provisions of Section 11 also constitutes contravention of the provisions of section 15, such contravention shall be punishable under sub-section (2) only”.

- Section 19 (Offences by Bodies Corporate): “Where any contravention of this Act has been committed by a body corporate, and it is proved that such offence has been committed with the consent or connivance or, is attributed to any negligence on the part of, any director, partner, manager, secretary or other officer of the body corporate, such director, partner, manager, secretary or other officer of the body corporate, shall be deemed guilty of such contravention along with the body corporate and shall be punished accordingly”.

### **2.1.2 Pakistan Environmental Protection Agency (Review of IEE & EIA) Regulations, 2022**

The IEE/EIA Regulations of 2022 establish the framework for the preparation, submission, and review of the IEE and the EIA. The regulations categorise development projects for IEE and EIA into two schedules (Schedules I and II). Schedule I include projects where the range of environmental issues is comparatively narrow and the issues can be understood and managed through less extensive analysis. Schedule II covers major projects that have the potential to affect a large number of people in addition to generating potentially significant adverse environmental impacts. It was determined that the proposed Project will fall under Schedule II requiring EIA.

### **2.1.3 Environmental Regulatory Authorities**

Since the project area falls in Punjab Province, the Punjab Environmental Protection Agency (EPA) is the relevant environmental regulatory authority. The provincial EPAs are responsible for environmental regulation and implementing Government of Pakistan (GoP) environmental policies in their respective provinces. As part of their roles, provincial EPAs are responsible for reviewing EIA documentation for compliance with provincial EIA requirements and procedures and, using their district-based staff, monitoring the implementation of EMPs. The Statutory functions of the provincial EPAs are to:

- Administering and implementing the Environmental Protection Act, its rules and regulations.
- Reviewing IEE/EIA, preparation of procedures and guidelines.
- Prepare, revise and enforce Environmental Quality Standards (EQS) for industries, municipalities, vehicular emissions.
- Establishing and maintaining laboratories, certification of laboratories for conducting tests and analyses;
- Assisting local Councils, Authorities and/or Government Agencies in execution of projects.

- Establishing a system of surveys, monitoring, examination and inspection to combat pollution.
- Conducting training for government staff and industrial company staff.
- Provide information and education to the public on environmental issues.
- Publishing annual “State of the Environment” reports.
- Undertaking surveys and qualitative and quantitative analysis of data on air, soil and water quality, and industrial, municipal and traffic emissions.

#### **2.1.4 RUDA HSE Manual and Construction Regulations (2021)**

Ravi Urban Development Authority (RUDA) has implemented a structured framework for health, safety, and sustainable construction under its HSE Manual and Construction & Development Regulations (2021). These Regulations are designed to ensure responsible urban growth, worker protection, and environmental stewardship.

##### **Health, Safety, and Environment (HSE) Manual Highlights**

**Objective:** To prevent workplace accidents, ensure worker health, and minimize environmental impacts during project execution.

**Scope:** Applies to RUDA headquarters, project sites, and jurisdictional areas.

##### **Key Measures:**

- Risk assessments and mitigation plans for construction activities.
- Provision of Personal Protective Equipment (PPE).
- Emergency response planning and first aid arrangements.
- Environmental controls for dust, emissions, and noise pollution.
- HSE training and awareness programs for all personnel.
- Regular HSE inspections and audits.

##### **Construction & Development Regulations (2021)**

###### **Design & Safety Standards:**

- Mandatory inclusion of fire safety systems: alarms, hydrants, extinguishers, and emergency exits.
- Minimum building standards for ventilation, access, and disabled-friendly design.

###### **Industrial Zone Specifics:**

- Regulated disposal of solid and liquid waste.
- Buffer zones and green belts for pollution control.

###### **Enforcement:**

- Non-compliance may lead to penalties, suspension of activity, or demolition of unauthorized structures.
- Compliance with RUDA’s HSE Manual and Construction Regulations (2021) is essential for ensuring safe construction practices, protecting workers and nearby communities, and maintaining environmental integrity throughout the project lifecycle.

## 2.1.5 Other Important Environmental Legislations in Pakistan

This EIA report will be submitted to Punjab-EPA whom, according to the Regulations, shall complete its review process within 45 days of submission.

## 2.1.6 Applicable Legislation and Regulatory Framework

The proposed project will be planned, executed, and monitored in compliance with applicable environmental, social, health, and safety legislation at the federal and provincial levels. The following laws and regulations are particularly relevant to the grid station and its associated infrastructure.

Table 2-1 Relevant Legislation for EIA

Legislation	Description
Pakistan Environmental Protection Act, 1997	Provides the federal legal framework for environmental protection, including procedures for Environmental Impact Assessments (EIA) and Environmental Management Plans (EMP).
Punjab Environmental Protection Act, 2012	Adapts and enforces the PEPA 1997 within Punjab. Mandates environmental approvals, monitoring, and compliance through the Punjab Environmental Protection Agency (EPA).
Punjab Environmental Protection (EIA) Regulations, 2017	Specifies the criteria and procedural requirements for obtaining environmental approval for projects falling under different categories.
National Environmental Quality Standards (NEQS), 2000	Defines permissible limits for air emissions, effluent discharge, noise, and vehicular emissions to safeguard public health and the environment.
Punjab Occupational Safety and Health Act, 2019	Ensures occupational health and safety for workers, especially during construction and operational phases of infrastructure projects.
The Punjab Regularization of Employment Act, 2018	Provides legal protection and rights to workers and laborers, particularly those hired on contract or daily wages.
The Factories Act, 1934 (as amended in Punjab)	Regulates working conditions, safety, health, and welfare of workers at construction and industrial sites.

The Punjab Labour Policy, 2018	Addresses labor welfare, minimum wage, social security, and working hours. Relevant for ensuring labor rights on project sites.
The Forest Act, 1927	Governs the use, preservation, and management of forest areas. Relevant if any tree cutting or vegetation clearance is involved.
The Punjab Wildlife (Protection, Preservation, Conservation and Management) Act, 1974	Provides for the protection of wildlife and their habitats. Ensures that the project does not adversely impact protected or endangered species.
Building Code of Pakistan (Seismic Provisions), 2007	Specifies structural design requirements to ensure seismic resilience, applicable due to the project's location in Seismic Zone 2B.
Punjab Local Government Act, 2022	Establishes the legal basis for coordination with local bodies on municipal services such as solid waste disposal, water supply, and drainage.
Punjab Urban and Peri-Urban Forest Policy, 2019	Encourages green infrastructure and plantation along urban development corridors, applicable to buffer and greenbelt development at the grid site.
The Antiquities Act, 1975	Provides guidelines in case any archaeological or cultural heritage is encountered during project execution.

These legal requirements ensure that the project adheres to both local and international standards for environmental protection, social inclusion, and sustainable development. The EIA incorporates these laws to mitigate potential negative impacts on both the environment and local communities while promoting the project's long-term benefits.

### 2.1.7 International Agreements Related to Energy

Pakistan has entered into several international agreements and treaties. They concern climate change and depletion of the ozone layer; biological diversity and trade in wild flora and fauna; desertification; waste and pollution; and cultural heritage. Some of the International Environmental Treaties Endorsed by Pakistan is listed in Table 2-2.

Table 2-2 International Environmental Treaties Endorsed by Pakistan

Topic	Convention	Date of Treaty	Entry into Force in Pakistan
Climate change and the Ozone layer	United Nations Framework Convention on Climate Change - the primary objective is the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.	1992	1994
	The Paris Agreement - dealing with greenhouse-gas-emissions mitigation, adaptation, and finance.	2015	2016
	Kyoto Protocol to the United Nations Framework Convention on Climate Change - enabled by the above Convention on Climate Change. It has more powerful and legally binding measures. It sets binding targets for 37 industrialized countries and the European community for reducing greenhouse gas emissions.	1997	2005
	Vienna Convention for the Protection of the Ozone Layer - acts as a framework for international efforts to protect the ozone layer with a primary objective to protect human health and the environment against adverse effects resulting from human activities that modify or are likely to modify the ozone layer.	1985	1993
	The Montreal Protocol on Substances that Deplete Ozone Layer and associated amendments - enabled by the Vienna Convention, is designed to protect the ozone layer by phasing out the production and consumption of several substances believed to be responsible for ozone depletion.	1987	1993

Topic	Convention	Date of Treaty	Entry into Force in Pakistan
Waste and pollution	Basel Convention on the Control of Trans Boundary Movements of Hazardous Wastes and their Disposal - regulates the transboundary movement of hazardous waste and other waste with the stated purpose to protect human health and the environment against the adverse effects from generation and management of hazardous waste and other waste. The Convention provides for three sets of measures with binding obligations. These are Strict control of the transboundary movement of hazardous waste; Environmentally sound management of hazardous waste; and Enforcement and implementation of the provisions of the convention at international and national levels.	1989	1994
	International Convention on Oil Pollution Preparedness, Response and Co-operation	1990	1995
	Stockholm Convention on Persistent Organic Pollutants - seeks to protect human health and the environment from Persistent Organic Pollutants, which are chemicals that remain intact in the environment for long periods, become widely distributed geographically and accumulate in the fatty tissue of humans and wildlife.	2001	2008

Topic	Convention	Date of Treaty	Entry into Force in Pakistan
Biodiversity and the protection of plants and animals	Convention on Biological Diversity – covering ecosystems, species, and genetic resources and the field of biotechnology. The objectives are: conserve biological diversity. sustainable use of its components; and fair and equitable sharing of benefits arising from genetic resources.	1992	1994
	Cartagena Protocol on Biosafety to the Convention on Biological Diversity - addresses potential risks posed by living modified organisms resulting from modern biotechnology.	2000	2009
	Bonn Convention on the Conservation of Migratory Species of Wild Animals - aims to conserve terrestrial, marine, and avian migratory species throughout their range. It is concerned with the conservation of wildlife and habitats on a global scale.	1979	1987
	Memorandum of Understanding concerning Conservation Measures for the Siberian Crane - parties undertake to provide strict protection to Siberian Cranes and identify and conserve wetland habitats essential for their survival.	1998	1999
	Convention on International Trade in Endangered Species of Wild Fauna and Flora - to ensure that international trade in specimens of wild animals and plants does not threaten their survival.	1973	1976

Topic	Convention	Date of Treaty	Entry into Force in Pakistan
	International Plant Protection Convention (1997 Revised Text) - to prevent the international spread of pests and plant diseases. It requires the maintenance of lists of plant pests, tracking of pest outbreaks, and coordination of technical assistance between member nations.	1951/52	1954
	Agreement for the Establishment of the Near East Plant Protection Organization - to establish the Near East Plant Protection Organization (NEPPO), which promotes international co-operation to implement the International Plant Protection Convention.	1993	2009
	Plant Protection Agreement for the Asia and Pacific Region and amendments – establishes the Asia and Pacific Plant Protection Commission to review and promote the region’s progress in the implementation of the Agreement. Trade-in plants and plant products are regulated by certification, prohibition, inspection, disinfection, quarantine, destruction, etc., as necessary.	1955 (amendment 1967)	1958 (amendment 1969)
	Convention on Wetlands of International Importance especially as Waterfowl Habitat and associated protocols and amendments - to promote conservation and sustainable use of wetlands. The Ramsar List of Wetlands of International Importance now includes almost 1,800 sites (known as Ramsar Sites). There are currently 19 Ramsar sites in Pakistan.	1971 (amended 1987)	1976 (amended 1994)

Topic	Convention	Date of Treaty	Entry into Force in Pakistan
Cultural heritage	Convention concerning the Protection of the World Cultural and Natural Heritage - requires parties to adopt a general policy on the protection of the natural and cultural heritage, to set up services for such protection, to develop scientific and technical studies, to take appropriate legal, technical, scientific, and administrative measures and to foster training and education for such protection.	1972	1976

These treaties ensure that the project adheres to both local and international standards for environmental protection, social inclusion, and sustainable development. The EIA incorporates these laws to mitigate potential negative impacts on both the environment and local communities while promoting the project's long-term benefits.

### 2.1.8 Environmental Standards and Guidelines

PEQS (Punjab Environmental Quality Standards) are part of the broader framework established by the Pakistan Environmental Protection Act, 1997 (PEPA) at the national level. While the National Environmental Quality Standards (NEQS) provide a general framework for pollution control across Pakistan, PEQS are tailored to address the unique environmental concerns of Punjab. Some PEQS are mentioned in Table 2-3.

Table 2-3 Relevant PEQS for EIA

Legislation	Description
Air Quality Standards	PEQS establish limits for concentrations of air pollutants like sulfur dioxide (SO <sub>2</sub> ), nitrogen oxides (NO <sub>x</sub> ), carbon monoxide (CO), particulate matter (PM), and ozone, among others. These standards aim to control emissions from industrial, vehicular, and other sources to ensure air quality remains within acceptable levels, thus protecting public health and the environment.
Water Quality Standards	These standards set permissible limits for pollutants in surface water, groundwater, and wastewater, including parameters like pH, biochemical oxygen demand (BOD), total dissolved solids (TDS), heavy metals, and pathogens. Ensuring that water bodies meet PEQS is critical for the protection of aquatic ecosystems and human health.

Noise Pollution Standards	PEQS also define acceptable noise levels for different areas (residential, industrial, commercial, and recreational). These standards help to mitigate noise pollution, which can negatively affect human health, wildlife, and the overall quality of life.
Industrial Effluent Standards	For industries in Punjab, PEQS provide limits on the discharge of effluents to prevent contamination of land, water, and air. These regulations ensure that industrial activities do not degrade environmental quality or endanger public health.
Solid Waste Management	PEQS address standards for the disposal and management of solid waste, including waste segregation, treatment, and disposal practices to minimize environmental impacts.

These legal national requirements ensure that the project adhere environmental protection, social inclusion, and sustainable development. The EIA incorporates these laws to mitigate potential negative impacts on both the environment and local communities while promoting the project's sustainability and long-term benefits.

### 2.1.9 Institutional Responsibilities and Stakeholders

Institutional responsibilities play a critical role in conducting the environmental assessments and recommending mitigation measures. Stakeholders in the EIA process include local communities, who may be impacted by the project through changes in land use, noise, or air quality. These communities will be engaged early in the process to address concerns and ensure that their rights and interests are considered. Engaging these institutions and stakeholders throughout the EIA process helps create a transparent and accountable approach, ensuring the project aligns with both environmental and social sustainability goals.

## 2.2 Environmental Screening of project

The IEE/EIA Regulations of 2022 established the framework for the preparation, submission, and review of the IEE and the EIA. The regulations categorise development projects for IEE and EIA into two schedules (Schedules I and II). Schedule I include projects where the range of environmental issues is comparatively narrow and the issues can be understood and managed through less extensive analysis. Schedule II covers major projects that have the potential to affect a large number of people in addition to generating potentially significant adverse environmental impacts.

According to Review of Initial Environmental Examination and Environmental Impact Assessment Regulations 2022, the project GS (CB-I & CB-II) falls under SCHEDULE – II Category: A Energy Sub-category:2 Transmission lines more than 132 kV and Grid Station. Hence, this project, i.e., RUDA GS 132 kV requires an EIA to be submitted to EPA Punjab as highlighted in ANNEX-1.

## 2.3 Transmission Line Clearance Requirements

Water and Power Development Authority (WAPDA) and its affiliated Distribution Companies (DISCOs) implement standard engineering practices for determining urban and rural electrical clearances in line with national safety and reliability standards. These practices are guided by the Pakistan Electric Power Company (PEPCO), which oversees operational standards and utility performance, and the National Electric Power Regulatory Authority (NEPRA), which serves as the primary regulatory body for the electricity sector in Pakistan. NEPRA has formulated and enforced a comprehensive set of regulations and codes, including the NEPRA Grid Code and Distribution Code, that prescribe minimum vertical and horizontal clearance requirements for the planning, design, and construction of overhead transmission and distribution lines. These clearances are critical to ensuring public safety, maintaining service reliability, and preventing electrical hazards across diverse geographical and infrastructural settings. The standards are also aligned, where applicable, with international guidelines. These are shown in Table 2-4.

Table 2-4 Clearance Requirement for overhead Electrical Transmission Lines

Description	400 V & Below	11 kV & 33 kV	66 kV	132 kV	220 kV	500 kV
	(Feet)	(Feet)	(Feet)	(Feet)	(Feet)	(Feet)
Across Country						
Across Street Intersection	19	20	20	22	23	27
Along Streets	17	20				
Across Private Property, Footpaths and Places Inaccessible to Vehicular Traffic	15	15				
Roads and Highways	-	-	26	26	26	31
Rivers and Major Canals from H.F.L.	-	-	30	30	30	30
Railway Tracks						
Inside Station Limits	31	33	34	36	37	39

Description	400 V & Below	11 kV & 33 kV	66 kV	132 kV	220 kV	500 kV
	(Feet)	(Feet)	(Feet)	(Feet)	(Feet)	(Feet)
Outside Station Limits	23	25	26	28	29	30
Building Parts:						
Vertical Clearance	8	12	15	17	20	25
Horizontal Clearance	4	6	15	20	25	30
Earth Part of Line:	2	6	9	11	13	15
(Insulated Services, Guys, Earth wire etc.)						
Telegraph Lines	4	6	9	11	13	15
400 V Lines and below:	2	6	7	9	11	13
11 kV Lines	-	4	7	9	11	13
33 kV Lines	-	6	7	9	11	13
66 kV Lines	-	-	10	12	14	16
32 kV Lines	-	-	-	12	14	16

The safety considerations must be borne in mind during selection of route for transmission lines. The main points of the guidelines are:

- Operation in environmentally sensitive areas with special respect for fragile ecosystems and their inherent biodiversity are to be avoided to the extent possible;
- Similarly, the Right of Way (RoW) for a transmission line through natural features like mountains, hilly terrain susceptible to landslides, large lakes, reservoirs, marshes, human habitations and reserved forests or national parks are to be avoided to the extent possible;
- RoW is selected after due consideration for location of telecommunication lines and railway circuits to avoid electrical interference due to mutual induction;
- Residential structures are kept a minimum of 12 m out from the plumb line of the outer conductor in the RoW. However, in the absence of an alternative alignment,

an exception can be made far from buildings and single floor factory buildings, provided neither is used for purposes of residence;

- Innovative technologies and latest equipment must be adopted or used to abate pollution in construction activities and operations;
- Routes of T/Ls are avoided to the maximum extent through areas of cultural or historical importance and religious places;
- Tube wells and open wells using a surface pump are not permitted under high voltage conductors as piping and cranes used to recondition such wells could make contact with high voltage conductors;
- Existing orchards can remain within the RoW although Towers are kept out of orchards wherever possible. Orchards are to be over-sailed by a clearance of six (6) m above the height of a mature orchard whereas all other trees are to be removed;
- Brick kilns should be kept at least 40 m outside the centreline of the RoW;
- Alternative route alignments should be used if any school, rural dispensary, mosque or local shrine falls within 200 m of the centreline of a planned route;
- Existing open wells and hand pumps can remain under high voltage conductors, provided open wells are capped;
- Selection of sites for Tower foundation and Tower erection is made consciously on stable surfaces and by rejecting sites susceptible to erosion, slips and landslides;
- Spacing between Towers/poles may not be uniform and ranges could vary for physical and other considerations, such as crossing of main roads, residential areas, streams and canals and trees and for avoiding graveyards and big ditches in between Towers/poles;
- The main consideration relating to public safety is a safe horizontal and vertical distance of conductor from ground level to prevent electrocution of people or animals under the transmission line. A corridor having a minimum width of 30 m, clear of all obstructions, is provided for extra high voltage (132 kV) transmission lines (half on either side of the centreline). However, general farming within this corridor is allowed and tree plantations that do not exceed a height of one and a half (1.5) meter are also allowed to remain under the lines. Similarly, open wells, including Persian wheels, can remain under transmission lines. Tube wells and pumps are not permitted under high voltage conductors, because piping and cranes used to refurbish such wells may come into contact with the lines.
- No residential or other public buildings such as factories, schools, hospitals and mosques, except for graves/graveyards, are permitted within the RoW. However, farm buildings which are used for residential purposes may remain under extra high voltage lines, provided a vertical clearance of at least 8m is maintained. The height of towers can be increased to accommodate such buildings.

## **3 Project Description**

### **3.1 General**

The proposed RUDA 132 kV Grid Station Chahar Bagh CB-I & CB-II is an essential infrastructure project aimed at meeting the increasing electricity demand in the region. The project falls under the jurisdiction of the Ravi Urban Development Authority (RUDA) and is part of a broader urban expansion plan in District Lahore.

### **3.2 Project Appreciation**

RUDA is actively and dynamically managing the power grid across the RUDA region and developing infrastructure to meet the electricity demand. The GS project will reduce load on adjacent 132 kV grid stations, transmission lines, and 11 kV feeders. The distribution Transformers of 100/200 kVA ratings will easily be monitored through Transformer Monitoring System. A quality training will be providing to employees and RUDA business will further flourish. It will generate more commercial, Industrial and agricultural activities in RUDA region.

### **3.3 Project Location**

A new 132 kV Grid Station is for a premier residential development by Ravi Urban Development Authority (RUDA), strategically located in Lahore, Pakistan situated along the Main Ring Road, it offers seamless connectivity to various parts of the city including CB-I and CB-II. The Project area is accessible via multiple routes, including a dedicated Ring Road interchange, a 220-foot wide road from Chahar Bagh, Theri Road, and Bhaini Road. 132 kV Grid Station Chahar Bagh is situated within Zone 1 of Ravi Urban Development Authority (RUDA) jurisdiction in Lahore, Pakistan. Specifically, it is located near Harbanspura along the Lahore Ring Road, accessible via the Shareef Pura Interchange as shown in Figure 3-1.

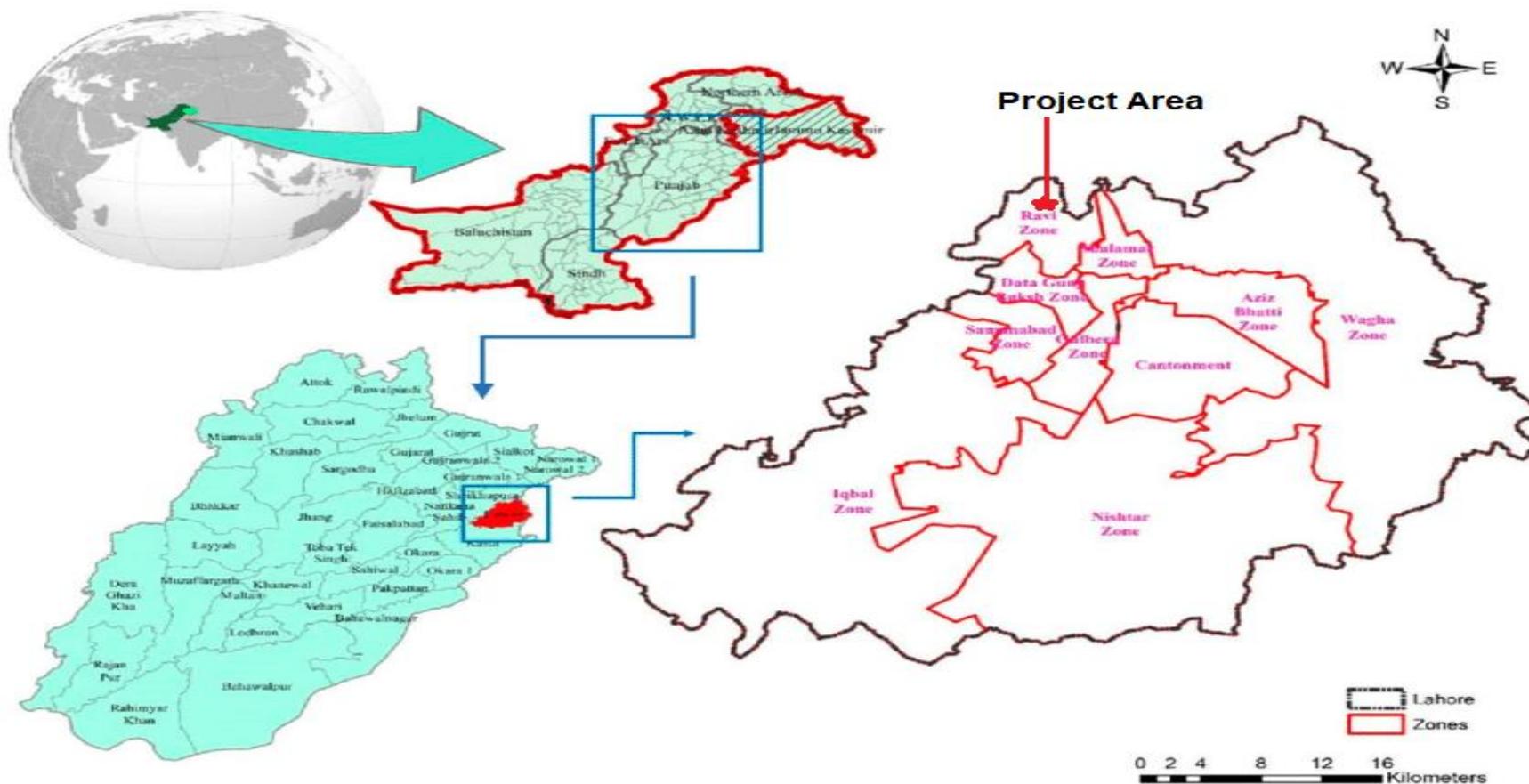


Figure 3-1 Location Map of Proposed Grid Station

## **3.4 Analysis of Alternatives**

### **3.4.1 Site Selection Criteria**

The analysis of alternatives is a fundamental component of the Environmental Impact Assessment (EIA) process. It is designed to ensure that project planning considers a range of viable options and selects the most environmentally sound, socially acceptable, and technically feasible alternative. This approach not only enhances environmental protection but also promotes sustainable development and informed decision-making. For the proposed 132kV Grid Station, the selection of the project site and design was guided by a comprehensive evaluation of alternative locations, routes, and layouts. The assessment involved both strategic-level screening and site-specific evaluations, with the objective of minimizing environmental degradation and social disruption while ensuring the project remains technically and economically viable.

### **3.4.2 Location Alternatives**

#### **3.4.2.1 Grid Station**

Grid stations site location is determined by a committee comprising of professionals from planning; design, construction; operation and social formations of the RUDA. The committee selects the best site based from a number of alternatives, on the following considerations: Least cost; technically and socially acceptable alternative; least social impacts; soil and atmospheric conditions that are not likely impose a higher cost or damage the planed facilities; acceptable living conditions for staff members (health, education, water etc.); reasonable access conditions to allow movement of heavy equipment; reasonable access conditions to allow incoming and outgoing transmission lines RoW.

The alternative sites were evaluated based on the following key criteria:

#### **Land Ownership and Legal Status:**

- Priority was given to sites under the control of RUDA or government ownership to avoid delays related to land acquisition, reduce legal complexities, and minimize costs.
- The selected site lies on government-owned agricultural and waste land, thus requiring no displacement of private landowners.

#### **Environmental and Ecological Sensitivity:**

- Sites were evaluated for the presence of sensitive ecological features such as wetlands, forests, protected species habitats, and biodiversity corridors.
- The selected site does not fall within any protected or ecologically sensitive zone, and natural vegetation is sparse due to prolonged agricultural use.

#### **Proximity to Human Settlements:**

- Alternative locations closer to densely populated settlements were excluded to minimize noise pollution, EMF exposure, and safety risks to the community.
- The chosen site is located at a safe distance from residential areas, reducing potential health and nuisance impacts.

#### **Social Impacts and Displacement:**

- Avoiding sites that could lead to physical or economic displacement of local communities was a key consideration.
- The selected location requires no resettlement or livelihood disruption, thus significantly reducing the social footprint of the project.

#### **Construction and Operational Feasibility:**

- Ground conditions, topography, and ease of access were evaluated to determine engineering feasibility and cost-efficiency.
- The selected site offers flat terrain with direct access from an existing road developed under the approved Chahar Bagh Master Plan, facilitating logistics and reducing civil works complexity.

#### **Integration with Existing Infrastructure:**

- The site was selected based on its proximity to the proposed power demand centers and its connectivity with the existing LESCO transmission network.
- This alignment ensures technical optimization and reduction in transmission losses.

#### **Cost Considerations:**

- Financial feasibility was assessed by comparing land preparation costs, transmission line lengths, compensation requirements, and resettlement needs across various sites.
- The selected site was found to be the most cost-effective option with minimal land development and compensation costs.

#### **3.4.2.2 Transmission Line**

Three transmission line routes were thoroughly reviewed jointly by RUDA technical team and LESCO, as shown in Figure 3-2.

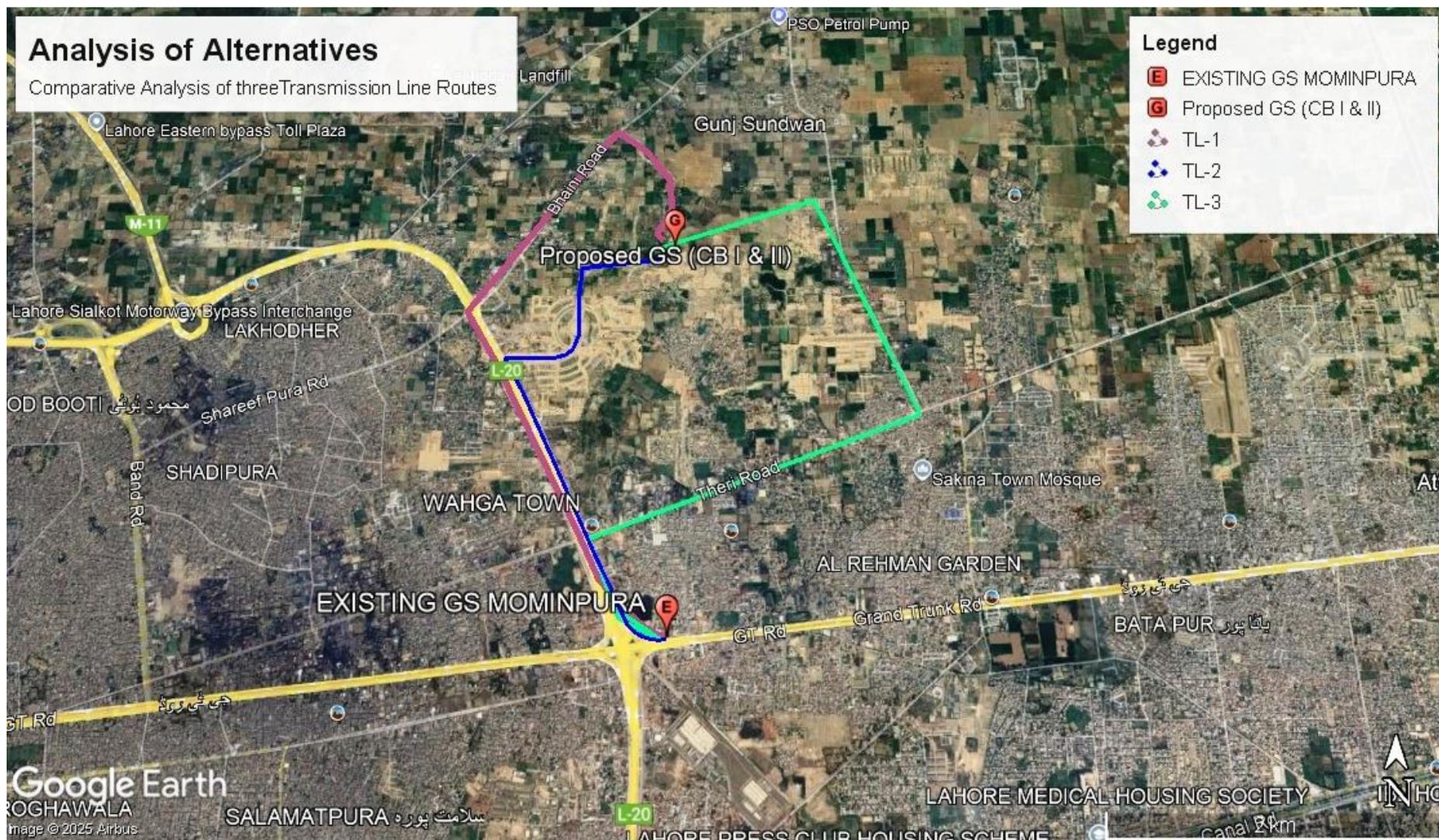


Figure 3-2 Alternative Analysis of Three Transmission Line Routes

### **Route 1: Along Tehri Road**

The first transmission line (TL) route follows the existing alignment of Tehri Road. This route primarily traverses a semi-urban area with mixed land use, including residential clusters, small-scale commercial establishments, and patches of agricultural land on the outskirts. The length of this route is 7.5 km. The advantage of selecting Tehri Road as the alignment corridor lies in the existing road infrastructure, access for construction vehicles, pole transportation, and routine maintenance activities is relatively easier. However, road is narrow and community health and safety precautions will be required for safe pole installation and line stringing. Stringing and installation of a few poles may required additional land.

### **Route 2: Along Ring Road and CB-1/CB-2 ROW**

The second TL route of approx 4.8 to 5 km length runs along the designated corridors of the Ring Road and the existing CB-1 and CB-2 right-of-ways. This route is largely linear and benefits from the planned infrastructure zones within the urban development layout. The ROW for CB-1 and CB-2 is relatively clear, designed to accommodate utilities and services. The alignment minimizes environmental and social disturbances by utilizing reserved corridors intended for such infrastructure. It intersects controlled urban developments and may involve coordination with municipal authorities for temporary access permissions and compliance with urban development regulations. Due to the urban context, special attention must be paid to traffic management, noise control, and public safety during construction. However, as construction of GS starts at earliest, the disruption will be minimal in newly developed and less populated area with wide row available.

### **Route 3: Along Ring Road and Bheni Road ROW**

The third route of the transmission line with the length of approx 6 km, follows a combination of the Ring Road and the ROW along Bheni Road. This alignment passes through peri-urban and rural areas with lower population density compared to TL1 routes but greater then TL 2 route. The route offers favorable conditions for transmission infrastructure, as the ROW along Bheni Road provides sufficient space for pole installation with limited encroachment risks. However, parts of the route, especially the last 3-4 kms may pass through agricultural land, which will require proper consultation with landowners and compensation where applicable. A new access road may be required in last section for transporrtation of heavy conductor and TL poles which may pose challenges in terms of relocation or resettlement, making it a technically and socially viable option for the project.

### **Selected Route- Route 2: Along Ring Road and CB-1/CB-2 ROW**

The second transmission line (TL) route has been selected along the Ring Road and the designated CB-1 and CB-2 right-of-way (ROW). This alignment has been strategically chosen due to its minimum overall length and limited disturbance to private land, agricultural fields, and existing settlements. By following pre-allocated infrastructure

corridors, the route avoids densely populated or privately owned areas, significantly reducing the need for land acquisition and minimizing potential resettlement or compensation issues. Additionally, the route circumvents narrow inner roads and congested localities, allowing for smoother pole transportation, construction activities, and future maintenance. Its compatibility with existing infrastructure plans ensures easier coordination with development authorities and contributes to efficient and socially responsible implementation.

### **3.4.2.3 Conclusion of Alternatives Analysis:**

The alternative analysis concluded that the selected site for the 132kV Grid Station at Chahar Bagh offers the most balanced solution in terms of environmental sustainability, social acceptability, technical viability, and economic efficiency. By utilizing government-owned, ecologically low-value land and avoiding settlements or sensitive areas, the project ensures minimal adverse impacts and aligns with RUDA's sustainable urban development vision.

Future upgrades or expansions will also consider these principles to maintain environmental and social safeguards as the Chahar Bagh area continues to grow.

### **3.4.3 Technology Alternatives**

In evaluating technology alternatives for the proposed 132kV Grid Station at Chahar Bagh, emphasis was placed on selecting equipment and systems that ensure operational efficiency, environmental safety, and long-term reliability. The gas-insulated switchgear (GIS) technologies were considered as it offers space-saving advantages and lower maintenance in highly urbanized settings.

### **3.4.4 132/11kV grid station Technical Specifications**

A 132/11kV Grid Station is a type of electrical substation that is used to convert high voltage into low voltage. The 132/11kV refers to the voltages that are used in the conversion process. The substation consists of various components, including transformers, switchgear, and circuit breakers. The purpose of a 132/11kV substation is to provide a safe and reliable source of power for homes and businesses.

A 132 kV substation is a technical specification for an electrical substation that operates at a voltage of 132,000 volts. This type of substation is typically used to distribute electricity from a generation source to lower-voltage distribution networks or directly to consumers. A 132 kV substation typically consists of high-voltage transmission lines, transformers, switchgear, and other equipment necessary to connect the electrical system. The typical layout of 132 kV substation is given below.

## **3.5 Description of Grid Stations**

### **3.5.1 Grid Station Equipment**

A 132 kV substation equipment list includes various types of equipment that are used in a substation. The list includes circuit breakers, transformers, Bushings, Cables,

Capacitors, Fuses, GIS (Gas Insulated Switchgear), Isolators, Lightning Arrestors, Metering Equipment ,Power Quality Equipment ,Protection Relays ,Reactors and Surge Protection Devices.

### **3.6 Description of Transmission Line**

A total of 33 poles are proposed for the project, which are categorized into three main types based on their structural design and intended function. These include 10 SPA-type poles, 13 SPD-type poles, and 10 SPG-type poles. Each type serves specific technical purposes in the overall design and stability of the transmission or distribution line, ensuring structural adequacy and load-bearing capacity across different segments of the route.

The average span between two poles is estimated to be approximately 160 meters. However, it is important to note that this span may vary depending on site-specific requirements such as terrain, accessibility, and alignment adjustments. The flexibility in span allows for better adaptation to ground conditions, minimizing the need for excessive earthworks or realignment.

The height of the poles ranges between 70 to 75 feet. This height ensures sufficient ground clearance for conductor wires, safety from human and vehicular contact, and compliance with standard transmission design protocols. The height selection is in accordance with utility requirements and is suitable for both rural and semi-urban landscapes.

For the foundation design and area requirements of these poles, reference should be made to the engineering guidelines provided by LESCO (Lahore Electric Supply Company). These guidelines offer standard specifications for pole foundations, including dimensions, depth, reinforcement, and soil stability criteria, ensuring safe and durable installation across different site conditions.



Figure 3-3 Proposed TL and Location of Poles

### 3.7 Cost of the Project

The approximate cost of the project is PKR 1.8 billion, including construction, equipment procurement, and associated infrastructure development.

### 3.8 Construction Facilities within Grid Station Premises

For the 132 kV Chahar Bagh Grid Station, the contractor will establish all necessary construction facilities, such as workers' accommodations, material storage areas, site offices, and utility zones, within the boundaries of the grid station site in the Utility area of CB-1 and CB-2. This strategy is intended to eliminate the need for additional land and to minimize potential social or environmental impacts outside the project footprint.

The contractor will be responsible for designing the layout of these temporary facilities, including labor camps, sanitation units, access routes, equipment zones, and designated storage areas. This layout will be submitted by contractor and approved by RUDA prior to the start of construction works.

Special attention will be given to ensuring proper sanitation, worker safety and well-being, solid and liquid waste management, and fire safety measures. The design and operation of these facilities will be planned to minimize any adverse impact on nearby communities and the surrounding environment.

### 3.9 Construction Requirements

The construction of GS in RUDA jurisdiction, involves several key requirements to ensure the successful completion of the projects. These include:

**Site Preparation and Civil Works:** Preparation for building the stations, including leveling and foundation work for the grid stations, transformer bays, control buildings, and associated infrastructure.

**Electrical Equipment Installation:** Procurement and installation of electrical equipment, including transformers, circuit breakers, busbars, and control panels.

**Transmission Line Integration:** Connection of the new Grid Stations to the existing transmission network, involving the construction of new transmission lines and associated substations where necessary.

**Safety and Compliance:** Adherence to safety standards during construction, ensuring compliance with national and international environmental regulations, and implementation of environmental and social mitigation measures.

**Infrastructure Development:** Construction of access roads, drainage systems, fencing, and security measures around the grid station areas.

**Water Requirement:** The water source will be ground water during construction phase and approximately 0.5 million Gallon water is required for sprinkling, concrete mixing and labor use.

**Electricity Requirement:** The source of electricity will be generators and LESCO grid station.

### 3.10 Civil and Structural Works

The initial phase includes site preparation, leveling, and earthworks. This will be followed by the construction of foundations for transformers, control room, equipment plinths, boundary walls, and other ancillary structures.

#### Materials required:

- **Cement, Sand, and Crush Aggregate:** For all concrete foundations, columns, plinths, and floor slabs.
- **Bricks/Blocks:** For control room, internal partitions, and boundary wall.
- **Steel Reinforcement Bars:** For RCC works in transformer foundations, gantry structures, and other load-bearing elements.
- **Waterproofing Materials:** For substructure and transformer foundations to prevent seepage and protect insulation.
- **Bitumen or Pavers:** For internal access roads and vehicular paths.
- **Paint and Finishing Materials:** For building interiors, control panels, and safety markings.

#### 3.10.1 Electrical and Mechanical Components

The grid station will house key high-voltage and low-voltage electrical equipment, all requiring proper mounting, grounding, and protection as per NTDC/LESCO standards.

#### Major equipment and materials:

- 132/11 kV Power Transformers
- 132 kV Circuit Breakers, Isolators, and CT/PTs
- Control and Relay Panels
- Bus Bars and Gantries
- Earthing and Lightning Protection System
- LT Panels, Cable Trays, and Cable Ducts
- Battery Banks and Chargers

#### 3.10.2 Site Utilities and Safety Infrastructure

To ensure operational safety and functionality, the grid station must be equipped with:

- Drainage and Stormwater Channels
- Firefighting Equipment and Sand Buckets
- Security Fencing, Gates, and Surveillance Systems
- Lighting Poles and Internal Illumination
- Water Supply Line for Staff Use and Fire Safety

- Note on Quarry and Construction Material Procurement for 132 kV Chahar Bagh Grid Station, Lahore

### 3.11 Quantities of Construction Material

The construction of the 132 kV Grid Station at Chahar Bagh, Lahore, will require a substantial quantity of construction materials including aggregates, sand, crush, cement, steel, and bricks.

Table 3-1 Estimated Construction Material Quantities

Material	Estimated Quantity	Remarks
Cement (OPC)	~3,000 – 3,500 bags	Foundations, RCC works, plinths, walls
Sand	~1,200 – 1,500 cubic feet	RCC, masonry, plaster
Crush (Aggregate 1/2")	~2,500 – 3,000 cubic feet	Concrete works
Bricks	~120,000 – 140,000 units	Control room, guard room, walls
Steel Reinforcement	~40 – 50 tons	RCC foundations, columns, gantry bases
Bitumen or Pavers	~1,000 – 1,200 sq. meters	Internal roads
Precast Cable Trenches	~300 – 500 meters	For HV cable routing
Boundary Wall (8 ft high)	~1,100 – 1,200 linear feet	Around full site
Waterproofing Materials	As required (~200 m <sup>2</sup> )	Transformer foundations
Paint & Finishing	~2,000 – 2,500 liters	Buildings, poles, marking
Drainage Pipes/Channels	~200 – 300 meters	Stormwater control
Backfilling Material	~1,000 – 1,200 cubic feet	General levelling and filling

All construction materials will be procured from existing and approved commercial sources to ensure quality and environmental compliance.

No new quarry or excavation site will be developed specifically for this project. All aggregates and crush material (stone, gravel, etc.) will be sourced from licensed and operational quarries, which are already regulated by the relevant government departments. This approach eliminates the need for new quarry development, thereby avoiding any direct environmental degradation such as deforestation, land excavation, or habitat disturbance that typically results from new material extraction sites.

Sand and soil, where required for backfilling and leveling, will also be obtained from approved suppliers who operate within environmentally cleared zones. Procurement of

construction materials will follow applicable environmental, social, and safety regulations, and necessary documentation from suppliers will be verified to confirm legal and sustainable sourcing.

By utilizing existing commercial sources, the project ensures minimal ecological disturbance while supporting sustainable infrastructure development.

### 3.12 Manpower Requirements

The construction of GS will require a skilled and diverse workforce to complete the various tasks involved. The key manpower requirements include:

**Project Management and Supervision Team:** A dedicated project management team to oversee the construction process, ensure timelines are met, and liaise with stakeholders, including local authorities and environmental agencies.

**Civil Engineers and Technicians:** Professionals for civil works, site development, and structural construction, ensuring the foundation and buildings are constructed according to design specifications.

**Electrical Engineers and Technicians:** Specialized engineers to handle the installation and testing of electrical equipment, including transformers, switchgear, and control systems.

**Safety and Environmental Experts:** Personnel to ensure compliance with safety standards and environmental regulations throughout the construction phase.

**Labor Force:** Skilled and unskilled laborers for tasks such as welding, fabrication, construction, and manual labor, as well as equipment operators and drivers for machinery.

### 3.13 Wastewater Generation:

The total estimated wastewater generation for the project during the construction phase includes both domestic and construction-related sources. Domestic wastewater, primarily resulting from workers' daily activities, is projected at approximately 112,500 liters per month, based on an average of 75 liters per person per day for 50 workers over 30 days. Additionally, construction process wastewater—originating from concrete washout, equipment and vehicle washing, and site drainage—is estimated to range between 17,000 to 35,000 liters per month. Thus, the total monthly wastewater generation from all sources is expected to be approximately 129,500 to 147,500 liters. To manage this effectively and prevent contamination of the surrounding environment, a septic tank system will be installed at the construction site for the safe collection, containment, and preliminary treatment of domestic wastewater. Construction-related wastewater will be directed to sedimentation pits or temporary lined containment areas for proper disposal or reuse after treatment.

### **3.14 Solid Waste generation:**

During the construction of the grid station, it is estimated that approximately 30 kilograms of municipal solid waste will be generated per month. Construction waste primarily includes, packaging materials, scrap metal, and other miscellaneous non-hazardous materials associated with routine construction activities will be 100-150 kg per month. However, most of the construction waste will be reused, recycled and can be sold in market, remaining construction waste would be 20-30 kg per month. Moreover, construction debris will be disposed of in environmentally safe manner under the supervision of construction supervision consultant. Proper waste segregation, storage, and disposal practices will be implemented to manage this waste in an environmentally responsible manner.

**Administrative and Support Staff:** Personnel to handle logistics, procurement, and documentation, as well as ensuring smooth communication between various teams.

### **3.15 Construction Schedule**

The construction schedule for 132 kV Grid Stations is projected over a span of 14 Months (420 days), depending on site-specific conditions and the coordination of resources.

## 4 Baseline Studies

### 4.1 Baseline Studies Area

The baseline studies aim to establish the existing environmental and social conditions within the project area of influence, which encompasses both the footprint of the proposed 132kV GS and the corridor of impacts along the associated transmission lines. This defined area includes the grid station site, adjacent agricultural and waste lands, nearby settlements, and roadside alignments designated for transmission infrastructure. The purpose of these studies is to assess key physical, biological, and socioeconomic parameters that may be affected during the project's construction and operational phases. The findings serve as a benchmark for evaluating potential impacts and formulating appropriate mitigation and monitoring measures to ensure environmental and social compliance throughout the project lifecycle.

The project area and baseline study area with demarcation project area of influence/corridor of impacts is shown in Figure 4-1.

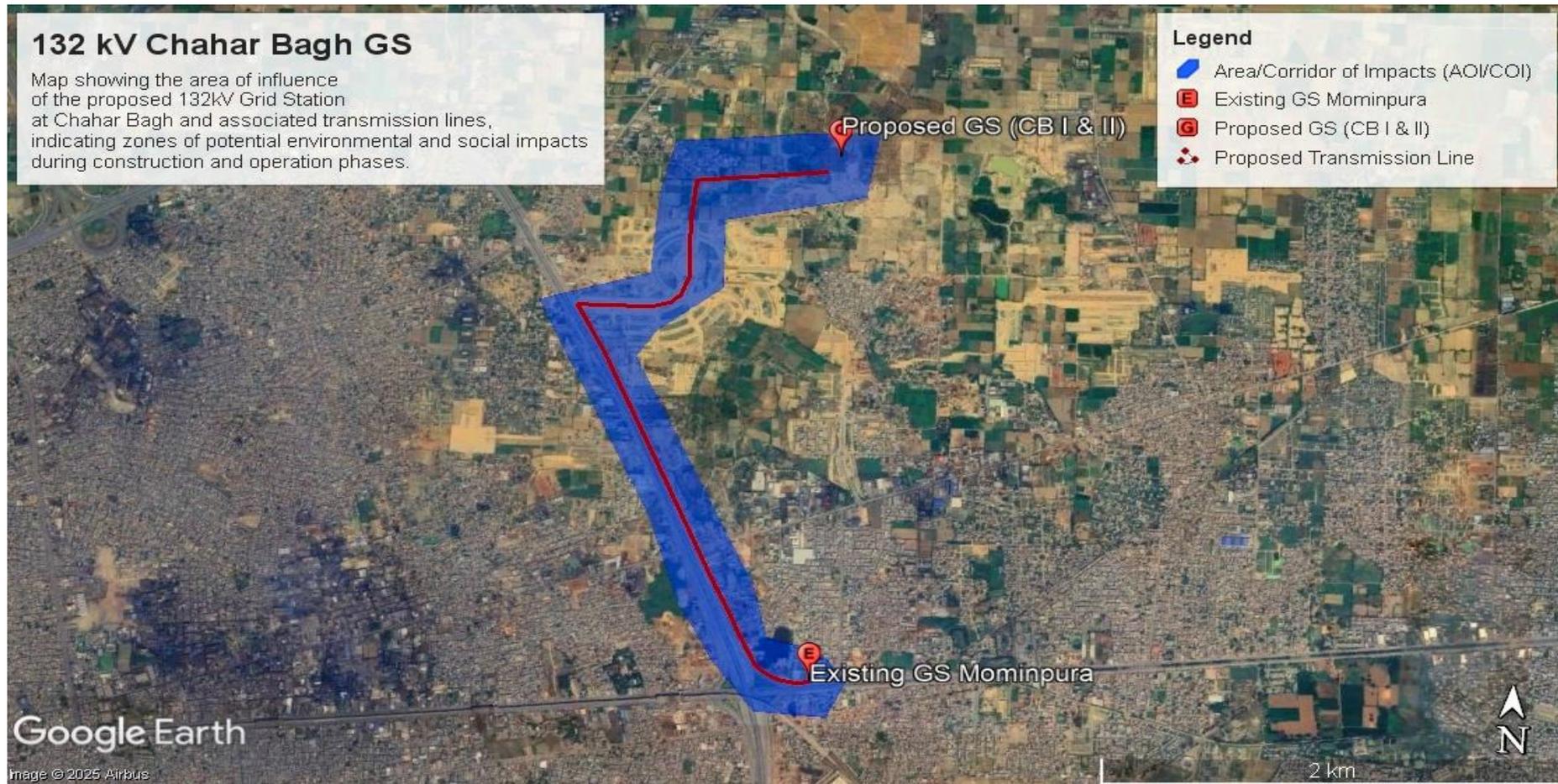


Figure 4-1 Project Area of Influence/Corridor of Impacts

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## 4.2 Physical Environment

The physical baseline of the project sites includes a description of the topography and geography, geology and soils, land use, seismicity, climate, water resources, water quality, ambient air quality, and sound levels in the Area of Influence (AoI) of the Project.

### 4.2.1 Project Influence Area

The project area includes all the areas that are likely to be directly or indirectly affected by the proposed construction activities, including but not limited to: direct footprint of the converter and GS site and right of way of proposed transmission line, temporary construction areas and worker camp sites, access roads to the project facilities for transport of material and equipment, etc.; areas that will be affected by the emissions from construction traffic; and also adjoining areas of the GS site that will be affected by operational activities.

The entire area procured for construction of the proposed substation, is included in direct impact zone. The area within 5 km wide Right of Way (RoW) where project activities such as foundation excavation for tower installation and stringing of conductors are carried out. This area will also be kept permanently clear of any vegetation above 5 feet height during the operation phase of the project which may result in repeated disturbance of the habitat. The roads connecting to the project site will be used as a route for transport of equipment and material required for construction and operation of the grid stations. All the local roads and the main road used for the construction of transmission line is also included in the project area of influence.

The indirect impact zone refers to the area where indirect impacts of the project may extend includes a buffer zone of 1 km radius around the substation and the transmission lines.

### 4.2.2 Climate

The climate of Chahar Bagh, Lahore, is consistent with the general climate of Lahore, which is classified as a hot semi-arid climate. Lahore experiences distinct seasonal changes, including hot summers, mild winters, and a monsoon season.

The climate of the proposed project area at Chahar Bagh, Lahore, falls under the hot semi-arid (BSh) climate classification as per the Köppen climate system. The region experiences extreme seasonal variations, including intense heat during the summer months, a distinct monsoon season, and mild to cool winters. However, in recent years, climate patterns have shown increasing volatility due to urbanization, climate change, and rising air pollution levels, particularly affecting Lahore and its surrounding areas.

#### **Summer (April to June):**

Summers in the project area are intensely hot, with daytime temperatures frequently exceeding 40°C. June is typically the hottest month. During this period, heatwaves have become increasingly frequent and severe, posing risks to human health, worker safety,

and infrastructure performance. Prolonged heat stress also contributes to increased energy demand for cooling and affects the efficiency of transmission and distribution systems.

#### **Monsoon (July to September):**

The monsoon season brings much-needed rainfall, usually beginning in late June or early July, and continuing through September, with average rainfall ranging between 200–300 mm. While monsoon rains temporarily reduce temperatures and improve air quality, they also increase surface water runoff and flood risks, especially in poorly drained urban areas. These rains are essential for agriculture but can disrupt construction schedules if not properly planned.

#### **Winter (December to February):**

Winters are mild to cool, with night-time temperatures dropping to 5°C–12°C. Dense fog and temperature inversions are common in December and January, often leading to severely reduced visibility and deterioration of air quality. In recent years, winter SMOG—a toxic mix of fog and air pollutants—has become a recurrent issue in Lahore, significantly impacting public health and construction activities.

#### **Spring and Autumn (March–April and October–November):**

These transitional seasons are marked by moderate temperatures ranging between 15°C and 30°C, and are generally considered the most favorable for outdoor work and environmental stability. However, autumn months often coincide with increased air pollution due to crop burning in surrounding regions, which can exacerbate SMOG episodes.

#### **Emerging Climate Concerns**

Due to rapid urbanization, reduced green cover, and industrial emissions, SMOG and heatwaves have become permanent seasonal features of Lahore's environment. These conditions pose significant challenges for infrastructure development and operation, including health risks to workers, reduced visibility, mechanical stress on equipment, and environmental degradation. Climate resilience measures, such as dust suppression, SMOG preparedness, and heat stress management for labor, will be essential during both the construction and operational phases of the grid station.

The **Error! Reference source not found.** the monthly average of temperature and precipitation in a year. The temperature is highest during the months of June and July while the lowest temperature is during the months of December and January.

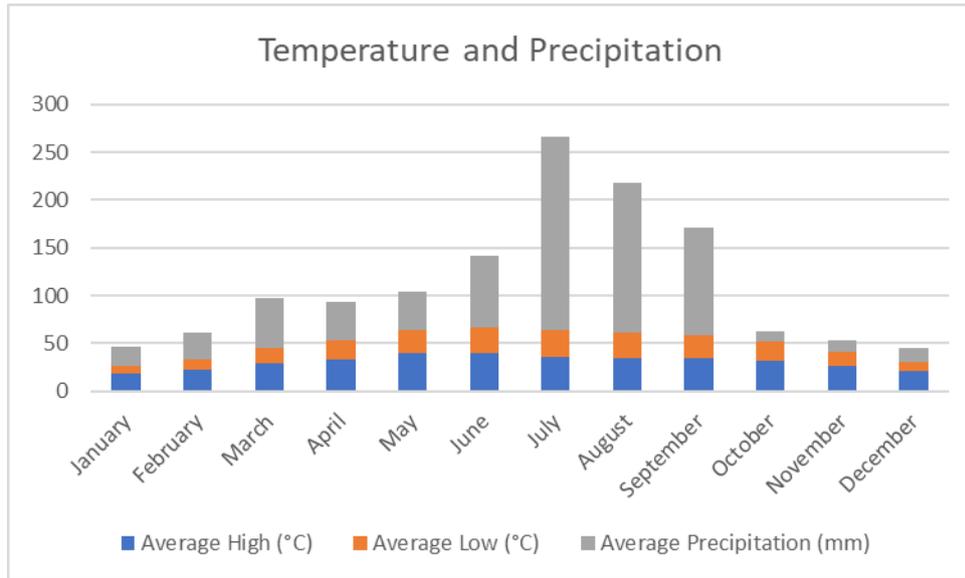


table 4-2 Temperature and Precipitation

The climate of Lahore, including the Chahar Bagh area, is affected by urbanization, which leads to the urban heat island effect, making temperatures in the city center higher than in surrounding rural areas.

#### 4.2.3 Soil

The soils in the Chahar Bagh area of Lahore belong to the Alluvial Soil category, with certain variations in their texture and fertility. The soils in this region are influenced by periodic flooding and sedimentation by the Ravi River. Key characteristics include:

- **Texture:** The soil is typically loamy and clayey, which makes it well-suited for agricultural purposes, particularly in the historical context when the land around Chahar Bagh may have been used for garden cultivation or agriculture. The fertility of these soils is moderate to high, making them suitable for various vegetation and crops.
- **Fertility:** These soils are rich in nutrients like nitrogen and phosphorus, contributing to their agricultural productivity. However, urbanization has caused the soil's fertility to decrease in some parts due to construction and industrial activity. In addition, the presence of salts, especially in areas affected by flood irrigation, could also limit the growth of some plants.
- **Drainage:** Soils in Chahar Bagh's vicinity are typically well-drained due to their composition of sand and silt, although the water retention capacity varies depending on the depth of clay layers. Urban development and construction have altered natural drainage patterns, leading to localized issues like waterlogging in certain parts of the city.
- **Soil pH:** The soils around Lahore, including Chahar Bagh, tend to have a slightly alkaline pH (around 7.5 to 8.5), which is typical for areas influenced by riverine

deposits in arid to semi-arid regions. This alkalinity can affect the types of plants that thrive in the region.

#### **4.2.4 Seismology and Earthquake Risks**

In general, the I-II project area lies within the Central Indus Basin which makes it less prone to earthquakes and seismic activity as compared to other areas which lie closer to tectonic plates. Therefore, the region is classified at medium risk with 10% chance of highly damaging shaking effects in the next fifty years. This requires that the harmful impacts of the project should be considered in all phases, especially during the construction and design stage. Moreover, project design, project planning decisions and construction techniques should be taken into the account regarding the seismic risk level.

#### **4.2.5 Wind Speed**

The project site at Chahar Bagh experiences moderate wind speeds that fluctuate with seasonal climatic conditions. On average, wind speeds in the region range between 6 to 11 km/h, with higher values typically recorded during the pre-monsoon and summer months (April to June), driven by increased thermal activity and surface heating.

Data from nearby locations such as Shad Bagh, which are in close proximity to the project area, indicate that average wind speeds can reach up to 9.2 km/h in April and 9.1 km/h in May. These wind levels gradually decline during the post-monsoon and winter periods, reflecting the seasonal atmospheric stability and lower thermal contrasts.

The prevailing wind conditions are generally not strong enough to pose significant structural risks; however, wind direction and velocity are important considerations for the dispersion of dust and emissions during construction, as well as for ensuring safe installation and operation of electrical equipment and transmission lines.

#### **4.2.6 Air Quality**

The air quality in the Chahar Bagh area of Lahore is influenced by the overall environmental conditions of the city. Lahore, being one of the most populous and industrialized cities in Pakistan, experiences significant air quality challenges due to rapid urbanization, industrial activities, vehicular emissions, and seasonal weather conditions. These factors also impact the air quality specifically in the Chahar Bagh area. Ambient Air Quality monitoring was conducted at two strategic locations, Near Chahar Bagh and Near Project Location. The objective was to assess the baseline air quality conditions and evaluate compliance with the Punjab Environmental Quality Standards (PEQS).

##### **4.2.6.1 Air Quality Monitoring at Location-1**

The Air quality is monitored for 24 hrs at the location near Chahar Bagh of co-ordinates 31°37'03.6"N 74°26'12.3"E on 12-May-2025 to 13-May-2025 whose average results are in **Table 4-1**.

Table 4-1 Average Air quality Monitoring Readings at Location-1

Parameter	Unit	Monitoring Duration	LDL	Average Obtained Concentration	PEQS
Nitrogen Dioxide (NO <sub>2</sub> )	µg/m <sup>3</sup>	24 Hours	1.00	74.24	80.0
Nitrogen Oxide (NO)	µg/m <sup>3</sup>	24 Hours	1.00	39.29	40.0
NO <sub>x</sub>	µg/m <sup>3</sup>	24 Hours	1.00	113.53	120.0
Sulphur Dioxide (SO <sub>2</sub> )	µg/m <sup>3</sup>	24 Hours	1.00	88.61	120.0
Carbon Monoxide (CO)	mg/m <sup>3</sup>	24 Hours	0.01	7.14	5.0*
Ozone (O <sub>3</sub> )	µg/m <sup>3</sup>	24 Hours	-	61.64	130.0**
Particulate Matter (PM <sub>2.5</sub> )	µg/m <sup>3</sup>	24 Hours	1.00	99.03	35.0
Particulate Matter (PM <sub>10</sub> )	µg/m <sup>3</sup>	24 Hours	1.00	214.48	150.0
Suspended Particulate Matter (SPM)	µg/m <sup>3</sup>	24 Hours	1.00	348.51	500.0
Lead Airborne Particles	µg/m <sup>3</sup>	24 Hours	-	0.36	1.5
*08 hours standard for CO					
**01 hour standard for O <sub>3</sub>					

The 24-hour monitoring results indicate:

- Particulate Matter (PM<sub>2.5</sub>) concentration was 99.03 µg/m<sup>3</sup>, significantly exceeding the PEQS limit of 35.0 µg/m<sup>3</sup>.
- PM<sub>10</sub> was recorded at 214.48 µg/m<sup>3</sup>, also exceeding the PEQS limit of 150.0 µg/m<sup>3</sup>.
- Carbon Monoxide (CO) concentration was 7.14 mg/m<sup>3</sup>, exceeding the 8-hour PEQS standard of 5.0 mg/m<sup>3</sup>
- Gaseous pollutants including NO<sub>2</sub> (74.24 µg/m<sup>3</sup>), NO (39.29 µg/m<sup>3</sup>), NO<sub>x</sub> (113.53 µg/m<sup>3</sup>), and SO<sub>2</sub> (88.61 µg/m<sup>3</sup>) were found within permissible limits.
- Ozone (O<sub>3</sub>) and Lead levels were well below PEQS limits.

These results suggest that particulate matter is a critical pollutant at this location, likely influenced by vehicular emissions, construction activities, and unpaved surfaces.

#### 4.2.6.2 Air Quality Monitoring at Location-2

The Air quality is monitored for 24 hrs at the location near Project site of co-ordinates 31°35'26.3"N 74°26'11.9"E on 13-May-2025 to 14-May-2025 whose average results are in Table 4-2.

Table 4-2 Average Air Quality Monitoring Readings at Location-2

Parameter	Unit	Monitoring Duration	LDL	Average Obtained Concentration	PEQS
Nitrogen Dioxide (NO <sub>2</sub> )	µg/m <sup>3</sup>	24 Hours	1.00	75.68	80.0
Nitrogen Oxide (NO)	µg/m <sup>3</sup>	24 Hours	1.00	40.05	40.0
NO <sub>x</sub>	µg/m <sup>3</sup>	24 Hours	1.00	115.74	120.0
Sulphur Dioxide (SO <sub>2</sub> )	µg/m <sup>3</sup>	24 Hours	1.00	90.33	120.0
Carbon Monoxide (CO)	mg/m <sup>3</sup>	24 Hours	0.01	2.57	5.0*
Ozone (O <sub>3</sub> )	µg/m <sup>3</sup>	24 Hours	-	62.83	130.0**
Particulate Matter (PM <sub>2.5</sub> )	µg/m <sup>3</sup>	24 Hours	1.00	481.12	35.0
Particulate Matter (PM <sub>10</sub> )	µg/m <sup>3</sup>	24 Hours	1.00	491.66	150.0
Suspended Particulate Matter (SPM)	µg/m <sup>3</sup>	24 Hours	1.00	1004.78	500.0
Lead Airborne Particles	µg/m <sup>3</sup>	24 Hours	-	0.67	1.5
*08 hours standard for CO					
**01 hour standard for O <sub>3</sub>					

Air quality parameters at this location reflected a more severe situation in terms of particulates:

- PM<sub>2.5</sub> and PM<sub>10</sub> were alarmingly high at 481.12 µg/m<sup>3</sup> and 491.66 µg/m<sup>3</sup>, respectively—far exceeding PEQS.
- SPM (Suspended Particulate Matter) reached 1004.78 µg/m<sup>3</sup>, breaching the PEQS limit of 500.0 µg/m<sup>3</sup>.

- 
- NO ( $40.05 \mu\text{g}/\text{m}^3$ ) was marginally above the PEQS limit of  $40.0 \mu\text{g}/\text{m}^3$ , while other gaseous pollutants remained within acceptable limits.
  - CO concentration was significantly lower here ( $2.57 \text{ mg}/\text{m}^3$ ), indicating relatively better vehicular management or dispersion conditions compared to Chahar Bagh.

#### **4.2.6.3 Conclusion:**

- These findings indicate poor ambient air quality particularly due to high particulate pollution, which could pose serious respiratory and cardiovascular risks to the local population if not mitigated. The sign and Stemp Monitoring Report are provided in the ANNEX-3.

#### **4.2.7 Water Quality**

- Groundwater in Lahore, including the Chahar Bagh area, is an important source of potable water. However, the increasing demand for water and over-extraction has led to a drop in the water table. Additionally, the groundwater has become contaminated with nitrates, salts, and heavy metals from industrial runoff, sewage leakage, and the use of chemical fertilizers and pesticides in nearby agricultural areas.

##### **4.2.7.1 Drinking Water Quality Monitoring:**

- A drinking water sample collected near the farmhouse in the Chahar Bagh was subjected to comprehensive physical, chemical, and microbiological analysis in accordance with Punjab Environmental Quality Standards (PEQS). The results are shown in Table 4-4.

Table 4-3 Drinking Water Quality Monitoring Results

Parameters	Analysis Method	Unit	LOR	Result	PEQS
				01	
<b>PHYSICAL &amp; CHEMICAL ANALYSIS</b>					
pH	APHA-4500H <sup>+</sup> B	-	0.01	6.94	6.5-8.5
Odor	In-house	-	-	Odorless	Non-Objectionable
Taste	In-house	-	-	Sweet	Non-Objectionable
Color	APHA-2120 B/C	Pt/Co	1.0	<1.0	≤15 TCU
Turbidity	APHA-2130 B	NTU	0.1	<0.1	<5 NTU
Total Hardness	APHA-2340 B & C	mg/l	0.1	252.0	< 500 mg/l
Total Dissolved Solid (TDS)	APHA-2540 C	mg/l	1.0	474.0	< 1000
Ammonia	APHA-4500-NH <sub>3</sub> -B	mg/l	0.002	<0.002	-
Chloride	APHA-4500Cl <sup>-</sup> B	mg/l	0.24	13.69	< 250
Cyanide (CN)	APHA-4500CN E	mg/l	0.01	<0.01	≤ 0.05
Fluoride (F)	APHA-4500F <sup>-</sup> D	mg/l	0.01	<0.01	≤ 1.5
Nitrite	APHA-4500NO <sub>2</sub> B	mg/l	0.01	0.27	≤ 3 (P)
Nitrate	APHA-4500NO <sub>3</sub> C	mg/l	0.1	0.6	≤ 50
Phenolic Compound	APHA-5530 D	mg/l	0.01	<0.01	-
Residual Chlorine	APHA-4500Cl G	mg/l	0.1	<0.1	0.2-0.5
Aluminum (Al)	APHA-3111Al B	mg/l	0.028	<0.028	≤ 0.2
Cadmium	APHA-3111Cd B	mg/l	0.0028	<0.0028	0.01
Copper	APHA-3111Cu B	mg/l	0.0045	<0.0045	2
Chromium	APHA-3111Cr B	mg/l	0.0054	<0.0054	≤ 0.05 (P)
Mercury	APHA-3112Hg B	mg/l	0.0008	<0.0008	≤ 0.001
Antimony (Sb)	APHA-3111Sb B	mg/l	-	ND	≤ 0.005 (P)
Nickel	APHA-3111Ni C	mg/l	0.008	<0.008	≤ 0.02
Zinc	APHA-3111Zn B	mg/l	0.0033	<0.0033	5.0
Arsenic	APHA-3111As B	mg/l	0.01	<0.01	≤ 0.05 (P)
Barium	APHA-3111Ba B	mg/l	0.031	<0.031	0.7
Manganese	APHA-3111Mn B	mg/l	0.0016	<0.0016	≤ 0.5
Iron	APHA-3111Fe B	mg/l	0.1	<0.1	-
Boron	APHA-4500-B (C)	mg/l	0.1	<0.1	0.3
Lead	APHA-3111Pb B	mg/l	0.013	<0.013	≤ 0.05
Selenium	APHA-3111Se B	mg/l	-	ND	0.01 (P)
<b>MICROBIOLOGICAL ANALYSIS</b>					
Total Coliforms	APHA:9222 B	CFU/100ml		32	0/100ml
Faecal Coliforms (Ecoli)	APHA:9222 D	CFU/100ml		Absent	0/100ml
<b>Note:</b>					
*Uncertainty of all the parameters and laboratory conditions at the time of analysis will be provided as per client's requirement. The lab environmental conditions are maintained at 25±5C° and humidity at 50±20%.					

The results indicate that the water quality is largely compliant with regulatory limits and suitable for human consumption.

- pH was found to be 6.94, well within the acceptable PEQS range of 6.5–8.5, indicating neutral water that poses no corrosive or scaling risks.
- Turbidity (<0.1 NTU), Color (<1.0 Pt/Co), and Total Dissolved Solids (474 mg/l) were all within safe limits, signifying visually and chemically clean water with acceptable mineral content.
- Total Hardness measured 252 mg/l, also within permissible levels (<500 mg/l), implying the water is moderately hard but not harmful
- Essential characteristics such as odor (odorless) and taste (sweet) were found to be non-objectionable and suitable for drinking.
- For toxicological parameters, all tested heavy metals (including Lead, Arsenic, Mercury, Chromium, Cadmium, and Nickel) were below detection limits or within PEQS, minimizing any risk of chronic exposure. Other parameters like Nitrate (0.6 mg/l), Nitrite (0.27 mg/l), Chloride (13.69 mg/l), and Fluoride (<0.01 mg/l) were also well below their respective thresholds, indicating low contamination from agricultural or industrial sources.
- Crucially, microbiological testing revealed absence of Total Coliforms and Fecal Coliforms (E. coli) in the sample, confirming that the water is microbiologically safe and free from fecal contamination—a key requirement for public health safety.

#### **4.2.7.2 Conclusions:**

- The overall analysis concludes that the drinking water sample meets all PEQS requirements for potability. Continued monitoring and source protection are recommended to ensure the long-term safety of water resources, especially during construction and operational phases of the Chahar Bagh Grid Station project. The sign and Stemp Monitoring Report are provided in the ANNEX-3.

#### **4.2.7.3 Waste Water Monitoring:**

- A grab sample of wastewater collected from Near Bhaini Road (Chahar Bagh, Lahore) was analyzed to assess its compliance with the Punjab Environmental Quality Standards (PEQS). The results are shown in Table 4-4.

Table 4-4 Waste Water Quality Monitoring Results

Parameters	Analysis Method	Unit	LOR	Result	PEQS
				01	
<b>PHYSICAL &amp; CHEMICAL ANALYSIS</b>					
Temperature	-	°C	-	1.5	<3
pH	APHA-4500H* B	pH unit	0.01	8.12	6-9
Total Dissolved Solid (TDS)	APHA-2540 C	mg/l	1.0	2020.0	3500
Oil and Grease	USEPA-1664	mg/l	0.2	<0.2	10
Biological Oxygen Demand	APHA-5210 B	mg/l	1.0	218.0	80
Chemical Oxygen Demand	APHA-5220-D	mg/l	1.0	643.0	150
Total Suspended Solid	APHA-2540-D	mg/l	1.0	256.0	200
Phenolic Compound	APHA-5530 D	mg/l	0.01	<0.01	0.1
Chloride (Cl)	APHA-4500Cl B	mg/l	0.24	362.01	1000
Fluoride (F)	APHA-4500F C	mg/l	0.01	0.28	10
Cyanide (CN)	APHA-4500CN F	mg/l	0.01	<0.01	1.0
Detergent	APHA-5540 B	mg/l	-	9.0	20
Sulphate	APHA-4500-SO <sub>4</sub> C	mg/l	0.41	203.33	600
Sulphide	APHA-4500-S <sub>2</sub> -E	mg/l	0.4	<0.4	1.0
Ammonia	APHA-4500-NH <sub>3</sub> -B	mg/l	0.002	1.12	40
Silver	APHA-3500Ag-B	mg/l	0.0032	<0.0032	1.0
Cadmium	APHA-3500Cd B	mg/l	0.0028	<0.0028	0.1
Chromium	APHA-3500Cr B	mg/l	0.0054	0.0649	1.0
Copper	APHA-3500Cu B	mg/l	0.0045	0.0452	1.0
Lead	APHA-3500-Pb B	mg/l	0.013	<0.013	0.5
Mercury	APHA-3500-Hg B	mg/l	0.0008	<0.0008	0.01
Nickel	APHA-3500-Ni B	mg/l	0.008	0.0131	1.0
Zinc	APHA-3500-Zn B	mg/l	0.0033	0.7172	5.0
Arsenic	APHA-3500As B	mg/l	0.01	<0.01	1.0
Barium	APHA-3500Ba B	mg/l	0.031	<0.031	1.5
Manganese	APHA-3500-Mn B	mg/l	0.0016	0.0126	1.5
Iron	APHA-3500-Fe-B	mg/l	0.1	14.1907	8.0
Boron	APHA-4500B-C	mg/l	0.1	<0.1	6.0
Total Chlorine	APHA-4500Cl-B	mg/l	0.1	<0.1	1.0
Selenium	APHA-3500Se C	mg/l	0.23	<0.23	0.5
Total Toxic Metals	By Calculation	mg/l	-	0.1232	2.0
<b>Abbreviations:</b>					
ND: Not Detected		LOR: Limit of Reporting		PEQS: Punjab	
Environmental Quality Standards					
<b>Note:</b>					
*Uncertainty of all the parameters and laboratory conditions at the time of analysis will be provided as per client's requirement. The lab environmental conditions are maintained at 25±5C° and humidity at 50±20%.					

The test revealed exceedances in several key parameters, raising environmental and public health concerns.

- The Biological Oxygen Demand (BOD) was recorded at 218 mg/l, and Chemical Oxygen Demand (COD) at 643 mg/l, significantly higher than the PEQS limits of 80 mg/l and 150 mg/l, respectively. These high values indicate a strong presence of biodegradable organic matter, which may deplete dissolved oxygen in receiving water bodies, thereby affecting aquatic life.
- Total Suspended Solids (TSS) were also above the permissible level, recorded at 256 mg/l against a standard of 200 mg/l, which can lead to turbidity and sedimentation issues in aquatic ecosystems.
- The concentration of Total Dissolved Solids (TDS) stood at 2020 mg/l, well within the PEQS limit of 3500 mg/l, indicating acceptable salinity levels.
- Heavy metals such as Iron exceeded the PEQS, recorded at 14.19 mg/l compared to the allowable limit of 8.0 mg/l, which may pose toxicity risks to aquatic organisms and bioaccumulate in the food chain.
- All other toxic metals (e.g., Cadmium, Lead, Mercury, Arsenic) and compounds such as Oil and Grease, Phenolic Compounds, Cyanide, and Sulfide were found to be below detectable limits or within regulatory standards, suggesting no acute contamination by these substances.
- Nutrients such as Ammonia (1.12 mg/l) were well within the PEQS limit of 40 mg/l, suggesting a low risk of eutrophication under current discharge levels.
- The Total Toxic Metals concentration was calculated at 0.1232 mg/l, which is safely below the PEQS threshold of 2.0 mg/l.

#### **4.2.7.4 Conclusion:**

These findings highlight that while most metal and chemical concentrations are within acceptable limits, the elevated levels of BOD, COD, TSS, and Iron require corrective action. Without proper wastewater treatment, continued discharge of such effluents may result in significant degradation of surface and groundwater resources. The sign and Stemp Monitoring Report are provided in the ANNEX-3.

#### **4.2.8 Noise**

Noise Level monitoring was conducted at two strategic locations, Near Chahar Bagh and Near Project Location. The objective was to assess the baseline noise levels and evaluate compliance with the Punjab Environmental Quality Standards (PEQS).

##### **4.2.8.1 Noise Level Monitoring at Location-1**

The Noise Level is monitored for 24 hrs at the location near Chahar Bagh of co-ordinates 31°37'03.6"N 74°26'12.3"E on 12-May-2025 to 13-May-2025 whose results are given below:

Table 4-5 Noise Level at Location-1

Sr. #	Time	Method/Technique	Unit	Results	PEQS
				LA avg	(Residential)
<b>Night Time</b>					
1.	23:12	Noise Meter	dB	56.3	
2.	00:12	Noise Meter	dB	60.7	
3.	01:12	Noise Meter	dB	59.7	
4.	02:12	Noise Meter	dB	63.0	
5.	03:12	Noise Meter	dB	58.4	45.0
6.	04:12	Noise Meter	dB	55.0	
7.	05:12	Noise Meter	dB	56.0	
8.	06:12	Noise Meter	dB	55.4	
<b>Night Time Average</b>			<b>dB</b>	<b>58.05</b>	<b>45.0</b>
<b>Day Time</b>					
9.	07:12	Noise Meter	dB	61.6	
10.	08:12	Noise Meter	dB	69.1	
11.	09:12	Noise Meter	dB	69.6	
12.	10:12	Noise Meter	dB	60.7	
13.	11:12	Noise Meter	dB	60.1	
14.	12:12	Noise Meter	dB	61.1	
15.	13:12	Noise Meter	dB	60.6	
16.	14:12	Noise Meter	dB	70.2	
17.	15:12	Noise Meter	dB	69.4	55.0

18.	16:12	Noise Meter	dB	69.4	
19.	17:12	Noise Meter	dB	73.3	
20.	18:12	Noise Meter	dB	60.9	
21.	19:12	Noise Meter	dB	70.4	
22.	20:12	Noise Meter	dB	68.7	
23.	21:12	Noise Meter	dB	65.2	
24.	22:12	Noise Meter	dB	66.7	
<b>Day Time Average</b>			<b>dB</b>	<b>66.06</b>	<b>55.0</b>

#### 4.2.8.2 Noise Level Monitoring at Location-2

The Noise Level is monitored for 24 hrs at the location near Project site of co-ordinates 31°35'26.3"N 74°26'11.9"E on 13-May-2025 to 14-May-2025 whose results are given in Table 4-6.

Table 4-6 Noise Level at Location-2

Sr. #	Time	Method/Technique	Unit	Results	PEQS (Commercial)
				LA avg	
<b>Night Time</b>					
1.	23:12	Noise Meter	dB	64.6	
2.	00:12	Noise Meter	dB	65.3	
3.	01:12	Noise Meter	dB	64.3	
4.	02:12	Noise Meter	dB	61.9	
5.	03:12	Noise Meter	dB	67.8	55.0
6.	04:12	Noise Meter	dB	69.7	
7.	05:12	Noise Meter	dB	60.2	
8.	06:12	Noise Meter	dB	59.5	

Night Time Average			dB	64.16	55.0
<b>Day Time</b>					
9.	07:12	Noise Meter	dB	72.5	
10.	08:12	Noise Meter	dB	69.9	
11.	09:12	Noise Meter	dB	72.5	
12.	10:12	Noise Meter	dB	73.9	
13.	11:12	Noise Meter	dB	70.3	
14.	12:12	Noise Meter	dB	71.7	
15.	13:12	Noise Meter	dB	70.9	
16.	14:12	Noise Meter	dB	75.2	
17.	15:12	Noise Meter	dB	69.4	65.0
18.	16:12	Noise Meter	dB	70.9	
19.	17:12	Noise Meter	dB	74.5	
20.	18:12	Noise Meter	dB	71.7	
21.	19:12	Noise Meter	dB	60.9	
22.	20:12	Noise Meter	dB	67.7	
23.	21:12	Noise Meter	dB	72.8	
24.	22:12	Noise Meter	dB	63.4	
<b>Day Time Average</b>			<b>dB</b>	<b>70.52</b>	<b>65.0</b>

#### 4.2.8.3 Conclusion:

- In both locations, noise pollution levels surpass the PEQS thresholds, particularly during peak hours. These elevated noise levels are primarily due to traffic, commercial activities, and possibly machinery or generator use. The sign and Stemp Monitoring Report are provided in the ANNEX-3.

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## 4.3 Biological Environment

### 4.3.1 Description of GS Area

The biological baseline assessment for the proposed 132kV GS indicates no significant ecological impact within the project footprint. The site comprises primarily agricultural and waste land, characterized by sparse vegetation and absence of any protected or endangered species. Common flora includes scattered trees such as neem, peepal, and acacia, while faunal presence is limited to commonly observed birds and reptiles found in semi-urban settings. Notably, the project site is situated at a safe distance from ecologically sensitive areas, with Bheni Plantation located approximately 15 km away and Tehra Plantation about 8 km away, minimizing any risk of direct or indirect disturbance. Figure 4-3 illustrates the Area of Influence (AOI) of the project along with the location of both plantations relative to the grid station site. However, the baseline environmental features of the surrounding areas are discussed hereunder to provide a comprehensive understanding of the regional ecological context.

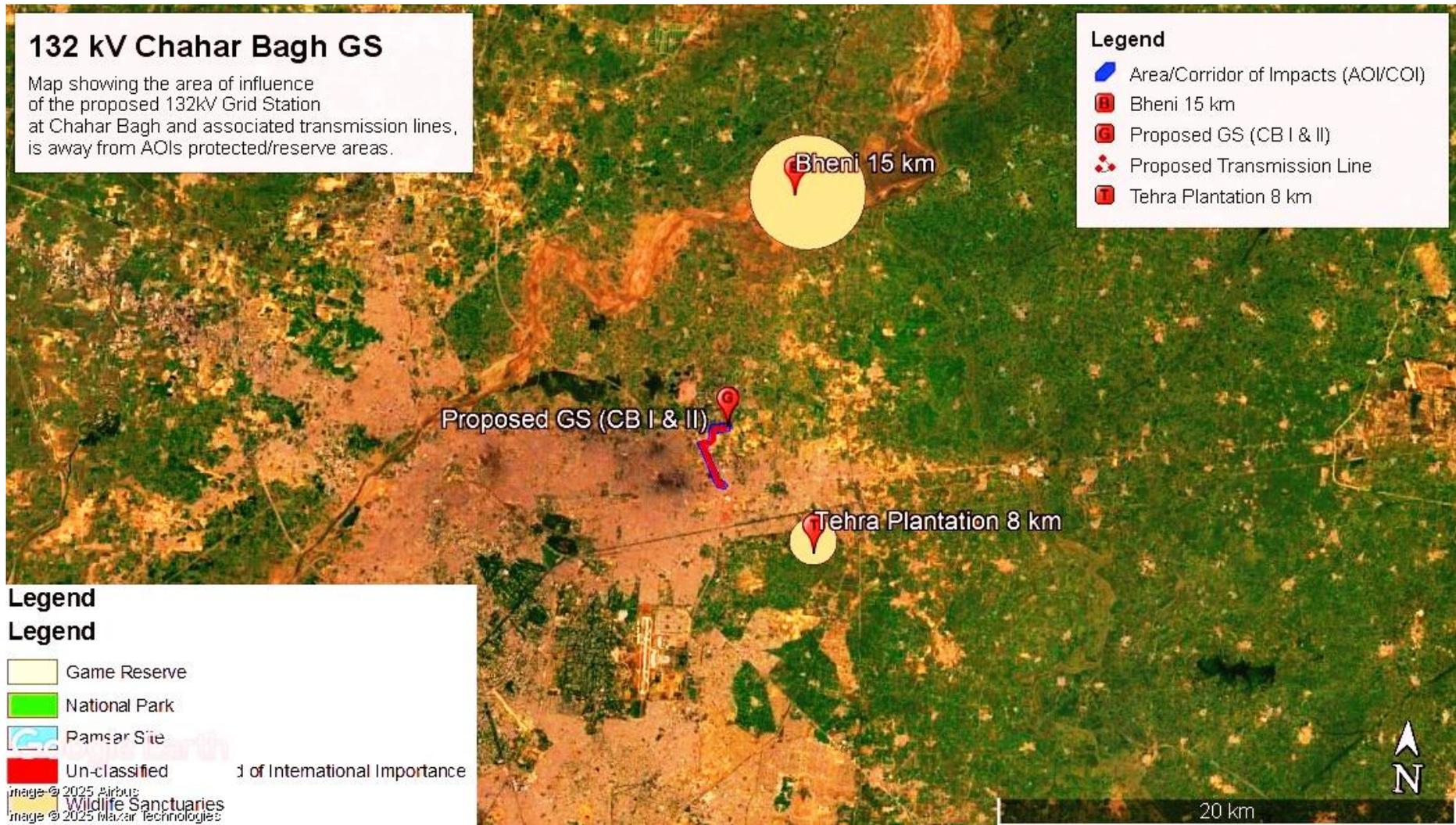


Figure 4-3 Project Area and nearest Protected Areas MAP

### 4.3.2 Flora

The site in which the project is located was once covered with native vegetation, consisting of trees like Karir (*Capparis aphylla*), Wan (*Capparis aphylla*) and Jand (*Prosopis spicigera*). With the onslaught of civilization, this vegetation was cleared for agricultural purposes. The major flora found on project site is given as under:

#### 4.3.2.1 Trees

Trees were not found on the project site. However, in surroundings, of the Study Area, a variety of tree plants was observed including both shady and fruit trees. These are of Egyptian Thorn (*Acacia nilotica*), Rain Tree (*Albizia lebbek*), Neem Tree (*Azadirachta indica*), Cotton Tree (*Bombax ceiba*), Paper Mulberry (*Broussonetia papyrifera*), Assyrian Plum (*Cordia myxa*), Sissoo Tree (*Dalbergia sissoo*), Koda Tree (*Ehretia serrata*), Corky Coral Tree (*Erythrina suberosa*), Red Gum (*Eucalyptus camaldulensis*), Spotted Gum (*Eucalyptus citriodora*), Flooded Gum (*Eucalyptus largiflorens*), Figure (*Ficus carica*), Athel Pine (*Tamarix aphylla*), Arjun Tree (*Terminalia arjuna*), Chinese Date (*Ziziphus jujuba*), Jujube (*Ziziphus nummularia*), Athel Pine (*Tamarix aphylla*), Arjun Tree (*Terminalia arjuna*), Chinese Date (*Ziziphus jujuba*), Jujube (*Ziziphus nummularia*)

#### 4.3.2.2 Grasses

On the project site, the identified grasses are Buffel Grass (*Cenchrus ciliaris*), Birdwood Grass (*Cenchrus setigerus*), Bermuda Grass, Egyptian Crowfoot Grass (*Cynodon dactylon*), Dactyloctenium scindicum, Halfa Grass (*Desmostachya bipinnata*), Southern Crabgrass (*Digitaria ciliaris*), Jungle Rice (*Echinochloa colonum*), Barnyardgrass (*Echinochloa crus-galli*), Wiregrass (*Eleusine indica*), Candy Grass (*Eragrostis cilianensis*), Spring Grass (*Eriochloa procera*), Whip Grass (*Hemarthria compressa*), Blady Grass (*Imperata cylindrica*), Blue Panicgrass (*Panicum antidotale*), Gingergrass (*Paspalum distichum*), Bottle-brush grass (*Perotis hordeiformis*), Tall Reed (*Phragmites karka*), Plume Grass (*Saccharum munja*), Canne D'italie (*Saccharum ravennae*), Wild Cane (*Saccharum spontaneum*), Yellow Foxtail (*Setaria glauca*), Pigeon Grass (*Setaria pumila*), Johnson Grass (*Sorghum halepense*), Madagascar Dropseed (*Sporobolus coromandelianus*), Goosegrass (*Acrachne racemosa*), Silver Beardgrass (*Bothriochloa laguroides*), Creeping Panic Grass (*Brachiaria reptans*).

#### 4.3.2.3 Shrubs

Chinese Bellflower (*Abutilon × hybridum*), Mimosa Bush (*Acacia farnEIAAna*), Saltbush (*Atriplex crassifolia*), Rubber bush/ Aak (*Calotropis procera*), Bush Morning Glory (*Ipomoea carnea*), Big Sage (*Lantana camara*), Castor Oil Plant (*Ricinus communis*), Salt Cedar (*Tamarix dioica*), Indian Ginseng (*Withania somnifera*).

#### 4.3.2.4 Ornamental Plants

At Some houses and Deras, there were also observed ornamental plants like Bougainvillea, Jasmine, and Quisqualis etc.

#### **4.3.2.5 Vegetables**

A large number of vegetables are grown in the study area. Some important of these are Phool Gobhi/cauliflower (*Brassica oleracea* Var. *Botrytis*), Band Gobhi (*Brassica oleracea* Var. *capitata*) Turnip, Raddish (*Raphanus sativus*), Carrot (*Daucus carota*), Bhindi, Tomato (*Lycopersicum esculentum*), Vegetable Marrow (*Cucurbita pepo*), Baingan (*Solanum melongena*) etc.

#### **4.3.2.6 Crops and Fodder**

Crops usually seeded in the area include Rice, Barley (*Hordeum vulgare*), Jawar (*Andropogon sorghum*), Maize and Sugarcane along with other fodder. Wheat crop was also identified sown on the project site.

#### **4.3.3 Fauna**

The survey was done in the project area and data was gathered for mammals, reptiles, birds, amphibians and insects. A checklist of the species that might be expected in the study area was prepared by searching published literature. Both direct observation and indirect methods were used to gather information. Community surveys were carried out and data was gathered from the local people regarding information of animals. The detail of the fauna in the project sites are given as under:

##### **4.3.3.1 Mammals**

The mammals found at project site are Wild boar (*Sus scrofa*), Indian crested porcupine (*Sus scrofa*), Palm squirrel (*Funambulus pennantii*), Indian hare (*Lepus nigricollis*), Asiatic Jackal (*Canis aureus*), roof rat (*Rattus rattus*), Indian mongoose (*Herpestes mungo*), Bush rat (*Golunda ellioti*), soft furred field rat (*Millardia meltada*), Asiatic House shrew (*Suncus murinus*), Indian false vampires (*Megaderma lyra*), House mouse (*Mus musculus*), Jungle cat (*Felis chaus*).

##### **4.3.3.2 Reptiles**

The reptiles found at project site are Indian crate (*Bungarus caeruleus*), Ceylon Chameleon (*Chamaeleo zeylanicus*), Checkered keelback (*Xenochrophis piscator*), Indian monitor lizard (*Varanus bengalensis*), Spiny tail lizard (*Uromastyx hardwickii*), Indian garden lizard (*Calotes versicolor*).

##### **4.3.3.3 Amphibians**

Amphibians found at project sites are Indian bull frog (*Hoplobatrachus tigerinus*), Indus toad (*Bufo stomaticus*).

##### **4.3.3.4 Birds**

The birds found at project site are Intermediate Egret (*Egretta intermedia*), Red turtle dove (*Streptopelia tranquebarica*), Common Myna (*Acridotheres tristis*), House Sparrow (*Passer domesticus*), Black Drongo (*Dicrurus macrocercus vieillot*), House Crow (*Corvus splendens*), Red vented bulbul (*Pycnonotus cafer*), Cattle egret (*Bubulcus ibis*), Hoopoe

(Upupa epops), Red-Wattled Lapwing (*Vanellus indicus*), Green bee eater (*Merops orientalis*), Bank Myna (*Acridotheres ginginianus*), Black Partridge (*Francolinus francolinus*), Pied kingfisher (*Ceryle rudis*), Black kite (*Milvus migrans*), Wild rock dove (*Columba livia*), White-breasted Kingfisher (*Halcyon smyrnensis*), Indian robin (*Saxicoloides fulicata*), White wagtail (*Motacilla alba*), Pied myna (*Gracupica contra*), Purple sunbird (*Cinnyris asiaticus*), little brown dove (*Spilopelia senegalensis*), golden backed woodpecker (*Dinopium benghalense*), Bush chat (*Saxicola caprata*), yellow throated sparrow (*Petronia xanthocollis*), Ring necked dove (*Streptopelia capicola*), Indian roller (*Coracias benghalensis*), Crow pheasant (*Centropus sinensis*), Crested lark (*Galerida cristata*), Common babbler (*Turdoides caudata*), Shikra (*Accipiter badius*), long tailed shrike (*Lanius schach*), Indian pond Heron (*Ardeola grayii*), Common tailor bird (*Orthotomus sutorius*), baya weaver (*Ploceus philippinus*), Magpie robin (*Copsychus saularis*).

The migratory birds found at project sites are Common Sand piper (*Actitis hypoleucos*), little egret (*Egretta garzetta*), Black winged stilt (*Himantopus himantopus*).

#### **4.3.3.5 Insects**

The insects found at project sites are house fly (*Musca domestica*), Scarlet Dragonfly (*Crocothemis erythraea*), Slender Skimmer (*Orthetrum sabina*), Wandering Glider (*Pantala flavescens*), Dotted Border (*Agriopsis marginaria*), Mottled Emigrant (*Catopriila pyranthe*), Small Salmon Arab (*Colotis amata Fabricius*), Painted Lady (*Cynthia cardui*), African Monarch (*Danaus chrysippus*), Peacock Pansy (*Junonia almana*), Lucerne Moth (*Nomophila nearctica*), Lime Butterfly (*Papilio demoleus*), the indian cabbage white (*Pieris canidia*), Green veined white (*Pieris napi*), Oriental Leaf worm Moth (*Spodoptera litura*), Pale Grass Blue (*Zizeeria maha*).

#### **4.3.3.6 Fish**

There is not any natural or manmade water pond present at project site hence no fish and fisheries present.

#### **4.3.3.7 Wildlife Sanctuaries and Game Reserves**

No wild life sanctuary or game reservoir is located in the vicinity of the project area.

#### **4.3.3.8 Rare or Endangered Species**

Indian Cobra (*Naja naja*), Indian chameleon (*Chamaeleo zeylanicus*), Saara hardwickii (*Uromastyx hardwickii*), Indian softshell turtle (*Nilssonina gangetica*) and Bengal monitor (*Varanus bengalensis*)

### **4.4 Socio-Economic Baseline**

Chahar Bagh, developed by the Ravi Urban Development Authority (RUDA), is strategically located along the Lahore Ring Road near the Shareefpura Interchange and Chahar Bagh Bhaini Interchange. This location places it in close proximity to several established residential settlements and industrial areas.

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#### 4.4.1 Administrative and Political Settings

Lahore, the capital city of Punjab Province, is not only the second-largest city of Pakistan but also serves as the political, administrative, and cultural heart of the region. As the provincial capital, Lahore hosts all major government institutions, including the offices of the Chief Minister Punjab, the Punjab Provincial Assembly, and the central offices of various provincial ministries and departments. This makes the city the center of governance and policymaking not only for Punjab but also often influences national-level decisions.

Administratively, Lahore is classified as a City District, which is managed by the Metropolitan Corporation Lahore (MCL). The city is further subdivided into administrative towns, now largely integrated into zones under the revised local government system, to facilitate municipal governance, service delivery, and urban management. These zones include prominent areas like Ravi, Shalimar, Gulberg, Data Gunj Baksh, Samanabad, Iqbal, Wagha, Aziz Bhatti, Nishtar, and Allama Iqbal Town. The city's law enforcement falls under the jurisdiction of Lahore Police, operating as part of Punjab Police, with the Capital City Police Officer (CCPO) at the helm, supported by divisions, circles, and police stations spread across the city.

Lahore also hosts specialized agencies responsible for urban planning, development control, and environmental management. The Lahore Development Authority (LDA) oversees urban planning and land use control, while the Ravi Urban Development Authority (RUDA) is tasked with the development of new riverfront urban areas along the Ravi River. Additionally, the Parks and Horticulture Authority (PHA) and Traffic Engineering and Transport Planning Agency (TEPA) play crucial roles in managing Lahore's green infrastructure and transport systems.

Politically, Lahore is considered the stronghold and battleground of major political parties. The city is represented through multiple constituencies in both the National Assembly and the Punjab Assembly, ensuring its political voice is central in legislative affairs. Lahore also has an established local governance structure under the Punjab Local Government Act, with elected metropolitan mayors, deputy mayors, and union council representatives, although the functioning and continuity of local governments often fluctuate with the political dynamics of the province.

In terms of the judicial system, Lahore is home to the Lahore High Court, the principal seat of the High Court for Punjab. Several district and session courts, family courts, and civil courts also operate in the city to deal with routine judicial matters. Being the political and administrative hub, Lahore frequently witnesses political protests, rallies, and sit-ins, adding to its complex security and law and order environment. The city also grapples with urban challenges such as congestion, pollution, and informal settlements, which place additional demands on its governance systems.

In Lahore, as in other parts of Pakistan, the Union Council (UC) serves as the lowest tier of the local government system and is considered the fifth tier of governance in the overall

administrative structure of the country. In the rural and peri-urban areas of Lahore, these UCs are often referred to as village councils, representing a large village and its surrounding hamlets, incorporating smaller settlements within their jurisdiction. However, in urban and metropolitan areas of Lahore, the term union council is more commonly used, where it represents neighborhoods or sectors within the city boundaries. Each UC in Lahore functions as an elected local government body, with a mayor and a deputy mayor elected directly by the local population, responsible for addressing community-level governance issues, development activities, and local dispute resolutions.

Above the Union Council is the Tehsil Council (TC), which serves as the next higher tier of local government. In Lahore's administrative framework, about four to five Union Councils collectively form a Tehsil Council, which is tasked with overseeing development planning, service delivery, and administrative coordination at the sub-district level. Although Lahore is now a City District, its administrative divisions still reflect the tehsil-based structure for ease of governance, especially in peripheral and rural areas falling under its jurisdiction.

At the apex of the local government system is the district level, which encompasses multiple tehsils. Lahore, being a city district, is administered by the District Coordination Officer (DCO), who coordinates the activities of various tehsils and ensures the implementation of provincial and federal policies at the district level. The DCO also oversees inter-departmental coordination, revenue collection, law and order management, and service delivery within the entire Lahore district.

In line with the local government system of Punjab, Lahore's UCs are comprised of members who are directly elected by the people through open electoral competition. These elected members not only serve their respective union councils but also act as part of the electoral college for selecting representatives to the next higher tier, i.e., the Tehsil Council. This tiered electoral system ensures representation from the grassroots level up to the district and provincial level, aiming to strengthen democratic governance and improve local service delivery in both urban and rural segments of Lahore.

#### **4.4.2 Nearby Settlements**

The immediate vicinity of Chahar Bagh includes a mix of well-established neighbourhoods and emerging housing societies:

- **Harbanspura:** A longstanding residential area known for its traditional neighborhoods and access to major roads.
- **Shahdara:** Located across the Ravi River, Shahdara is a historic suburb featuring Mughal-era monuments and a dense urban population.
- **China Scheme:** An urban residential locality situated near the Ring Road, offering a variety of housing options.
- **Lahore Press Club Housing Scheme (LPCHS):** A planned residential community providing modern amenities.

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#### 4.4.3 Nearby Industrial and Commercial Zones

Chahar Bagh benefits from its proximity to several industrial and commercial areas, contributing to the economic vibrancy of the region:

- **Bund Road Industrial Area:** A significant industrial zone housing various manufacturing and commercial enterprises.
- **GT Road Corridor:** A major commercial artery featuring a range of businesses, from retail outlets to service providers.
- **Shahdara Industrial Area:** Hosts a variety of industrial units, contributing to the economic activity in the region.
- **Bhaini Road Industrial Pockets:** Includes several small to medium-sized industrial establishments, supporting local employment and commerce.

#### 4.4.4 Surrounding Settlements and Industrial Units around the Grid Station

The proposed grid station site is located in a semi-urban setting surrounded by a mix of residential settlements and industrial units. The major settlements located in the immediate vicinity of the grid station include:

- **Gunj Sundwan:** A well-established residential settlement characterized by a mix of old and newly developed housing structures. The area is densely populated and has a developed community infrastructure.
- **Handoo:** Situated close to the grid station, Handoo is a rural-urban transitioning locality, with a growing residential population and limited commercial activities.
- **Natt Kalan:** Another prominent settlement in the vicinity, Nat Kalan is a traditionally established village that has gradually transformed into a peri-urban area with expanding housing colonies and small businesses.

These settlements contribute significantly to the local socio-economic profile of the project area and are likely to benefit from the enhanced electricity supply infrastructure.

#### 4.4.5 Major Industrial Units

The project area is also characterized by several industrial and manufacturing units located along the nearby industrial corridors, which include:

- **Koh-i-Noor Steel Mills:** A prominent steel manufacturing facility producing various steel products for construction and industrial use.
- **Star Asia Tech Industries:** An established engineering industry specializing in the production of industrial machinery and equipment.
- **Sakhi Engineering Works:** A reputed name in precision engineering, fabrication, and mechanical works for local and regional markets.
- **Hussain Engineers:** Known for manufacturing mechanical and electrical components, Hussain Engineers cater to both domestic and commercial sectors.
- **AN Enterprises:** A growing enterprise engaged in mechanical fabrication, steel structures, and general engineering services.

- **Ashfaq Engineering Works:** Specializing in custom engineering solutions, Ashfaq Engineering Works supports various sectors, including construction and industrial development.
- **Hassnat Batching Plant:** A concrete batching plant providing ready-mix concrete for construction projects in the surrounding urban and industrial zones.
- **Fabro International:** These industries are vital to the local economy, providing employment opportunities and contributing to the regional industrial output. The proposed GS will play a key role in ensuring a reliable and uninterrupted power supply to these industrial units, supporting their operational efficiency and growth.

#### 4.4.6 Methodology

Relevant secondary data/information was collected from various departments at the central and the provincial level was cross checked to establish their authenticity.

Both qualitative and quantitative assessment were done for the social assessment study covering different social environment parameters of the project location by interacting with social groups and relevant stakeholders of the project area. Quantitative survey methods involved filling up of questionnaires at local areas and household levels by investigators recruited locally. The questionnaires contained mostly structured questions for collection of the required data.

The study area for socio-economic survey includes the areas which will be directly and indirectly affected due to the proposed Project activities of the water treatment plant. Estimated population for the calculation of sample size for social survey in the study area is taken from the locals through social survey.

The sample size of 99 households was calculated based on the Standard Statistical Formula using a confidence level of 95% (which is frequently used in social research) and confidence interval of 10%. The calculated samples size was distributed proportionately among the nearby settlements. The houses of these settlements were identified and counted by using freely available Google Earth imagery and verified by conducting socio-economic field surveys. The households were selected by using random sampling technique, a type of probability sampling. Questionnaires were developed to collect the baseline data, based on the demographic and socio-economic indicators. Interviewing technique was used as a tool for data collection. In order to quantify the existing baseline conditions of the study area, collected data was digitized and analysed by using Statistical Package for Social Sciences (SPSS) software.

The detailed survey was conducted in the study area April and May 2025, interviewing 99 sample respondents at household level covering nearby above mentioned settlements of the project area.

##### 4.4.6.1 Task Specific Approach

In conducting the social survey, full concentration was given to identify areas of impacts and collection of necessary data/information on the existing social environment

(economic, social, cultural etc.). This was done by holding discussions / meetings followed by in-depth survey and administering structured / semi-structured questionnaires. Assessment was also made about the project impact on the livelihood of the people.

#### **4.4.6.2 Reconnaissance Field visit**

A reconnaissance visits to the project, before conducting detailed survey was conducted in April 2025 by the consultant, helped in collection of necessary data/information for primary assessment through consultations with project stakeholders including project beneficiaries and project affected persons. In addition, a preliminary social survey was also conducted and the results used as inputs in designing the detailed survey.

#### **4.4.6.3 Data Collection and Field Survey**

The Consultant conducted field survey/investigation in May 2025 on various socio-economic aspects to assess the existing socio-economic environment of the project as well as identify likely impacts under a changing situation with and without the project. Accordingly, the social study covered the beneficiaries, the affected people, concerned stakeholders and NGOs working in the area and elicited their views / suggestions for mitigation / enhancement of different types of impacts. The survey adopted both qualitative and quantitative approach through structured / semi-structured questionnaire for interviews and a checklist of issues for discussions.

#### **4.4.6.4 Community/Stakeholders' Participation**

A number of community consultations with different stakeholders, beneficiaries and affected communities of the project area were organized to facilitate stakeholders' / peoples' participation in the project activities of the proposed treatment plant and incorporate their views and feedbacks for planning/preparation of the project. Such consultations would strengthen the commitment of a wide cross-section of the affected people, public representatives, government employees, professional groups, voluntary groups including NGOs, community based organizations by giving them an opportunity to participate in key decisions.

#### **4.4.7 Finding of Socioeconomic survey at Project Site**

The socioeconomic baseline covers the demography, administrative and political settings, religious and cultural, economic aspects, infrastructure and facilities, security situation, gender, NGOs and CBOs and ecosystem services.

To document the socio-economic conditions of the population settled in the Project Area, social surveys of the selected House Holds (HH) were carried out. One of the major steps after the identification of the affected areas and their estimated populations during the socioeconomic survey of May 2024 was the calculation of sample size. Total 3 main settlements fall near the Project Area (within the 2 km<sup>2</sup>) comprises about 25,000

individuals. Socio-economic survey was conducted in these areas. Socio-economic survey was carried out at Gunji SUndwan, Handoo and Natt Kalan areas to take maximum information of the Project Area. Based on social survey, approximate a number of HH and their population were estimated.



Figure 4-4 Socioeconomic Data Collection

The basic objectives of the social surveys were to:

- Observe and document the existing socio-cultural settings of the study area;
- Identify the potential impacts associated with the implementation of the proposed project;
- Get feedback from community about existing and potential social issues; and
- Evaluate the possibilities of addressing them in the report.
- Socio-economic survey of the selected households of the study area was carried out. Baseline information was collected from direct and indirect affected during the field visit.

#### 4.4.7.1 Population and Family Size

Based on the 2023 census data, Lahore remains the most populous district in Punjab, reflecting continued urban expansion and population growth. Household-level surveys conducted for the project indicate an average household size of 7 persons, which aligns with typical extended family structures in the region. As part of the social assessment, 99 households were surveyed, and the gender-wise distribution of family members among these respondent families is presented in the following section.

Table 4-7 Gender and Age of the Population

Sr. #	Age Group (Years)	Male		Female		Total	
		No.	%	No.	%	No.	%
1	0-4	38	11.1	29	9.1	67	10.1
2	5-9	48	14.0	31	9.7	79	11.9
3	10-19	66	19.2	75	23.4	141	21.3
4	20-39	90	26.2	88	27.5	178	26.8
5	40-49	75	21.9	62	19.4	137	0.7
6	50-59	18	5.2	22	6.9	40	6.0
7	60 and above	8	2.3	13	4.1	21	3.2
	<b>Total</b>	<b>343</b>	<b>100.00</b>	<b>320</b>	<b>100</b>	<b>663</b>	<b>100</b>

Based on the social survey, the maximum population falls in the age group between 20 and 39 years and it is this group that are responsible for most daily life routine activities. The gender ratio is an important demographic indicator, which is defined as the “number of males per hundred females”. The gender ratio based on the household was 107 males per 100 females. The gender ratio depends on the factors such as the gender ratio at birth, differential mortality rates between the sexes at different ages, and losses and gains through migration. In the local culture, sons are preferred because (i) they have a higher wage-earning capacity, (ii) they continue the family line; (iii) they are generally recipients of inheritance.

Girls are often considered an economic burden because of the dowry system and after marriage they typically become members of the husband's family, ceasing to have responsibility for their parents in illness and old age.

#### 4.4.7.2 Age and Marital Status of the Respondents

As per the respondents interviewed during the socio-economic survey, it was identified that majority of them were married i.e.98% of the total respondents. Therefore all of them were identified as key informant of the area. Majority of the respondent 57.6% fall under the age category is 36-50 years. Details of age of the respondents along percentage is given below.

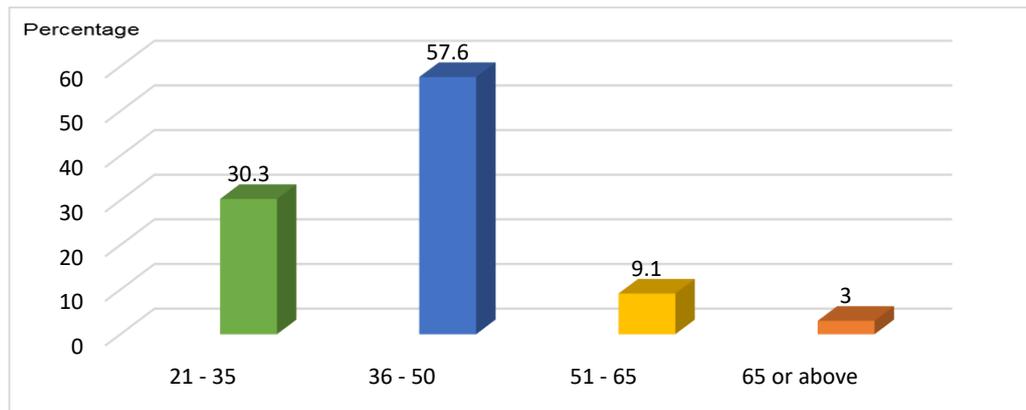


Figure 4-5 Age Distribution of Respondents in the Study Area

Endogamy is the prevalent style of marriage. Most of the people are monogamous as second marriage is expensive. Mothers have very little role in decision-making about marriages of their sons and daughters. Neither the groom nor the bride is allowed to choose his or her life partner in rural areas. The decision of the parents is considered final; however, sometimes the bridegroom is consulted before the final decision.

#### 4.4.7.3 Languages Spoken

Punjabi is the predominant language being spoken in the Study Area. However, Urdu is also understood.

#### 4.4.7.4 Ethnicity and Minority Groups

The population of the villages in Study area is predominantly Muslim and only few numbers of households were found Christians.

The core unit of social organization is the caste system (“baradari” in local language) in which groups are either defined on the basis of specific occupation or lineage. Occupationally defined caste groups are considered as lower status in the social setup. For instance occupationally defined baradari/caste groups are Mochi (cobbler), Machi (fisherman), Nai (barber), Gujjar (dairy and livestock farmers), Julahay (weavers) while lineage based baradari/caste groups are e.g., Khokhar, Sial, Malik, Rajput, Bhatti, Jutt, Kullah, Mian, Khurral, Syed, and Cheema. The social life of the local population is traditionally on rural or sub-urban.

Based on the HH survey, the population in the Study shows many castes. The major caste/ethnic groups are Arian, Sial, Sipra, Bharwana, Khurral, Bhutta, Sheikh, Khokhar, Malik, Rehmani, Bhatti, Syed, Cheema, Mochi Sindhu, Rana and Baloch. Among all the castes mentioned, Sial, Bharwana, Arain, Syed, Rahmani, Sheikh and Bhatti are the dominant castes of the Study Area.

During the field survey, it became apparent that the major castes were important because they have a key role in decision-making regarding the resolution of social issues of family matters. For instance, landlords (locally named as Chaudhry/Maher) as well as the

head/or elder of the respective caste generally make decisions related to the social issues at village level as well as the social development works in their areas. Prior to any Project/ programme to be initiated, it is essential to involve these groups right from start of the Project i.e., planning, design, implementation and operation of the GS, to make the Project successful.

#### 4.4.7.5 Literacy

The literacy level of the respondents, identified during the survey, depicts that the majority of the respondents interviewed in the Study Area were illiterate and their weightage is 27.3% followed by 23.3% primary, 17.2% middle, 13.1% secondary level educated. Details of the education level of the respondents are given below.

Table 4-8 Level of Education in the Study Area

Sr.	Education Level	Frequency	Percent
1	Illiterate	27	27.3
2	Primary	23	23.2
3	Middle	17	17.2
4	Secondary	13	13.1
5	Higher Secondary	9	9.1
6	Graduate	8	8.1
7	Post Graduate	1	1
8	Deeni Uloom	1	1
	<b>Total</b>	<b>99</b>	<b>100.0</b>

Based on the field survey and discussion with the locals, it is noted that female literacy rate is lower compared to males. Locals give least importance to female education. However, proposed project area fall near Lahore and considered semi urban area. In the above-mentioned villages low income families do not send their girls to school. Although, there are number of schools and colleges available in public and private sectors. Following are the reasons of low literacy rate among women in the area:

- The major cause of women illiteracy is increase in population, which is playing a negative role in this deprivation of female education. A family having more children and less income will prefer to educate the boys of the family, while the girls will be given embroidery or sewing skills;

- There is also misconception that females have to manage home after marriage whereas males have to earn for livelihood, so education matters only for males and not for females;
- Some families do not like their daughters to study in co-education institutes thus depriving them of higher education;
- The social setup is male dominated and girls restricted to homes and cannot go out freely thus any male of the family has to take responsibility for grocery purchasing etc. This sometimes seems difficult to them. There is also a sharp division between female oriented work and male oriented work. Females are not allowed to work in all sectors therefore their education is not considered valuable; and
- However, in urban areas of the project situation is better and locals send to their girl's schools for education.

#### **4.4.7.6 Languages Spoken**

Punjabi is the predominant language being spoken in the Area while Urdu is a common language.

#### **4.4.7.7 Housing**

Housing characteristics is one of the major indicators for the assessment of the living standard of the population. Most of the houses in the study area are owned by one influential resident of house who is male. However, some joint ownership also exists. Majority of the houses have ordinary construction, while nearby urban areas such as have new and modern construction buildings made of cement and bricks.

Housing characteristics is one of the major indicators for the assessment of the living standard of the population. Most of the houses are owned by one influential resident of house who is male. However, some joint ownership also exists. Majority of the houses have ordinary construction, with moderate standard buildings made of cement and bricks.

Approximately 93.7% houses are pacca (made from brick, stone, and mortar) and 5.3% are semi-pacca (made of clay, inferior bricks and plastered with mortar). Types of housing structures in the area are given in Figure 4-6.

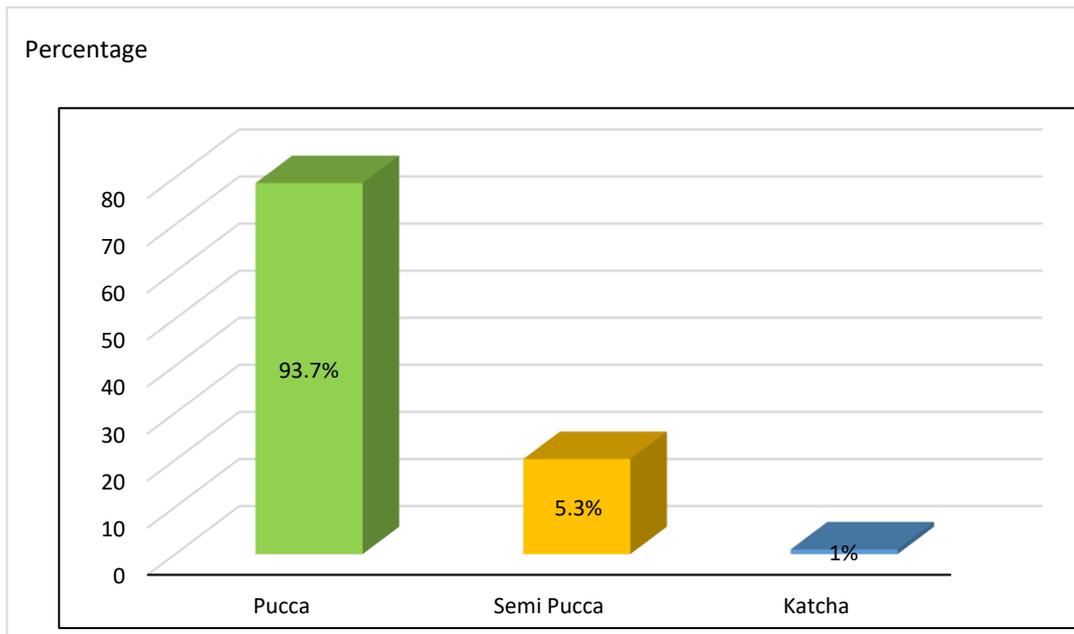


Figure 4-6 Type of Housing Structures

#### 4.4.7.8 Ownership Status

In the Study area, houses are generally owned by a single owner and no respondent was found on rented house.

The majority of the respondents have 2-3 rooms in their houses; few of them are having 4 or more rooms.

The type of the toilet used by the household indicates living conditions and is strongly related to the health and hygiene of the household members. All the people (100%) have flush type of latrine.

#### 4.4.7.9 Water Supply

Based on the socio-economic survey of the selected households, it was found no water supply is available whole the 3 villages. However, ground water quality is very good and locals use this water for drinking as well as domestic purpose. In the Study area depth of the ground water is about 50 to 70 ft. average. Locals use hand pumps and electric motors.

#### 4.4.7.10 Agriculture Practice

In the 3 villages of the Study area, groundwater is being supplied through tube well which is the main source of irrigation water. Due to nearby river Ravi groundwater is being used for agriculture purpose. Local farmers use traditional methods for farming (i.e., ploughing, tilling etc.) coupled with use of tractors and modern machinery for cultivation and

harvesting. They grow crops (e.g. wheat, Rice etc.) along with vegetables (all types) and fodder crops for their domestic animals. There are no fruit orchards in Project Study area.

#### **4.4.7.11 Ownership and Tenure System**

Agricultural labour in the study area is primarily done by men but women and children are also involved in farming activities. Big land owners employ tenants for agricultural activities or give their land for cultivation on contract basis whereas small land owners cultivate their land by themselves with the help of their family members. The big land owners in the Study Area hire labour on a permanent basis. However, in the project area exist only small land holders and they cultivate their own land. Every farmer and landowner adopts a system according to his own will and resources. Generally landowners hire tenants on equal-share of crop basis. The labourers work throughout the season and after harvest, the crop is distributed as per share between labourers and land owner. Some landowners hire the services of labourers on cash payment.

#### **4.4.7.12 Livestock**

A significant percentage of the workforce and households in the area is engaged in livestock rearing in addition to agricultural farming. The livestock is a pillar of economy growth through improvement of breeds, feeding and health facilities; dairy development; commercializing management of range dependent livestock for beef and meat; value addition of livestock products; and taking advantage of Lahore proximity to supply livestock products and develop a livestock market. The importance of livestock as a major source of livelihood has decreased due to growing of agriculture and vegetable cropping with tube wells and canal irrigation. The livestock farming is a traditional activity in the area; it comprises rearing of Buffalo, Cattle, Sheep and Goat. Cattle constitute major portion of the livestock population within the area.

#### **4.4.7.13 Amenities in the Study Area**

The availability of the basic infrastructure and social amenities measures the development of the area and living standard of the people. During the social survey, data regarding the availability of village infrastructure including electricity, road, basic health unit/center, school, drinking water/water supply scheme, telephone, sewerage/drainage, fuel wood and sui gas were collected in order to identify the pressing infrastructural development needs of the villages located in the Study area.

The survey results derived based on the 'village profile' shows that out of 3 villages/settlements, 100 percent of the villages/settlements in the Study area had access to roads, electricity, fuel wood and schools for boys and girls, while the other facilities like health and education were not available as per requirement. However, in case of any emergency they go to Shahdara and Lahore city.

#### 4.4.7.14 Common Diseases

Seasonal fever, cough, cold and flu are the common diseases amongst the people of the Study Area. However, some people were found who reported that they had been suffering from diarrhoea which was very common in the area

#### 4.4.7.15 Sewerage & Solid Waste Disposal

No public sewerage system was observed. Lined drainage channels were found in some village which lead to a larger pond and sometimes drop into the nearby major drain passing near the project area. While most of the settlements drop their sewerage water into the nearby fields. Solid waste disposal is one of the major problems being faced by the residents of the area. People throw solid waste within the vicinity of villages or burn it in a large pit. Most of the solid waste was found to be dumped in heaps near the villages in the Study area. Organic and livestock waste is collected in designated areas and used to prepare compost which farmers use on their fields as a soil conditioner.

#### 4.4.7.16 Occupations

The dominant source of income in the whole Study area is agriculture which is 78.8% . The second major source of income identified in the study area was labour. Only few people were found who use to work in other occupations. However, majority of the respondents are small land holder, therefore they are forced to adopt other source of income such as labour in existing power plant, livestock, small level general stores etc. Details occupational distribution of the respondents are given in Figure 4-7.

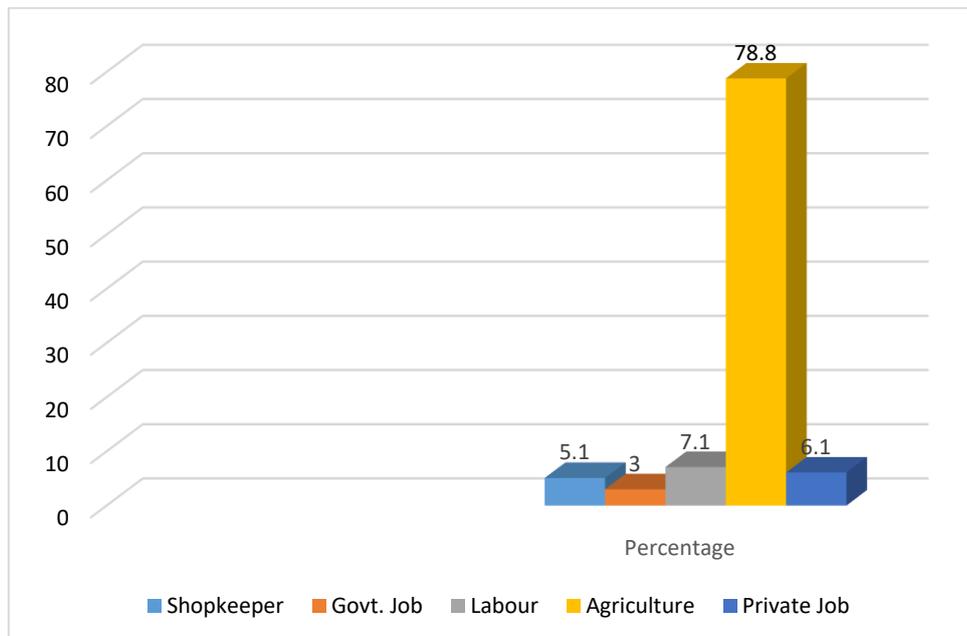


Figure 4-7 Occupation Distribution of Respondents in the Study Area

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#### 4.4.7.17 Income Sources and Expenditure

The major source of income in the entire Study area is agriculture and labour work. During the social survey, it was found that most of the respondents are working as labour in power plant and this is their second important source of income. In few cases two to three family members are doing job in plant. Construction of the Power plant is not only help reduce load shedding in the country it also improves the socio-economic status of the locals. Locals are satisfied from their income from plant, however, they demanded maximum labour opportunities to the locals and increase wages during the construction of new power plant. During the social survey, did not report any case that they use to borrow money to fulfil their needs.

The average monthly income of most of the respondents (mostly involved in agricultural works and labour) was found to be Rs. 40,000 to 50,000/- As discussed majority of the respondents are small land holders (less than 2 acres) due to their income is limited. But now, they are working on plants (industry), therefore, their income level have been increased.

## 5 Potential Impacts and Mitigation Measures

### 5.1 Project Overview

The 132 kV GS lies within the urban redevelopment boundary of RUDA, along the Ravi River corridor in Lahore. The substation is being developed under LESCO to meet the future electricity demands of the RUDA smart city initiatives. The land is designated for utility use within RUDA's master plan. The environmental review falls under EPA Punjab's jurisdiction, and the project will comply with the Punjab Environmental Protection Act (Amended 2012), NEQS, and relevant EPA Punjab guidelines.

### 5.2 Site-Specific Environmental and Social Considerations

#### Urban Setting and Minimal Ecological Disruption

- Located in a brownfield zone with negligible vegetation and no agricultural activity.
- No endangered flora or fauna reported.

#### Noise and EMF Exposure

- Acoustic barriers, EMF buffer zones, and compliant transformer design to protect nearby planned residential areas.
- Compliance with WHO-ICNIRP guidelines and EPA Punjab noise limits (55 dB day / 45 dB night).

#### Waste and Water Management

- Integration with RUDA's municipal systems for waste disposal and drainage.
- No groundwater extraction; treated surface water to be used.

#### Construction Phase Impacts

- Dust, traffic, and noise impacts will be managed via EMP.

#### Regulatory Oversight

- Environmental monitoring by RUDA, and third-party consultants in accordance with EPA Punjab requirements.

### 5.3 Impact Assessment Methodology

The significance of potential impacts was assessed using the criteria and methodology given below:

#### 5.3.1 Impact Magnitude

The potential implications of the project have been categorized as major, moderate, minor or minimal based on consideration of the parameters such as

- i) Duration of the effect;
- ii) Spatial extent of the impact;

- iii) Reversibility;
- iv) Likelihood and legal standards and established professional criteria.

Table 5-1 Parameters for Determining Magnitude

Parameter	Major	Moderate	Minor	Minimal
Duration of potential impact	Long term (Beyond the project period)	Medium term Lifespan of the project (Within the project period)	Limited to construction period	Temporary with no detectable potential impact
Spatial extent of the potential impact	Widespread far beyond project boundaries	Beyond next project components, site boundaries or local area	Within project boundary	Specific location within project component or site boundaries with no detectable potential impact
Reversibility of potential impacts	Potential impact is effectively permanent, requiring considerable intervention to return to baseline	The system requires approximately one year and some interventions to return to baseline.	Baseline returns naturally or with limited response within a few months	Baseline remains constant
Legal standards and established professional criteria	Breaches national standards and or international guidelines/obligations	Complies with limits given in national standards but violates international lender guidelines in	Meets minimum national standard limits or international guidelines	Not applicable

		one or more parameters		
Likelihood of potential impacts occurring	Occurs under typical operating or construction conditions  (certain)	Happens under worst case (negative consequences) or best case (positive impact) working conditions (likely)	Occurs under abnormal, exceptional or emergency conditions (occasional)	Unlikely to happen

### 5.3.2 Sensitivity of Receptor

The sensitivity of a receptor has been determined based on a review of the population (including proximity/numbers/vulnerability) and the presence of features on the site or the surrounding area. Each detailed assessment has defined sensitivity about the topic. Criteria for determining the sensitivity of receptors to the project's potential impacts are outlined in Table 5-2.

Table 5-2 Criteria for Determining Sensitivity

Sensitivity Determination	Definition
Very High	Vulnerable receptor with little or no ability to absorb proposed changes or minimal opportunities for mitigation.
High	Vulnerable receptor with little or no ability to absorb proposed changes or limited opportunities for mitigation.
Medium	Vulnerable receptor with some ability to absorb proposed changes or moderate opportunities for mitigation
Low	Vulnerable receptor with good ability to absorb proposed changes or/and excellent opportunities for mitigation

### 5.3.3 Assigning Significance

Following the assessment of magnitude, the quality and sensitivity of the receiving environment or potential receptor has been determined and the significance of each potential impact established using the impact significance matrix shown in Table 5-3.

Table 5-3 Significance of Impact Criteria.

Magnitude of Impact	Sensitivity of Receptors			
	Very High	High	Medium	Low
<b>Major</b>	Critical	Major	Moderate	Minimal
<b>Moderate</b>	Major	Moderate	Moderate	Minimal
<b>Minor</b>	Moderate	Moderate	Minor	Minimal
<b>Minimal</b>	Minor	Minimal	Minimal	Minimal

### 5.4 Summary of Assessed Impacts

The project's potential impacts and their significance have been assessed using the methodology described in the above section. A summary of these impacts and their significance along with the mitigation measures are presented in below Table 5-4.

Table 5-4 Potential impacts, their significance and Mitigation measures

Potential impacts	Sensitivity	Magnitude	Significance before Mitigation	Mitigation and Enhancement Measure	Residual Significance
<b>Environmental Considerations during Project Design</b>					
Audible noise will be generated by most of equipment during operation	High	Major	Major	Contractor will design (i) equipment that generate low sound levels, (ii) equipment layout to minimize the acoustic noise and (iii) acoustic barriers (walls or enclosures) wherever necessary to maintain noise levels that comply with national standards at offices, and accommodation facilities and at periphery of the station.	Minimal
Exposure to Electro Magnetic Fields (EMF) and radio interferences from the grid station equipment and the power lines (EMFs will affect the health and radio interferences will affect the telecommunications).	High	Moderate	Major	WHO endorsed standards on EMF and noise levels will be complied through design considerations. These include adequate spacing between the equipment and fencing/boundary wall or right of way. International standards on radio interferences will also be complied with.	Minimal

Potential impacts	Sensitivity	Magnitude	Significance before Mitigation	Mitigation and Enhancement Measure	Residual Significance
Safe drinking and sanitation facilities to the offices and colony, firefighting and cooling, and storm water design drainage facilities in the grid stations. Improper design of these facilities pose risk to workers' health and safety.	High	Major	Major	Contractor will design (i) water supply facilities including facilities for firefighting and cooling, (ii) sanitation facilities with septic tanks, and (iii) storm water management facilities with sedimentation ponds and connecting them to local streams.	Minimal
Oil spills and leaks from the transformers and reactors (these spills have potential to contaminate soil and water resources)	High	Major	Major	Contractor will design oil containment and recuperation systems around all transformers and oil-filled reactors	Minimal
<b>Environmental Impacts during Construction Stage</b>					

Potential impacts	Sensitivity	Magnitude	Significance before Mitigation	Mitigation and Enhancement Measure	Residual Significance
Risk of soil and water pollution from construction activities	Medium	Moderate	Moderate	Implementation of soil and pollution control measures as specified in EMP	Minimal
Dust and noise from construction activities	Medium	Moderate	Moderate	Maintenance of construction equipment and vehicles; and implementation of EMP.	Minimal
Waste generation and disposal (materials and solid waste)	Medium	Moderate	Moderate	Proper collection and disposal of waste at local municipal waste disposal facilities in coordination with LWMC and as per EMP	Minimal
Community health and safety from construction traffic and activities	Medium	Moderate	Moderate	Traffic, noise and dust control measures in accordance with EMP.	Minimal

Potential impacts	Sensitivity	Magnitude	Significance before Mitigation	Mitigation and Enhancement Measure	Residual Significance
Worker's health and safety (risk associated with working at height and electrical equipment; and inadequate facilities in construction camps)	Medium	Moderate	Moderate	Occupational health and safety measures; and adequate facilities in the construction camps in accordance with EMP.	Minimal
Employment opportunities for local communities	Medium	Moderate	Moderate (positive)	Preference to the local communities; in the construction works	Moderate (Positive)
<b>Environmental impacts during operation and maintenance stage</b>					
Improved power supply.	Very high	Major	Critical (positive)	Adequate maintenance of the facilities in accordance with the standard operating practices	Major (Positive)
Risk of bird collision and electrocution from the transmission line	Moderate	Minor	Minor	Insulation of exposed parts of the tower structure	Minimal

Potential impacts	Sensitivity	Magnitude	Significance before Mitigation	Mitigation and Enhancement Measure	Residual Significance
Generation of wastes from the offices and colonies	Medium	Moderate	Moderate	Solid waste disposal in the local available municipal waste disposal site i.e., Lakhoder.	Minimal
Impact on soil and groundwater quality	High	Major	Major	Regular maintenance of oil containment facilities and monitoring; and also storm water drainage facilities.	Minimal
<b>Social Impacts during operation and maintenance stage</b>					
Worker's health and safety	High	Major	Major	Implementation of OHS Plan	Minimal
Community health and safety	High	Minor	Moderate	Maintenance of water supply, sanitation and drainage facilities in the accommodation facilities. Safety barriers and signage to avoid electrocution.	Minimal

## 5.5 Environmental Considerations during Project Design

### 5.5.1 Exposure to EMF and Radio Interferences

Transmission lines and grid station equipment generate electrical and magnetic fields (EMF) which are considered to be health hazards although it has not been scientifically proven. The exposure limits for EMF fields developed by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) - a non-governmental organization formally recognized by WHO<sup>1</sup>, are given in Table 5-5.

Table 5-5 Standards for EMF Exposure

	Electric Field (kV/m)	Magnetic Field ( $\mu$ T)
Public Exposure	5	200
Occupational Exposure	10	1000

The radio interference level from the electromagnetic or electrostatic radiation generated by the station and the transmission lines may affect the telecommunications. The radio interference levels shall not exceed<sup>2</sup> 100 microvolt/m at the offices and residential areas under fair weather conditions.

#### Mitigation

Exposure to EMF and noise levels will be assessed during the design stage, and the residential colonies will be located at a sufficient distance away from the grid station facilities to ensure compliance with the internationally recognized standards. Hence no additional mitigation measures are proposed. The electric and magnetic fields will be regularly monitored during O&M phase to ensure compliance with the ICNIRP standards and if required additional mitigation measures will be proposed during O&M phase. The radio interference levels will also be managed through appropriate design features.

### 5.5.2 Safe Drinking Water, Sanitation and Drainage Facilities

Municipal water supply, sewerage and stormwater drainage facilities do not exist at the Grid Station site. Hence all these facilities should be newly developed for the project. Groundwater serves as the primary source for both drinking and irrigation in the project area. Inadequate or poorly designed water supply and sanitation facilities may pose significant risks to the health and safety of workers at the site.

<sup>1</sup> EMF Fields, WHO Webpage <http://www.who.int/peh-emf/standards/en/>

<sup>2</sup> IEEE (Institute of Electrical and Electronics Engineers) Standard 430-1986

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## Mitigation

To mitigate these impacts, the project will ensure the development of well-designed water supply, sewerage, and storm water drainage systems at the Grid Station site. Temporary sanitation facilities will be provided during construction, with proper waste disposal mechanisms in place. Groundwater use will be monitored to prevent over-extraction, and drinking water will be regularly tested for quality. Safe drinking facilities will be established at offices and accommodation facilities and also for the requirements of firefighting and cooling in the subproject.

These facilities will be established by the contractor in the initial stages of construction to supply for their offices and camps. The contractor will also design adequate sanitation facilities with septic tanks for offices, residential colonies and also for construction camps. The contractor will also design stormwater drainage facilities in and around the grid station for collection and disposal of rainwater.

All infrastructure will be developed in compliance with national environmental and public health standards to ensure the safety of both workers and the surrounding environment.

### 5.5.3 Risk of Oil Spills and Leaks from Transformers and Reactors

Fuels, oils and lubricants will be used in transformers and reactors. There will be risk of leakages from this equipment and spillages during storage and handling. These leaks and spills will contaminate soil and water resources in the project area.

#### Mitigation

Contractor will design oil containment and recuperation systems around all transformers and oil-filled reactors. The storage facilities for oils will be designed in bunded areas and will be covered on the top to avoid direct exposure to sunlight and rain.

## 5.6 Environmental Impacts from Construction

### 5.6.1 Risk of Soil and Water Pollution from Construction Works

Construction activities at the Chahar Bagh Grid Station site pose significant risks to soil and groundwater resources. During site preparation and foundation works, especially in the rainy season, there is a high likelihood of sediment-laden runoff entering nearby agriculture land and streams, leading to turbidity and degraded water quality. Wastewater from construction camps and site operations may also contribute to pollution. Additional risks include improper storage and handling of construction and hazardous materials, fuel spills, discharges from storage areas, and erosion from uncovered material stockpiles. Inadequate drainage systems can further exacerbate these risks, causing contamination of both soil and nearby water bodies

#### Mitigations

- Design and implement a comprehensive drainage management system to prevent surface runoff and sediment transport to nearby streams.

- Schedule earthworks during dry periods as far as possible to reduce runoff and erosion risks.
- Install sediment control measures such as silt fences, sedimentation ponds, and check dams around the construction area.
- Ensure proper storage, labeling, and containment of hazardous and construction materials on impervious surfaces with secondary containment.
- Provide designated fueling and maintenance areas with spill prevention and control measures.
- Regularly inspect and maintain machinery and storage areas to prevent leaks or accidental spills.
- Dispose of wastewater from construction camps through septic tanks or temporary treatment facilities to avoid direct discharge into water bodies.
- Cover and stabilize material stockpiles and locate them away from drainage paths.
- Conduct environmental awareness and training programs for workers on good housekeeping and pollution prevention practices

### 5.6.2 Dust and Noise from Construction Activities

During construction, air and noise emissions from the construction activities will cause temporary nuisances to the residents of the nearby settlements. The expected noise levels from the construction activities are estimated and presented in Table. In general, the noise levels are within the standards at the nearest receptors from the construction activities. However, the construction of transmission line may cause some temporary disturbances since at some locations residences are located about 50 m away from the line.

Table 5-6 Estimated Noise Levels During Construction

Stage of work	Description of works	Key activities	Activity LAeq,10m dB	Predicted noise at 800 m, dB
<b>Site preparation</b>	Earth works	Earthmoving	90	47
	Site compounds and set-up	Excavation works	90	37
		Transport and handling of soil/ materials	70	30
		Storage of soil/ materials	88	48
		Preparation of materials (cutting, grinding)	86	46
<b>Construction of foundations and buildings</b>	Ground preparation	Earthworks	90	51
	Building/equipment foundation construction	Transport and handling of soil / materials	70	30
	Internal roads	Concrete batching	95	42

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## Mitigations

- Limit construction activities to daytime hours (e.g., 8:00 a.m. to 6:00 p.m.) near residential areas to reduce disturbance during rest periods.
- Use well-maintained equipment and vehicles with low-emission and low-noise characteristics.
- Install temporary noise barriers or acoustic enclosures around particularly noisy equipment, especially when working near sensitive receptors.
- Implement dust suppression measures such as regular water sprinkling on unpaved roads, stockpiles, and construction areas.
- Cover trucks transporting construction materials and debris to minimize dust emissions.
- Conduct regular maintenance of construction machinery to reduce noise and exhaust emissions.
- Provide advance notice to nearby communities before initiating particularly noisy operations.
- Monitor noise and air quality levels at sensitive receptors during peak construction periods to ensure compliance with standards.
- Ensure that worker camps and major activity zones are located at a reasonable distance from residential areas wherever feasible.

### 5.6.3 Waste generation and disposal

Construction activities at the grid station site will generate significant quantities of waste materials, including concrete debris, discarded construction material, and various forms of waste from construction camps and yards—such as food waste, garbage, and recyclables. Recent studies indicate that the average per capita waste generation in Lahore is approximately 0.54 to 0.65 kg/person/day<sup>3</sup>, with higher-income areas tending toward the upper end of this range; thus, a workforce of 100 workers could produce approximately 60 kg of solid waste daily. While no cut and fill activities are anticipated due to the flat terrain, and therefore no earth spoils are expected, improper handling and disposal of generated waste—particularly hazardous materials like fuels and lubricants—could lead to soil and water contamination, and may pose health and safety risks to workers.

## Mitigations

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[https://www.globalscientificjournal.com/researchpaper/Review\\_and\\_Analysis\\_of\\_Existing\\_Solid\\_Waste\\_Management\\_System\\_in\\_Lahore.pdf?utm\\_source=chatgpt.com](https://www.globalscientificjournal.com/researchpaper/Review_and_Analysis_of_Existing_Solid_Waste_Management_System_in_Lahore.pdf?utm_source=chatgpt.com)

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- Develop and implement a solid waste management plan for the construction phase, outlining procedures for waste collection, segregation, storage, and disposal.
- Designate specific areas for waste collection and ensure placement of labeled containers for different waste types (e.g., organic, recyclable, hazardous).
- Contract with local municipal authorities or licensed waste handlers for the regular removal and proper disposal of solid waste.
- Train construction workers in waste minimization practices and safe handling of hazardous materials like fuels, lubricants, and chemicals.
- Store fuels and lubricants in secure, bunded areas away from stormwater drains and water bodies to prevent leaks and spills.
- Install waste bins at appropriate locations within workers' camps and construction yards to maintain hygiene and reduce littering.
- Reuse and recycle construction materials wherever possible to reduce overall waste generation.
- Conduct regular inspections of waste handling procedures and storage areas to ensure environmental compliance and housekeeping standards.
- Prepare and implement a spill response plan to address accidental releases of hazardous substances.

#### **5.6.4 Procurement of Quarry Material**

Quarry material will be required for construction of foundation, concrete structures and covering open areas between transformer plinths in the grid station, and also for internal road works. The amount of aggregates required for construction will be estimated by Contractor. Sourcing of material from the quarry areas will have significant impacts on the local air quality and noise levels due to blasting and crushing activities. The natural topography at the quarry sites will be affected by the quarrying. The transport of material from quarry sites to the construction areas will have impact on the local roads.

#### **Mitigations**

No quarry sites will be developed for this project. The contractor will procure material from the market and approved quarry sites. Material for this subproject will be sourced from the existing quarry sites and no new quarry areas will be developed.

- Select approved quarry sites located near the project area to minimize haul distances and reduce road wear and emissions
- Schedule material transport during off-peak hours to avoid traffic congestion and reduce disturbance to local commuters
- Ensure vehicles are properly maintained and comply with national emissions and load limit standards
- Use covered trucks to prevent spillage of construction material and control dust emissions

- Conduct regular road monitoring to address any road damage caused by construction traffic
- Provide traffic management training to drivers and enforce strict speed limits in populated or sensitive areas
- Place clear signage and safety measures along transport routes, especially near schools, hospitals, and residential zones
- Establish a grievance redressal mechanism to address public concerns regarding traffic disruptions or road conditions during the construction phase

### **5.6.5 Vegetation Clearing for Grid Station Construction**

The construction of the grid station will require only minor clearing of existing vegetation, limited to grasses and small non-woody plants. No tree cutting is anticipated within the grid station footprint. Similarly, the transmission line route passes through areas devoid of trees, and no ecologically sensitive flora or fauna species are present within the project area. Hence, the ecological impact is expected to be minimal and localized, without any significant disturbance to biodiversity or natural habitats.

- **Mitigations**
- Limit vegetation clearing strictly to the designated construction footprint to avoid unnecessary disturbance to surrounding areas
- Clearly demarcate construction zones to prevent accidental clearing of adjacent land
- Preserve natural ground cover wherever possible to reduce soil erosion and maintain microhabitat functions
- Stockpile and reuse cleared topsoil within the site for landscaping or restoration purposes after construction
- Implement dust suppression measures such as watering cleared surfaces during dry periods to prevent air quality deterioration
- Avoid construction activities during the breeding season of any common local species, even if not protected, as a good practice
- Carry out periodic environmental monitoring to ensure vegetation clearing remains minimal and within approved limits
- Restore cleared areas after construction with appropriate native grasses or ground cover to stabilize the soil and maintain ecological balance

### **5.6.6 Community Health and Safety**

During the construction of Chahar Bagh Grid Station and associated facilities, impacts on community health and safety will be similar to those observed in most large-scale infrastructure projects. These will include the generation of dust, noise, and vibrations due to the movement and operation of construction machinery and vehicles. The influx of temporary labor will increase the risk of spreading communicable diseases and may also lead to social tensions if cultural or social norms differ significantly between the workers

and the local community. Potential sources of conflict will arise from differences in religion, language, behavior, and dress code. The use of local roads by heavy vehicles, particularly for the construction of transmission lines although access to the grid station will primarily be via major roads increases the risk of accidents, particularly for vulnerable groups such as children, women, and the elderly. Additionally, there will be traffic congestion and temporary disruptions in the local transportation system. The most direct hazards associated with grid station construction will include the risk of electrocution, either through direct contact with high-voltage electrical components or indirectly through tools, vehicles, and equipment that come into contact with live electrical infrastructure.

### **Mitigations**

- To mitigate these impacts, dust and noise control measures such as regular water sprinkling and the use of low-noise equipment will be implemented.
- Workers will undergo health screenings and awareness sessions on communicable disease prevention, and local engagement strategies will be adopted to minimize social tensions.
- The project will prioritize hiring local labor where possible to reduce cultural conflict.
- Traffic safety measures will be enforced through proper signage, speed controls, and traffic management planning, especially near populated areas.
- Electrocution risks will be minimized by ensuring all workers receive safety training on working around high-voltage equipment, and by implementing strict safety protocols, including the use of insulated tools, personal protective equipment, and maintaining safe distances from energized components.
- Regular safety audits and community awareness programs will be conducted to reinforce health and safety standards throughout the construction period.
- Contractor will prepare a traffic management plan and it will be implemented with aim at ensuring access to construction areas, and preventing unsafe situations.
- Contractor will develop adequate facilities for the construction workers, including prayer and entertainment facilities so that there will be minimum interaction between them and local communities.
- The construction areas will be secured with appropriate barriers and signs to prevent local communities from entering construction areas.
- Education/ public outreach activities will also be carried out to prevent public contact with potentially dangerous equipment.
- There will be appropriate medical services and a facility with the capacity to treat emergency cases.
- Awareness raising materials such as posters and signage will be used as appropriate.

### **5.6.7 Worker's health and safety**

Some of the Occupational Health and Safety risks which are likely to arise during the construction phase of the Project, and are typical to many construction sites, include: exposure to physical hazards from use of heavy equipment including cranes; working at height and electrical equipment; trip and fall hazards; exposure to dust, noise and vibrations; falling objects; exposure to hazardous materials; and exposure to electrical hazards from the use of tools and machinery.

#### **Mitigations**

- Occupational health and safety procedures will be enforced at site.
- Contractor will be required to prepare, obtain approval of, and implement an occupational health and safety (OHS) plan, which is prepared in accordance with EMP of this EIA.
- Appropriate personal protection equipment (PPE), such as safety shoes, helmets, ear muffers, safety glasses, etc. will be given to the construction workers by the Contractor and necessary training will be provided in occupational health and safety.
- Only trained personnel will be assigned to deal with the live power lines or deactivating and properly grounding live power distribution lines before work is performed on, or in close proximity, to the lines.
- Adequate safe drinking water and sanitation facilities will be provided in the construction camps and work sites.

### **5.6.8 Employment opportunities for local communities**

About 50 to 100 skilled and non-skilled workers will be required during construction on continuous basis at GS site. The project offers good opportunities for local residents to apply for employment as unskilled and skilled construction workers. Contractor will be recommended to employ local workers and technicians to the extent possible. All these new opportunities for work for local residents could boost employment and improve the social and economic position of the population in the short time. This will be a major and significant positive impact of the project.

## **5.7 Environmental Impacts from O&M**

### **5.7.1 Risk of Bird Collision and Electrocution with the Transmission Line and Towers**

The Chahar Bagh Grid Station will be connected with existing 132 KV Momin Pura GS through a 5 km transmission line that runs entirely within the Chahar Bagh area on government-owned land. High-voltage transmission lines already pass through the subproject area. During consultations with local communities, no incidents of bird collisions or electrocutions were reported at any grid station sites. Power line structures, such as towers, can serve as perching, roosting, or nesting sites for various bird species,

particularly raptors, storks, and cranes. Due to their large wingspans, these birds may simultaneously contact two energized parts or an energized and a grounded part of the structure, potentially resulting in electrocution. While raptors are most often affected, smaller birds such as crows, ravens, magpies, and waders are also at risk, especially when conductors are closely spaced or jumpers exposed.

The maximum wingspan of local bird species is typically under 3 meters. The standard design for 132 kV transmission lines ensures a minimum conductor spacing of more than 10 meters, both vertically and horizontally, which significantly exceeds the wingspan of even the largest birds in the region. Therefore, the likelihood of bird electrocution through simultaneous contact with two conductors is extremely low. Additionally, the project area does not include staging or stopover sites for migratory birds, further reducing the risk of bird collisions. As a result, no significant impact on avifauna is anticipated from the Chahar Bagh Grid Station and its associated transmission line.

### **Mitigation**

No significant risk of bird collision or electrocution is expected from the Chahar Bagh Grid Station and its 5 km transmission line, as the conductor spacing exceeds bird wingspans and the area lacks migratory bird habitats.

### **5.7.2 Generation of Waste**

During regular operations of the Chahar Bagh Grid Station, various types of wastes will be generated, including materials from electrical equipment that become broken or obsolete, scrap materials, and used oils. Solid waste will also be produced from staff offices and the employee colony located at the grid station.

### **Mitigations**

- All hazardous wastes, including used oils and electrical scrap, will be stored in designated, secure areas and disposed of through licensed vendors in accordance with environmental regulations.
- Waste management protocols will be established to ensure segregation, proper storage, and safe disposal of all waste types.
- Regular training of operational staff on waste handling and environmental compliance will be conducted to maintain a clean and safe working environment.
- Solid waste will be regularly collected from the offices and accommodation facilities and will be disposed in the municipal waste disposal sites at Lakhoder.

### **5.7.3 Impact on soil and groundwater quality**

Fuels, oils and lubricants will be used in transformers and reactors. There will be potential leakages from the transformers and spillages will also occur during storage and handling. Improper management of stormwater drainage and septic tanks may also affect the soil and groundwater quality.

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## Mitigations

- Storm water drains and septic tanks will be regularly maintained to avoid any contamination of soil and water resources.
- Transformers and storage facilities for fuels will be regularly monitored for leaks. If any leakage noticed, these will be contained with absorbent material and immediate cleanup will be taken up.
- The contaminated soils will be disposed as a hazardous material.
- Only experienced workers will handle during, maintenance, and operation activities of the fuels.
- Absorbent and containment materials will be used around the oil storage facilities.

### 5.7.4 Worker's health and safety

Workers may be exposed to occupational hazards from contact with live power lines during maintenance, and operation activities. They are also exposed to occupational hazards (electrocution, EMF, hazardous materials such as oils) when working at elevation during maintenance, and operation activities.

#### Mitigation

Standard Operating Procedures (SOPs) on Worker's Health and Safety and these will be implemented during the operation. Regular training will be provided to the staff on the SOPs and risk registers (reporting and recording of accidents and near misses) will be maintained.

#### 5.7.4.1 Community health and safety near grid stations

The community health and safety impacts associated with the Chahar Bagh Grid Station will be limited as public access to the facility will be restricted. However, inadequate provision of drinking water, sanitation, and drainage facilities may affect the health and well-being of the employees and their families residing near or within the station premises. Additionally, electromagnetic fields (EMF) and noise emissions from the grid station could potentially impact nearby communities if not properly managed.

#### Mitigation

To mitigate these impacts, the project will ensure the provision of safe drinking water, adequate sanitation, and proper drainage infrastructure for employees and their families. EMF exposure will be minimized by adhering to international guidelines for equipment design and maintaining appropriate buffer zones. Noise levels will be controlled through proper equipment maintenance and installation of noise-reducing barriers where necessary. Regular monitoring of EMF and noise emissions will be conducted to ensure compliance with health and safety standards.

## 6 Environmental Management Plan

### 6.1 General

This Chapter provides an overall approach for managing and monitoring environment-related issues and describes the institutional framework and resource allocations proposed by RUDA to implement the Environmental Management Plan (EMP) for the GS and Transmission Line. The main objectives of EMP are to:

- Provide the details of the project impacts along with the proposed mitigation measures, and a corresponding implementation schedule.
- Define the responsibilities of the project proponent, contractor, supervisory consultants, and other role players, and effectively communicate environmental issues among them.
- Define a monitoring mechanism, reporting frequency, auditing, and identifying monitoring parameters 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.

### 6.2 Summary of Projects Impacts and Residual Impacts

The summary of Project Impacts and Residual Impacts are given in Table 6-1.

Table 6-1 Summary of Projects Impacts and Residual Impacts

Phase	Environmental / Social Impact	Residual Impact (Post-Mitigation)
Construction	Soil and groundwater contamination from wastewater, spills, poor material handling	Minor – if proper drainage, spill containment, and storage measures are implemented
Construction	Sediment runoff due to earthworks during rainy season	Low – if erosion control and work scheduling during dry periods are adopted
Construction	Air and noise emissions disturbing nearby residents (50 m away)	Low – with dust control, low-noise equipment, and work-hour restrictions

Construction	Waste generation from construction and worker camps (approx. 60 kg/day for 100 workers)	Low – with proper waste segregation, disposal, and recycling
Construction	Traffic congestion and risk of accidents from material transport	Moderate – unless traffic management and road safety measures are enforced
Construction	Minor vegetation clearing at grid station site; no tree cutting or sensitive flora/fauna affected	Negligible – with minimal site clearance and restoration post-construction
Construction	Community health risks (disease, conflict due to labor influx, traffic hazards)	Low – with health screenings, awareness, local hiring, and community engagement
Operation	Risk of bird electrocution/collision from transmission lines	Negligible – 132 kV line design ensures >10m spacing, no migratory bird staging areas
Operation	Waste from used equipment, oils, and employee colony	Low – if a structured solid and hazardous waste management plan is implemented
Operation	Restricted public access to grid station	None – no exposure to general public
Operation	Poor water, sanitation, and drainage for employee facilities affecting health	Minor – if facilities are adequately provided and maintained
Operation	EMF and noise emissions from operating equipment	Low – if standards are followed and routine monitoring is conducted

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### 6.3 Environmental Management & Monitoring Plan

An environmental management and monitoring plan establishes the linkages between the environmental and social impacts, mitigation strategy, and the agencies responsible for execution. Thus, the EMP covers

- A comprehensive listing of mitigation measures (actions).
- The institution(s)/ person(s) responsible for the implementation of specific actions.
- The parameters to be monitored to ensure the effective implementation of the actions.
- A timescale for the implementation of actions has been indicated subject to the project life cycle and indicated as During Construction (DC) or During Restoration (DR).
- The Affects Monitoring Plan for the ongoing activities is presented in tble below

Table 6-2 Environmental Management & Monitoring Plan

Potential Impact/Project Activity	Action	Responsibility		Monitoring Requirement	Timing
		Execution of Mitigation	Monitoring of Mitigation		
Route Selection	Using corridor-sharing to minimize RoW requirements. Prefer to select a route with a minimum tree cutting requirement	RUDA	–	–	DP
Transmission Structure Design	Choosing a transmission line tower with aesthetic appeal such as the darker color of oxidized steel structures may blend in better with forested backgrounds.	RUDA	–	–	DP
Tower Placement	Selection and use of the latest available technology for reducing the magnetic field from transmission lines.	RUDA	–	–	DP
Add-ons	Making minor adjustments in tower locations to avoid archeological sites or minimize effects on agricultural operations.	RUDA	–	–	DP
	Adding flight diverters to conductors to minimize bird collisions with the	RUDA	–	–	DP
Impacts due to EMF	LESCO standard operating procedures (SOPs) of minimum vertical ground clearance for TL conductor of 7 meters will be ensured.	LESCO			DP

Potential Impact/Project Activity	Action	Responsibility		Monitoring Requirement	Timing
		Execution of Mitigation	Monitoring of Mitigation		
	<p>Raising the conductor height above the ground to 8 m, typically by increasing tower height, will be ideal.</p> <p>Reducing conductor spacing.</p> <p>Arranging phases so that fields tend to cancel.</p> <p>Increasing transmission voltage (since magnetic field intensities are a function of current, and increased voltage, all things being equal, will result in reduced current).</p> <p>Reducing loads (and therefore, currents).</p> <p>Identification of potential exposure levels in the work area including surveys of exposure levels and establishment of safety zones.</p> <p>Safety signs and warning zone shall be highlighted to indicate EMF in the area</p> <p>Limit access to properly trained workers and those equipped with appropriate PPE when entering safety zones.</p>				

Potential Impact/Project Activity	Action	Responsibility		Monitoring Requirement	Timing
		Execution of Mitigation	Monitoring of Mitigation		
	Increasing right-of-way widths or buffer zone widths, to move people further from transmission lines.				
Construction Phase					
General	Arranging training sessions, conducting environmental monitoring, maintaining health safety and environment (HSE) and training records,	Contractor	RUDA	Compliance	DC, DR
	A 'no-hunting' policy is to be strictly enforced. Wild animals/livestock are not to be harassed or trapped. Project personnel are to be prohibited from buying wild animals or birds.	Contractor	RUDA	Compliance	DC, DR
	Field crew's general awareness of natural vegetation and wildlife is to be increased through training, toolbox talks, and notice board clippings.	Contractor	RUDA	Compliance	DC, DR
	Ensure that no trash, wrappers, shopping bags, paper, cans, bottles, or any other kind of litter are thrown in the open	Contractor	RUDA	Compliance	DC, DR
	Ensure the use of existing trails while walking	Contractor	RUDA	Compliance	DC, DR

Potential Impact/Project Activity	Action	Responsibility		Monitoring Requirement	Timing
		Execution of Mitigation	Monitoring of Mitigation		
	Ensure that archaeological sites are not disturbed	Contractor	RUDA	Compliance	DC, DR
	All sites of archaeological, historical, cultural, and religious significance are to be avoided. If any artifacts are discovered during the excavation, they must be delivered to the relevant authorities.	Contractor	RUDA	Compliance	DC, DR
	Ensure that domestic animals are not fed	Contractor	RUDA	Compliance	DC, DR
	Dust emissions at the construction sites are to be minimized by implementing good housekeeping and sound management practices.	Contractor	RUDA	Compliance	DC, DR
	Fuelwood and shrubs are not to be used as fuel during construction. Traditional rights of the localities should not be deprived of.	Contractor	RUDA	Compliance	DC, DR
	Noise from the campsites and construction sites is to be minimized using appropriate means (silencers, barriers, etc.) as required.	Contractor	RUDA	Compliance	DC, DR
	Fire prevention measures are to be implemented if fire hazards exist.	Contractor	RUDA	Compliance	DC, DR

Potential Impact/Project Activity	Action	Responsibility		Monitoring Requirement	Timing
		Execution of Mitigation	Monitoring of Mitigation		
	The construction crew's interaction with the local population is to be minimized. Liaison with the local community is to be maintained by the project proponent and the contractor.	Contractor	RUDA	Compliance	DC, DR
	No interaction with the local womenfolk.	Contractor	RUDA	Compliance	DC, DR
	Road and railway crossings are to be appropriately marked	Contractor	RUDA	Compliance	DC
Backfilling, Restoration, and Rehabilitation	Using the photographs taken before site/camp establishment, ensure that the RoW, camping area, access tracks, and other construction sites are restored as far as possible after abandoning the worksite.	Contractor	RUDA	Compliance	DR
	Ensure that no refuse or waste is left behind. Pick up all pin flags, signs, and refuse.	Contractor	RUDA	Compliance	DR
	Ensure that the natural drainage of the area is restored.	Contractor	RUDA	Compliance	DR
	Install cross-drainage ditches on steep slopes to divert run-off into the adjacent vegetation.	Contractor	RUDA	Compliance	DR

Potential Impact/Project Activity	Action	Responsibility		Monitoring Requirement	Timing
		Execution of Mitigation	Monitoring of Mitigation		
	Ensure that erosion control and revegetation measures using native species are taken where required.	Contractor	RUDA	Compliance	DR
	Ensure that all pits, holes, and sumps are backfilled. An extra cap of soil should be put on top to account for compaction.	Contractor	RUDA	Compliance	DR
	Remove all temporary stream/canal crossings. Stabilize banks at the crossings.	Contractor	RUDA	Compliance	DR
	Remove contaminated soil for appropriate disposal (eg, incineration).	Contractor	RUDA	Compliance	DR
	Implement active revegetation measures if natural growth is not considered sufficient.	Contractor	RUDA	Compliance	DR
	Take appropriate action to discourage access by project staff/vehicles to the area after the completion of the construction.	Contractor	RUDA	Compliance	DR
	Ensure that fences and gates are removed and restored.	Contractor	RUDA	Compliance	DR
	Take photographs of the sites after restoration.	Contractor	RUDA	Compliance	DR

Potential Impact/Project Activity	Action	Responsibility		Monitoring Requirement	Timing
		Execution of Mitigation	Monitoring of Mitigation		
	After the restoration of construction campsites and storage areas, after the construction period, preserved top soil will be spread and covered with grass and shrubs.	Contractor	RUDA	Compliance	DR
	The surplus excavated material will not be disposed-off at natural waterways even if it is dry and be disposed-off at designated sites appropriately.	Contractor	RUDA	Compliance	DR
Handling of fuels, oils, and chemicals	Equipment will be maintained properly to minimize oil or fuel leakages from construction machinery.	Contractor	RUDA	Compliance	DC, DR
	Fuels, oils, and other hazardous substances are to be handled and stored according to standard safety practices.	Contractor	RUDA	Compliance	DC, DR
	Clean-up will be undertaken in the event of an oil spill larger than half a liter. This will include the removal of contaminated soil and disposal at a proper location.	Contractor	RUDA	Compliance	DC, DR

Potential Impact/Project Activity	Action	Responsibility		Monitoring Requirement	Timing
		Execution of Mitigation	Monitoring of Mitigation		
	Fuels, oils, and chemicals are to be stored in areas lined by an impervious base and containing dikes.	Contractor	RUDA	Compliance	DC
	All storage fuel tanks will be marked by content and stored in diked areas with an extra 10% of the storage capacity of the fuel tank. The area will be lined with an impervious base.	Contractor	RUDA	Compliance	DC
	Install grease traps/ spill prevention trays on the site, wherever needed, to prevent the flow of oily water. Chemicals should be placed at a designated location on the site according to MSDS.  A spill-cleaning kit (shovels, plastic bags, and absorbent materials) will be available near fuel and oil storage areas.	Contractor	RUDA	Compliance	DC
	Fueling of construction vehicles and machinery will take place at designated places or over impermeable surfaces for fixed machinery.	Contractor	RUDA	Compliance	DC
	Hazardous materials will be stored separately from nonhazardous waste in designated places having impervious linings.	Contractor	RUDA	Compliance	DC

Potential Impact/Project Activity	Action	Responsibility		Monitoring Requirement	Timing
		Execution of Mitigation	Monitoring of Mitigation		
Vehicle Operation	Travel on existing roads, trails, or fence lines, wherever practical.	Contractor	RUDA	Compliance	DC, DR
	To the extent possible, only designated roads and trails are to be used for driving.	Contractor	RUDA	Compliance	DC, DR
	Use a 'no short-cuts' policy.	Contractor	RUDA	Compliance	DC, DR
	Minimize travel by good daily planning.	Contractor	RUDA	Compliance	DC, DR
	Limit vehicle speed to avoid damage to topsoil and raising dust. Ensure that a speed limit of 60 km/hr (30 km/hr near the settlements) on dirt roads is adhered to.	Contractor	RUDA	Compliance	DC, DR
	Dust emissions due to vehicular traffic are to be minimized by reduced speed. Water is to be sprinkled where necessary.	Contractor	RUDA	Compliance	DC, DR
	Use vehicles that are properly tuned and which do not emit abnormal exhausts	Contractor	RUDA	Compliance	DC, DR
	Use vehicles with proper exhaust mufflers (silencers)	Contractor	RUDA	Compliance	DC, DR

Potential Impact/Project Activity	Action	Responsibility		Monitoring Requirement	Timing
		Execution of Mitigation	Monitoring of Mitigation		
	Ensure that vehicles are not washed or repaired in the field, as far as possible	Contractor	RUDA	Compliance	DC, DR
	Plan efficient refueling of vehicles daily to minimize travel and chances of spills.	Contractor	RUDA	Compliance	DC, DR
	Periodically check for leaks under all operating vehicles; contaminated soil should be removed for proper disposal.	Contractor	RUDA	Compliance	DC, DR
	Keep a daily leak/spill record for each vehicle; repair at the earliest opportunity.	Contractor	RUDA	Compliance	DC
	To prevent fires when driving over dry grasslands, clear the undercarriage of the brush.	Contractor	RUDA	Compliance	DC
	Spark-arresting mufflers should be used in dry areas.	Contractor	RUDA	Compliance	DC, DR
	Fire-fighting equipment should be available while operating in dry areas, and all vehicles should carry a suitable fire extinguisher.	Contractor	RUDA	Compliance	DC, DR

Potential Impact/Project Activity	Action	Responsibility		Monitoring Requirement	Timing
		Execution of Mitigation	Monitoring of Mitigation		
	Do not throw litter or cigarettes out of vehicles.	Contractor	RUDA	Compliance	DC, DR
	Take special care while driving where there is wildlife to avoid accidents.	Contractor	RUDA	Compliance	DC, DR
	Do not sound the vehicle's horn near settlements, colonies of birds, or other wildlife.	Contractor	RUDA	Compliance	DC, DR
	Ensure that routes near or through the communities are avoided as far as possible.	Contractor	RUDA	Compliance	DC, DR
	Maintenance of vehicles and other equipment is to be allowed only in designated areas underlain with concrete slabs and a system to catch runoff. Washing of vehicles to be limited.	Contractor	RUDA	Compliance	DC
	Night time vehicular traffic is to be avoided as much as possible.	Contractor	RUDA	Compliance	DC, DR
	Drivers are to be instructed to give way to locals while driving on access tracks.	Contractor	RUDA	Compliance	DC, DR

Potential Impact/Project Activity	Action	Responsibility		Monitoring Requirement	Timing
		Execution of Mitigation	Monitoring of Mitigation		
	Drivers are to be instructed to keep a close watch for wild/domestic animals and children while driving.	Contractor	RUDA	Compliance	DC, DR
	Any damage to access tracks, metalled roads, watercourses or the canal/river protection bunds, etc., is to be appropriately repaired to bring these structures to their pre-construction condition. Any damage, which may cause hardship to the local community or wildlife, to be immediately repaired.	Contractor	RUDA	Compliance	DC, DR
	Litter or cigarettes are not to be thrown outside the vehicles; all vehicles are to carry adequate means of storing such trash, which is to dispose of at the campsite or any other designated place for this purpose.	Contractor	RUDA	Compliance	DC, DR
	Sewage and waste disposal systems will be provided at residential facilities following the regulatory requirements. Septic tanks will be constructed for the management of sewage from the residential area and grease traps will be constructed to manage sewage from the kitchen/mess.	Contractor	RUDA	Compliance	DC, DR

Potential Impact/Project Activity	Action	Responsibility		Monitoring Requirement	Timing
		Execution of Mitigation	Monitoring of Mitigation		
	<p>The sewage system for camps will be properly designed (pit latrines or, as required, septic tanks) to receive all sanitary wastewater.</p> <p>The solid residue from the septic tanks will be transported to the nearby municipal sewage disposal site.</p> <p>Lined wash areas will be constructed within the campsite or at the site, for the receipt of wash waters from construction machinery; and ensure proper labeling of containers, including the identification and quantity of the contents, hazard contact information, etc.</p>				
Sewage and other Waste	<p>Solid waste (including food waste) is not to be left un-disposed. Solid waste is to be segregated and disposed of as follows:</p> <p>Materials are suitable for recycling to be stored separately and sold to the approved recycling contractors. Use of three (3) bin systems where appropriate.</p> <p>Combustible waste to be burnt at a burn pit close to the camp.</p> <p>Medical waste is to be transported to a nearby facility for incineration.</p>	Contractor	-	Compliance	DC, DR

Potential Impact/Project Activity	Action	Responsibility		Monitoring Requirement	Timing
		Execution of Mitigation	Monitoring of Mitigation		
	The solid residue from the septic tanks is to be transported to municipal sewage treatment facilities available nearby.				
	Continuous liaison is to be maintained with the affected community and their concerns are addressed appropriately.	Contractor	RUDA	Compliance	DC, DR
Community Safety	Supply all protective gear (personal protective equipment, PPE) to all workers as per the job requirement.	Contractor	RUDA	Compliance	DC, DR
Occupational Health and Safety	Ensure strict adherence to occupational safety measures.	Contractor	RUDA	Compliance	DC, DR
	The construction crew undergoes medical screening before being deployed in the field.	Contractor	RUDA	Compliance	DC
Operational Phase	Mitigation measures discussed in the construction phase on local employment will be followed for the operational phase also.	LESCO	RUDA	–	DO

Potential Impact/Project Activity	Action	Responsibility		Monitoring Requirement	Timing
		Execution of Mitigation	Monitoring of Mitigation		
Local Employment	Project vehicles will be regularly maintained and tuned for gaseous emissions. A speed limit discussed in the construction phase will be followed.	LESCO	–	–	DO
Dust and air Emissions	Applicable mitigation measures discussed in the construction phase on Community Safety will also be followed for the operational phase	LESCO	–	–	DO
Community Safety	Applicable mitigation measures discussed in the construction phase on Occupational Health and Safety will also be followed for the operation phase	LESCO	–	–	DO
Occupational Health and Safety	Applicable mitigation measures discussed in the construction phase on Local Norms, Privacy and Women's Mobility will also be followed for the operational phase	LESCO	–	–	DO
Local Norms, Privacy and Women's Mobility	Applicable mitigation measures discussed in the construction phase on Traffic will also be followed for the operation phase	LESCO	–	–	DO

Potential Impact/Project Activity	Action	Responsibility		Monitoring Requirement	Timing
		Execution of Mitigation	Monitoring of Mitigation		
Traffic	A vertical clearance required as per international standards will be maintained for TL for minimizing EMF effects.	LESCO	–	–	DO
EMF Impacts	No construction will be allowed within 100 m of the TL	LESCO	–	–	DO

Note: DP = During Planning, DC = During Construction, DR = During Restoration, DO = During Operation

Table 6-3 Effects Monitoring Plan

Sr #	Monitoring Parameter	Monitoring Location	Frequency	Responsibility	Resource Requirement	Criteria for Triggering Action	Documentation
1	Water quality	At representative existing wells (if any) within 100 m of the campsite	Once base line before commencement of construction wrk and on quaterly bases during construction phase	Contractor	Resources for water sample collection and analysis	Water quality deterioration that can be attributed to the effluents released by the project facsimiles	A complete record of sample collection and analyses.
1	Waste Water	Camps/GS Site	Once base line before commencement of construction wrk and on quaterly bases during	Contractor	Resources for waste water sample collection and analysis	Waste Water quality that can be attributed to the effluents released by the project facsimiles.	A complete record of sample collection and analyses.

Sr #	Monitoring Parameter	Monitoring Location	Frequency	Responsibility	Resource Requirement	Criteria for Triggering Action	Documentation
			construction phase				
2	Ambient Air Quality	Campsite Access road Communities within 100 m of RoW, campsite or access road	Once base line before commencement of construction wrk and on quaterly bases during construction phase	Contractor	Resources for monitoring dust generation	To ensure compliance against PEQS for emissions	Records of measured values to be maintained
3	Noise	Campsite Access road Communities within 100 m of RoW, campsite or access road	Once base line before commencement of construction wrk and on quaterly bases during	Contractor	Noise meter	Exceeding limits (55 dBA during the day, 45 dBA during the night, measured at the receptor; or an increase of 3 dBA if the background noise is	Records of measured values to be maintained

Sr #	Monitoring Parameter	Monitoring Location	Frequency	Responsibility	Resource Requirement	Criteria for Triggering Action	Documentation
			construction phase			higher than the above-specified levels)	
4	exhaust emissions from equipment and vehicles	Campsite Access road RoW Other construction sites	Once base line before commencement of construction wrk and on quaterly bases during construction phase	Contractor	-	Personal judgment	Records of abnormal emissions.
5	Visual check for soil erosion	Campsite Access road RoW Other construction sites	After the restoration activity	Contractor	-	Visible signs of any soil erosion	Photographic record

Sr #	Monitoring Parameter	Monitoring Location	Frequency	Responsibility	Resource Requirement	Criteria for Triggering Action	Documentation
6	Grievances of the local communities	Campsite Access road RoW Other construction sites	During field activities	Contractor	Monitoring register	Complaints	Complete grievance record to be maintained in the social complaint register.

## 6.4 Mitigation Plans

As part of the Environmental Management Plan (EMP) for the construction of the 132 kV Grid Station at Chahar Bagh, Lahore, a comprehensive set of environmental and safety sub-plans has been developed to guide the contractor and project implementation team in managing potential risks during the pre-construction and construction phases. These sub-plans outline specific mitigation measures, monitoring responsibilities, emergency protocols, waste handling procedures, and restoration requirements, ensuring that all project activities remain compliant with the environmental regulations and guidelines of the Punjab Environmental Protection Act (2012). The sub-plans are structured to address both the general and site-specific environmental, social, and occupational health and safety concerns that may arise throughout the course of project execution. The following sub-plans are attached as **Annex 6** of this EIA:

- **EMP Sub-Plan 1:** Worker Accommodation Plan
- **EMP Sub-Plan 2:** Waste Management Plan
- **EMP Sub-Plan 3:** Plantation Plan
- **EMP Sub-Plan 4:** Occupational Health and Safety (OHS) Plan
- **EMP Sub-Plan 5:** Emergency Response Plan (ERP)
- **EMP Sub-Plan 6:** Spoil Management Plan
- **EMP Sub-Plan 7:** Traffic Management Plan
- **EMP Sub-Plan 8:** Framework for Restoration and Rehabilitation Plan

These sub-plans are essential for ensuring environmentally sound and socially responsible construction practices. The contractor shall be responsible for preparing and submitting detailed site-specific versions of each of these sub-plans, tailored to actual site conditions and implementation schedules. These site-specific plans will be annexed to the contract documents and must be reviewed and approved by the client's environment team and supervision consultant before the commencement of relevant activities.

## 6.5 Environmental Management Team along with their Roles and Responsibilities

Institutions responsible for executing and monitoring the environmental aspects of this project are:

- **RUDA:** The top management of RUDA will be ultimately responsible to ensure that the EMP is implemented through a monitoring mechanism. For this purpose, ESIC will develop and maintain internal institutional capacity for environmental management.
- **Contractors:** The RUDA construction contractors (the 'Contractors') will be primarily responsible for the implementation of the EMP. Contractors will develop an internal monitoring and reporting mechanism for all activities undertaken. Contractors are also

responsible for updating or making necessary changes to the EMP if and as required as a result of any changes in design or location, and ongoing reviews and requirements.

Specific roles and responsibilities for environmental monitoring are provided in Table 6-4.

Table 6-4 Roles and Responsibilities for Implementation of EMP

Aspect	RUDA's and LESCO Responsibilities	Contractor's Responsibilities	Relevant Documentation
Contracting	Ensure that the EMP implementation and internal monitoring and reporting requirements are included in the contract between RUDA/LESCO and the Contractors.	Understand the requirements and estimate the required resources.	The contract between RUDA/LESCO and Contractors
EMP Update	Review updated EMP if any changes to design happened	Update EMP if any changes to the design occur	Revised EMP
Resources	Ensure the availability of resources required for EMP implementation, monitoring of Contractors and preparing reports to authorities	Ensure the availability of resources required for EMP implementation and internal monitoring and reporting to RUDA.	Project EMP implementation and monitoring plans and budgets.
Environmental staff	Designate an HSE Manager for the Project	Appoint an officer dedicated to the environment (may be combined with health and safety, and for social issues).	Job descriptions.
Monitoring surveys and inspections	Undertake periodic inspections and carry out field measurements, where needed over and above those of the Contractor.	Systematically observe and collect data on environmental performance, undertake inspections, and carry out surveys	Inspection and survey reports.

Aspect	RUDA's and LESCO Responsibilities	Contractor's Responsibilities	Relevant Documentation
	Review Contractor monitoring.		
Environmental audit	Conduct periodic internal audits of the construction sites and commissioning third-party (external) audits	Conducting periodic internal audits.	Audit reports.
Reporting	Ensure that periodic environmental monitoring reports are received from the Contractors and are reviewed. Prepare reports to authorities if necessary	Generate monthly environmental monitoring reports and disseminate these to the management and appropriate staff members.	Periodic reports.
Corrective actions	Verify that the activities that are carried out comply with the EIA and EMP and identify corrective actions if needed.	Carry-out the required corrective actions.	Corrective action record.
Maintenance of record	Maintain monitoring data and record all incidents of environmental significance and related corrective measures.	Maintain monitoring data and record all incidents of environmental significance and related corrective measures.	Environmental databases.

## 6.6 Schedule for implementation and Environmental Budget

Personnel, including Contractors' personnel, working for or on behalf of the Project will receive training to maintain awareness of relevant environmental and social aspects, impacts, and risks associated with the Project and corresponding controls. The training will also maintain awareness of the environmental benefits of improved personal performance and the potential consequences of departure from specified procedures.

Visitors to Project sites will receive relevant environmental and social awareness training as part of site induction training. Environmental training will help to ensure that the requirements of this EIA and EMP are clearly understood and followed by all Project personnel in the course of the construction phase.

The Contractors will have primary responsibility for providing training to all construction personnel in line with the Training Plan shown in Table 6-8.

Table 6-5 Training Schedule

Target Audience	Trainers	Contents	Schedule
Contractor Supervisors/Managers	Implementation/Training Consultant	Induction training per 'Training Plan'	Before the start of construction activities
Selected management staff from the contractor	Contractor	Key findings of EIA Mitigation measures EMP	Before the start of construction activities
All site personnel	Contractor	Mitigation measures of EMP and EIA Camp rules	Before and during construction activities
Construction crew	Contractor	EMP Waste disposal procedures	Before and during construction activities
Drivers	Contractor	Road safety Defensive driving Road access restrictions Vehicle movement restrictions Waste disposal	Before and during the construction phase
Construction Staff	Contractor	Waste disposal Vehicle movement restrictions	Before and during the construction phase
Camp staff	Contractor	Camp operation Waste disposal Natural resource conservation Housekeeping Camp Rules	Before and during the construction phase

## 6.7 Environment Management Budget

An estimated cost for the implementation of mitigation measures prescribed in the Environmental Management Plan (EMP) has been provided in *Table 6-6*. The cost includes the hiring of staff, arrangements for water sprinkling, provision of PPEs to workers and Voluntarily Tree Plantation, the arrangement of first aid kits at the site and waste management, etc. The budget for landscaping is also included in the given cost where required. The cost does not cover the implementation of mitigation measures prescribed in the Environmental Management Plan (EMP) for the operational phase which will be included as part of RUDA's ongoing environment management program.

**Table 6-6 Estimated Environmental Management Costs**

Sr. #	Activity	Description	Cost (Rs.)	Rationale
1	Medical screening for workers	Rs. 5,000 per person for 50 employees	500,000.00	Medical screening of the workers before deployment on site and twice a year during whole construction period.
		50 x 5,000 x 2 = 500,000		
2	Health and Safety of Workers	For the provision of dust masks, safety shoes, gloves, first aid box, ear plugs, safety helmets and safety jackets (Hi Vis) and provision of dust bins, warning tap, safety cones and safety sign boards.	1,807,500.00	For detail, please refer to Annex-5
3	Staff for EMP Implementation	HSE Expert to monitor / conduct all HSE related activities e.g. TBTs, PPEs, housekeeping, safety signage, emergency preparedness, etc. during construction and operational phase	2,800,000.00	Cost for hiring HSE Experts along with their monthly logistics during construction phase.
		Environmental/ HSE Officer: 01 for 14 months, 100,000 per month		
		HSE Inspector: 02 for 14 months @50,000.0 per month each 14X 2 x 50,000= 1,400,000		

4	Implementation of Mitigation Plan	Implementation of other EMP Measures during Construction such as sprinkling of water, wastewater & spill Management, etc. 100000x14	1,400,000.00	Implementation of mitigation measures in Table 6-2
5	Handling of solid waste	Includes the cost of collection, segregation, transportation, disposal and management of domestic, commercial and construction wastes	700,000.00	Rs. 50,000 per month for 14 months to collect construction waste from all the active sites on daily basis.
6	Instrumental Monitoring	Air, Noise, and Water Quality Monitoring (Baseline & Quarterly) 6x150,000=900,000	900,000.00	
7	Environmental Audit	Environmental Auditing through third party after completion of construction phase = 500000	500,000.00	Cost for auditors along with logistics, travels and accommodation charges at construction completion
8	Voluntarily Tree Plantation and Environmental Enhancement Measures	Plantation of 500 trees types and species are given in tree plantation plan Section 6.8		Cost will be covered under RUDA Chahar Bagh's own maintenance budget
9	Grievance Redress Mechanism (GRM)	GRM Setup, Forms, Record Keeping	50,000.00	Implementation of GRM (Section 6.18.3)
10	Unforeseen Impacts	Cost for any unforeseen impact is 1 % of EMP cost	86,500.00	Mitigation of unforeseen Impacts (outbreaks, social issues)
<b>Total</b>			<b>8,744,000</b>	

### 6.8 Proposed Monitoring Program to assess performance or output of EMP

- A monthly report on the monitoring and compliance is to be provided to RUDA & LESCO by the Contractor based on the requirements set out in this section.
- The monitoring report should be prepared by RUDA through CC for submission to the local authorities or local offices of the Punjab EPA.
- The EMP will be reviewed if the projects continue for more than a year, and updated annually, or more frequently based on the outcomes of reviews, monitoring by RUDA, and inspections conducted by the Implementataion Consultatant/ Construction supervision Consultant..

### **6.8.1 Implementation**

The Plan must identify and describe the responsibilities of all parties, including the RUDA and contractors. The Plan must also identify the roles and responsibilities of individual positions within the RUDA and contractor. This should be shown in an organogram that includes as much detail as possible, down to the individual person/position.

Oversight activities of contractors and RUDA will be laid out in detail in the Plan, including the frequency and scope of oversight activities. In all cases, RUDA will remain ultimately responsible for the implementation of the Plan by contractors.

### **6.8.2 Revision**

The Plan will be reviewed by the contractor at least annually, and whenever there is a significant change in project or site conditions, when it is determined that any mitigation measure is or may be insufficient to achieve its purpose, and where non-compliance occurs with regard to the conditions of approval. It will be revised when necessary to update or improve rehabilitation and landscaping management, and when it is determined necessary to ensure compliance with applicable standards and good international industry practice.

### **6.8.3 Training Requirements**

The Plan must identify training requirements for staff and managers of the contractors, including who will be responsible for conducting the training and who must be trained in what skills. Training will focus on the assigned responsibilities of the trainees and will cover technical and administrative skills needed to perform assigned responsibilities, identification of response actions required in case of incidents, and topics related to occupational health and safety, including personal protective equipment required to conduct assigned activities.

## **6.9 Change Management**

The Change Management System proposed for the project recognizes three orders of changes in the project design or project area:

First-Order: A first-order change leads to a significant departure from the project described in EIA and consequently requires a reassessment of its environmental impact. Examples of first-order changes include:

- Shifting the project area by more than 5 km
- Increasing the total length of RoW by over 50 km
- Using technology that has significantly greater effects
- Increasing the crew size by more than 50%
- Re-routing the ROW through any sensitive wildlife areas.
- A new environmental assessment will be conducted and a revised IEE/ EIA report submitted to the provincial EPAs for a first-order change in the project.

Second-Order: A second-order change entails project activities not significantly different from those described in the EIA.

A second-order change may alter the project's impact, but not its overall magnitude. In case of such changes, the ESIC will be required to reassess the impact of the activity on the environment, specify additional mitigation measures, if necessary, and report the changes to the provincial EPAs. Examples of such changes include:

- Shifting of the project area by 1 to 5 km
- Increasing the total length of RoW by 10 to 50 km
- Using a different technology that is as disturbing, or less disturbing than that proposed
- Increasing the crew size by more than 10% but less than 50%.

Third-Order: A third-order change or uncertainty is of little consequence to the EIA findings. In case such a change is made, the only action necessary will be to update the EMP to reflect how the change has been dealt with.

Examples of third-order changes are:

- Shifting the project area by 1 km or less
- Increasing the total length of RoW by 5 km
- Changing the layout of the campsites or construction sites.

The examples given above are hypothetical and have been given to illustrate the magnitude of the three types of changes. At this stage, no changes are under consideration. Any change in the project design will be evaluated based on the criteria provided above, and appropriate action will be taken. The record will be maintained in the Change Record Register.

## **6.10 Reporting and Feedback Mechanism**

The Contractor will prepare a 'Construction Management Plan' (CMP) demonstrating the way they will comply with the requirements of mitigation measures proposed in the EMP of the EIA report. The CMP will form part of the contract documents and will be used as a monitoring tool for compliance. Violation of the compliance requirements will be treated as non-compliance leading to the corrections or otherwise imposing a penalty on the contractors

The contractor, through the environmental specialist on its team, will prepare periodic (not more than once every three months) status reports on the EMP implementation. Such reports will carry information on the main types of activities carried out within the reporting period, the status of any clearances/permits/licenses which are required for carrying out such activities, mitigation measures applied, and any environmental issues that emerged concerning suppliers, local authorities, and affected communities.

The Contractor's reports will be based on reports prepared by various subcontractors and their monitoring and supervision. The contractor will assess how accurate is the information provided in the contractor's reports, fill any gaps identified in them, and evaluate the adequacy of mitigation measures applied by the subcontractor. The contractor must highlight any cases of

incompliance with EMPs, inform on any acute issues brought up by a contractor or revealed by the supervisor himself, and propose corrective actions.

After completion of the Contractor's contract, RUDA will oversee the operation and maintenance of the Project.

Feedback and adjustment will be carried out in two tiers. Upon request for EMP modification by the subcontractor, the Contractor and RUDA will review the proposals in detail and consider their acceptance or rejection. Primarily, only those modifications will be considered, which do not contravene the conditions of the environmental approval from Punjab-EPA. RUDA will consider the recommendations of the Contractor but it will be the final authority on approval of the change. It may decide to undertake studies before approval of the change.

#### **6.10.1.1 Change-Record Register**

A change-record register will be maintained at the site, to document any changes in EMP and procedures related to changes in the project design, construction plan or external environmental changes affecting the EMP. These changes will be handled through the change management mechanism discussed later in this chapter.

#### **6.10.1.2 Proposed EMP Reporting and Reviewing Procedures**

The Plan must call for periodic inspection/monitoring of the construction footprint and project activities against the requirements of the Plan. For verification and monitoring, the Plan will need to specify:

- The locations and activities that will be monitored.
- The measurable/observable criteria by which implementation of rehabilitation and landscaping management will be judged successful, and when they will be considered complete.
- The timing and frequency of inspection and monitoring.
- The required qualifications of persons who will conduct the monitoring and inspection.
- Records that must be kept and the person responsible for keeping the records.
- Reports that will be prepared, to whom the reports are to be submitted for review and the length of time records will be kept.

The Plan must describe what actions will be taken, and by whom, if inspection/monitoring results show that satisfactory natural regeneration is not occurring, or the rehabilitation management practices do not meet applicable requirements, including the requirements of the Plan itself.

### **6.11 Equipment Maintenance Details**

#### **6.11.1 Construction**

Equipment during the construction phase includes dump trucks, loader trucks, excavators, cranes, front-end loaders, fuel tankers, water bowsers, cars etc. This equipment and other machinery will only be repaired at designated sites at the warehouse.

---

### **6.11.2 Operations**

Limited vehicular movement by the maintenance team will be required on a need basis.

### **6.12 Grievance Redress Mechanism**

A grievance redress mechanism will be established especially during the construction period to allow affected persons/families to appeal against any decision, practice or activity arising out of the survey, data collection, compensation rates resettlement-related benefits, and environmental issues.

## 7 Stakeholder Consultations

### 7.1 General

Stakeholder engagement (consultation) is an important feature of the environmental assessment, especially with the local population and key stakeholders (e.g., authorities, community leaders and organizations). Effective consultation can lead to acceptable decision-making regarding Project design and implementation and the stakeholders feel a sense of ownership. Stakeholder engagement was initiated at EIA level.

Stakeholders, especially the local population, involvement is an important feature of the environmental assessment and can lead to a better and more acceptable decision-making regarding the project design and implementation. Public involvement, undertaken in a positive manner and supported by a real desire to use the information gained to improve the Project design, will lead to better outcomes and lay the basis for on-going positive relationships between the stakeholders. Public involvement is necessary for smooth implementation of the project. The local community support is also required for the success of the Project.

Public consultation was carried out with the relevant government departments, affected individuals, institutions and PAPs in all accessible villages in the AOI during the month of May 2025. These consultations were conducted concurrently with the baseline survey.

The feedback and issues raised during the consultation were recorded and documented. Consultations with Government departments were mostly related to the proposed the transmission line route alignment, legal requirements, associated impacts, lessons learned during the implementation of previous projects, availability of requisite baseline information, specific legal requirements, information regarding any future development plans and coordination between the various concerned departments.

The stakeholder consultations had the following main objectives:

- Sharing of information with government authorities, local communities and affected persons about the proposed Project and expected environmental and social impacts;
- Understanding the stakeholders concerns regarding various aspects of the Project, including the existing situation, grid station location, land acquisition, compensation and the potential impacts of the construction-related activities and operation of the Project;
- Recording the feedback of public in order to develop a mechanism to address their issues and other local level concerns and incorporation of the outcomes in final decision making; and
- Acquire the latest data, information and other approved procedures relevant to the Project from the concerned government authorities.

## 7.2 Stakeholder Mapping

Identification of stakeholder is an important step which ensures that all stakeholders are identified and classified as per their role about the Project. The Project identified primary as well as secondary stakeholders as defined below.

As per definition, stakeholder is a person or an institution/organization that is affected or in any way can be determined to have an interest in the proposed Project. Stakeholders can be divided into two main groups, Primary Stakeholders and Secondary Stakeholders. Primary stakeholders are those who are directly affected due to the loss of assets and conditions.

The secondary stakeholders include government departments and agencies that has an interest in or in some way through planning and implementation will be involved in the Project.

The secondary stakeholders with regard to the Project were identified to include:

- RUDA
- LESCO
- EPA as regulatory authority
- Project Design Consultant/Engineer
- Locals/ Public residing in close vicinity or Project Area
- Civil society organizations (CSOs)
- Non-governmental organization (NGOs)
- Other concerned

Details regarding roles and responsibilities of the concerned agencies and departments are given in Table 7-1.

Table 7-1 Role of Concerned Agencies/Departments

Project Stakeholder	Name	Roles
<b>Proponent</b>	RUDA	<ul style="list-style-type: none"> <li>• RUDA is the Project Proponent of the proposed Project.</li> </ul>
<b>Punjab Authorities</b>	Environmental Protection Agency, Punjab	<ul style="list-style-type: none"> <li>• EPA, Punjab is the regulatory authorities and mainly responsible for the development and implementation of the environmental policies and strategies in order to integrate the environmental issues and sustainable development approaches into the legal and regulatory frameworks as per Punjab Environmental Protection Act, 1997;</li> <li>• EPAs are responsible for the issuance of NOC of the Proposed Project;</li> </ul>

Project Stakeholder	Name	Roles
		<ul style="list-style-type: none"> <li>EPA Punjab is responsible for the compliance of EMMP and NOC provision during the construction and operation stages of the Project.</li> </ul>

### 7.3 Consultation Outcomes

Consultations were carried out in the villages falling within the COI of the 220 kV transmission line and the area of the proposed grid station. In total 16 consultation meetings were held with directly and indirectly affected villages and communities. The majority of the people who participated in these consultations were village leaders and elders who according to local culture and custom are those who have decision power in the community.

The socio-economic survey was carried out in conjunction with the consultations which took place from the April to May 2025.

#### 7.3.1 Consultation with Proponent

A consultation meeting was held with the project proponent, Ravi Urban Development Authority (RUDA), to gather essential project information and align on environmental and social considerations. The discussion focused on the location, scope, and layout of the proposed 132kV Grid Station at Chahar Bagh, as well as construction timelines, available utility services, and integration with the broader Chahar Bagh development plan.

Key points discussed included:

- Finalized coordinates and land ownership details of the grid station site
- Access road and utility corridor planning (already covered under approved EIA for Chahar Bagh)
- Availability of space for plantation and greenbelt development
- Workforce deployment, temporary facilities, and construction logistics
- Roles and responsibilities for maintenance (particularly for landscaping and environmental compliance)
- Alignment of transmission lines through government/RUDA-owned land to avoid social or agricultural impacts

Following the consultation, a joint site visit was conducted with RUDA's technical and planning teams. The visit verified the physical condition of the site, surrounding land use (agricultural and waste land), proximity to nearby plantations, and suitability of access infrastructure. Observations made during the visit supported the integration of environmental safeguards and informed the preparation of the baseline and mitigation measures.

Table 7-2 RUDA's Environment Management Team

Name	Organization	Designation	Role
Ms. Nadia Tahir	Ravi Urban Development Authority (RUDA)	Deputy Director	Leads Environmental Department

### 7.3.2 Regulatory Authority

The Punjab Environmental Protection Agency (Punjab-EPA) guidelines were considered during the preparation of Environmental Impact Assessment (EIA) and for that purpose, extensive consultation with public and other considerable department and agencies were conducted.

Table 7-3 Consultation with EPA

Name	Organization	Concerns
Dr. Amir Farooq (Director EIA)	Punjab Environmental Protection Agency	Consider all guidelines of Punjab EPA during preparation of Environmental Impact Assessment. Extensive public consultation should be conducted. Ecological baseline should be conducted. Primary and updated data should be used. Detailed environmental management and monitoring plan should be developed. Global best practices for green urban development should be adopted in detailed designing.

### 7.3.3 Consultation with LESCO

As part of the EIA process for the proposed 132kV Grid Station at Chahar Bagh, a formal consultation was held with the Lahore Electric Supply Company (LESCO) to obtain critical technical and operational input, and to ensure environmental and safety compliance from the power distribution perspective.

This engagement aimed to align the environmental planning with LESCO's engineering standards and anticipate any environmental or occupational health and safety concerns during the construction and operation phases. The consultation covered the following key areas:

- Technical integration of the grid station with LESCO's existing and planned power infrastructure
- Design specifications for transformers, protection relays, grounding systems, and feeder alignments

- Environmental safeguards, including noise control, electromagnetic field (EMF) limits, and oil spill containment systems
- Compliance with NEQS and LESCO’s internal HSE protocols during both construction and operation
- SCADA system compatibility and future scalability for increased urban load
- Roles and responsibilities for operation, maintenance, and eventual handover of the grid station infrastructure
- Mitigation of any potential social or ecological impacts, especially in relation to right-of-way and transmission corridors

The insights gathered were integrated into the impact assessment, mitigation measures, and environmental management plan (EMP) sections of this EIA report.

Table 7-4: Consultation with LESCO

Name	Department	Concerns/Observations
	LESCO	<ul style="list-style-type: none"> <li>• The officer was briefed about the Project and asked about the potential impacts on drainage canals;</li> <li>• The officer informed that there is no canal in the proposed transmission line route.</li> <li>• Mr. Qaisar expressed appreciation of the Project as it will help to overcome the electricity crisis of the country;</li> <li>• He added that the consultations should be conducted with the families that are affected by the Project.</li> <li>• The officer informed that the compensation will be paid in three phases i) piling ii) tower construction iii) stringing of conductors;</li> </ul>

Figure 7-1 Institutional Stakeholder Consultations



Institutional Consultation with EPA



Institutional Consultation with RUDA



Institutional Consultation with LESCO



Consultation with Local People



28 March 2025 11:11

**Grid Station Location**



28 March 2025 11:11

**Grid Station Location**



Google

**Lahore, Punjab, Pakistan**  
 Jc8m+vjh, Lahore, Punjab, Pakistan  
 Lat 31.617603° Long 74.436779°  
 12/05/2025 03:31 PM GMT +05:00

**Consultation with Environmental Monitoring Unit**



Google

**Lahore, Punjab, Pakistan**  
 Jc8m+vjh, Lahore, Punjab, Pakistan  
 Lat 31.61762° Long 74.436752°  
 12/05/2025 03:30 PM GMT +05:00

**Consultation with Environmental Monitoring Unit**



Google

**Lahore, Punjab, Pakistan**  
 Jc8m+vjh, Lahore, Punjab, Pakistan  
 Lat 31.617629° Long 74.436731°  
 12/05/2025 02:37 PM GMT +05:00

**Air Quality Monitoring**



Google

**Lahore, Punjab, Pakistan**  
 Jc8j+qvp, Bhaini Road, Zahra Pir, Lahore, Punjab, Pakistan  
 Lat 31.617232° Long 74.43198°  
 14/05/2025 04:11 PM GMT +05:00

**Collection of Water Sample**

### 7.3.4 Environmental Practitioners and Experts

The findings of consultation with the environmental practitioners and experts are mentioned below:

Table 7-5 Consultation with Environmental Practitioners and Experts

No.	Name	Organization	Designation	Views
1	Muhammad Waqar Saleem	Earthcon Management & Development Solutions (EMDS)	Social and Environment Expert	Vulnerable should be kept on high priority. Practices to accommodate the affected persons should be considered.
2	Dr. Saamia Saif	Environmental Consultancies & Options.	Environmental Expert	Plantation plan and rehabilitation plan should be completed as per policies and requirements. Mitigation measures should be added in the report.

### 7.3.5 Community Consultation

Community consultation is a core component of the Environmental Impact Assessment (EIA) process, aimed at ensuring transparency, fostering stakeholder inclusion, and integrating local knowledge and concerns into project planning. For the proposed 132kV Grid Station for Chahar Bagh CB-I & CB-II, a targeted community consultation exercise was conducted with local residents and stakeholders to inform them about the project, its potential impacts, and proposed mitigation measures, while also documenting their feedback and suggestions.

#### 7.3.5.1 Objectives of Consultation

- To inform local communities about the nature, scope, and timeline of the project
- To understand community concerns, perceptions, and expectations regarding environmental, health, and social impacts
- To incorporate local knowledge into the assessment of potential risks and mitigation strategies
- To foster public participation and improve project acceptability

#### 7.3.5.2 Methodology

The consultation was carried out through structured interviews, informal discussions, and focused group meetings with residents, farmers, laborers, and local opinion leaders within the project's area of influence, particularly those residing near the grid station site and along the proposed transmission line corridor.

A total of 99 households were engaged during the social survey. Data was collected through questionnaires and verbal interactions in the local language to ensure clarity and comfort for participants.

### **7.3.5.3 Key Concerns and Feedback**

The community demonstrated a positive attitude toward the project and appreciated the opportunity to be consulted. Many participants welcomed the idea of tree plantation and expressed interest in seeing the project contribute to local environmental improvement. However, several concerns were raised:

- Health and safety risks due to potential EMF exposure and proximity to high-voltage lines
- Dust, noise, and traffic disturbances during the construction phase
- Potential impact on local access routes and agricultural activity during equipment movement
- Need for local employment opportunities during construction
- Assurance of compensation or protection of land if any temporary land use is involved
- Requests for greenbelt development and plantation along the grid station boundary and access routes

### **7.3.5.4 Mitigation Commitments Explained to the Community**

The consultation team explained the measures incorporated into the EIA and Environmental Management Plan (EMP), including:

- EMF levels will be maintained within international safety guidelines
- Noise and dust will be controlled through scheduled operations, water sprinkling, and proper equipment use
- Transmission lines will traverse government/RUDA-owned roadside land, avoiding private agricultural land
- Local labor will be prioritized during construction, where feasible
- Landscaping and plantation will be undertaken to improve the site's visual and environmental quality



Figure 7-2 Photographs of Community Consultation

## 8 Conclusions and Recommendation

### 8.1 Conclusions

Based on provided design, environmental and social field surveys, and an impact assessment for the proposed 132kV Grid Station and associated transmission line at RUDA Chahar Bagh, the following major findings and anticipated impacts have been identified:

- The proposed Grid Station will be constructed on land owned by Chahar Bagh, and the alignment of the transmission line avoids the need for any new land acquisition, minimizing resettlement risks.
- Tree cutting is not expected during project implementation. Instead, native tree species will be planted within the Grid Station boundary to improve aesthetics and contribute to ecological enhancement.
- No protected forests, wildlife sanctuaries, wetlands, archaeological sites, or other environmentally sensitive areas fall within the project's Area of Influence.
- Temporary construction-related environmental impacts may include dust generation, noise pollution, air emissions from machinery, vibration, and risks of surface water contamination, all of which can be effectively mitigated through best practices and strict implementation of the Environmental Management Plan (EMP).
- Occupational health and safety hazards for construction workers such as heat stress, injuries, and exposure to electrical hazards will be addressed through enforcement of health and safety protocols and capacity building under the EMP.
- Community health and safety concerns, especially related to increased vehicular movement and construction-related activities, require awareness campaigns and site-specific safety measures.
- The project site does not fall in or near areas inhabited by Indigenous Peoples or marginalized ethnic groups.
- Minor traffic disruptions may occur during transportation of materials and equipment, requiring traffic management planning in coordination with local authorities.
- The visual impact of the substation and transmission line will be low, considering their location in a planned enclave and urbanizing area.
- The project offers positive long-term benefits by improving grid reliability, reducing line losses, and supporting planned urban development within the RUDA Chahar Bagh.
- Job creation during construction and operation phases will provide short-term livelihood opportunities for skilled and unskilled labor in the local community.

### 8.2 Recommendations

Comprehensive mitigation and monitoring measures have been proposed in this report to minimise the negative impacts and to enhance the positive impacts of the project. These should

be implemented in accordance with the recommendations in the EMP of this report and monitored followed up by the project proponent, RUDA, during construction and operation of the project.

To ensure that the environmental and social impacts of the proposed 132kV Grid Station and associated transmission line are effectively managed, the following key recommendations are made:

- Comprehensive mitigation and monitoring measures have been detailed in the Environmental Management Plan (EMP) of this report. These must be strictly implemented during all phases of the project to minimize adverse impacts and enhance project benefits.
- Regular environmental and social monitoring, including air and water quality testing, noise level monitoring, and occupational safety audits, should be conducted by qualified professionals, and reports should be documented and shared with relevant stakeholders.
- Contractors must be contractually bound to adhere to EMP provisions, including waste management, dust suppression, noise control, and safety protocols. Pre-construction trainings and tool-box sessions must be conducted to build their capacity.
- Plantation and landscaping activities within the Grid Station should use native and non-invasive species, with regular maintenance to ensure long-term survival and ecosystem benefits.
- Health and safety plans should be strictly implemented to safeguard both workers and the nearby community, including use of personal protective equipment (PPE), site security fencing, and proper signage.
- Compliance with all relevant national environmental regulations, RUDA's environmental guidelines, and any conditions laid out by the Environmental Protection Agency (EPA) must be ensured.
- Post-construction audits and an environmental completion report should be prepared to assess the effectiveness of mitigation measures and identify any residual issues for corrective action.

# ANNEXURES

## ANNEX-1 Environmental Screening of Project

2650 THE PUNJAB GAZETTE (EXTRA ORDINARY) DECEMBER 16, 2022

### SCHEDULE II (See Regulation 4) List of projects requiring an EIA

#### A. Energy

1. Hydroelectric power generation over 50MW
2. Transmission lines more than 132 kV and grid stations
3. Nuclear power plants
4. Petroleum refineries
5. Oil and gas extraction projects including exploration, production, gathering systems, separation and storage
6. Renewable Energy projects (including wind and solar) more than 100 MW

#### B. Manufacturing and processing

1. Cement plant
2. Chemical manufacturing units, including pharmaceuticals and cosmetic
3. Sugar mills and Distilleries
4. Food processing industries including, beverages, milk and dairy products with total cost more than Rs 200 million
5. Paper and paperboard, paper pulping, paints and dyes,
6. Textile units comprising of dyeing & printing
8. Pesticides and fertilizer manufacturing units
9. Poultry waste processing units / rendering units
10. Tannery and leather units
11. Rubber projects with total cost more than Rs. 100 million
12. Battery Manufacturing and Recycling Plants
13. Ceramics and glass units
14. Electro plating and nickel/chrome plating including Surgical Units
15. Cutlery units
16. Slaughter House
17. Iron and steel rolling mills
18. Steel Furnaces
19. Smelting plants
20. Auto mobile manufacturing and assembling units
21. Resource Recovery Units

#### C. Mining and mineral processing

1. Mining and processing of coal, gold, copper, Sulphur and precious stones

## ANNEX-2 List of Key Staff

Names	Positions
Mehwish Rehman Alvi	Team Leader / Environmental Expert
Nouman Petras	Sociologist
Najma Iftikhar	Environmental Engineer
M. Hasnain Javaid	Environmental Expert
Sakhawat Ali	Ecologist
Amad Atiq	GIS Analyst

## ANNEX-3 Environmental Monitoring Report



Green Crescent

Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 6644

### CHEMICAL ANALYSIS TEST REPORT (DRINKING WATER)

*Disclaimer: This report is not valid for Court Cases, Environment Protection Orders, Compliance Report for Operational Phase Approvals, or any regulatory action under Punjab Environmental Protection (Smog Prevention and Control) Rules, 2023 etc.*

Sample Details			
Job Ref. No:	GCEC-PK-PU-148/2025	Client Name:	RUDA
Telephone No.	0300-1768319	Consultant Name:	Cleantech Solutions
Sample Date:	14-05-2025	Sample Matrix:	Drinking Water Sample
Sample Receipt Date:	15-05-2025	Sampled By:	GCEC
Grab/Composite:	Grab Sampling	Date of Completion of Analysis:	16-05-2025
Address:	Chahar Bagh Enclave, RUDA, Lahore		
Project Name:	Chahar Bagh Grid Station		
Sample Identification			
01   Near Farmhouse			

Parameters	Analysis Method	Unit	LOR	Result 01	PEQS
PHYSICAL & CHEMICAL ANALYSIS					
pH	APHA-4500H+ B	-	0.01	6.94	6.5-8.5
Odor	In-house	-	-	Odorless	Non-Objectionable
Taste	In-house	-	-	Sweet	Non-Objectionable
Color	APHA-2120 B/C	Pt/Co	1.0	<1.0	≤15 TCU
Turbidity	APHA-2130 B	NTU	0.1	<0.1	<5 NTU
Total Hardness	APHA-2340 B & C	mg/l	0.1	252.0	< 500 mg/l
Total Dissolved Solid (TDS)	APHA-2540 C	mg/l	1.0	474.0	< 1000
Ammonia	APHA-4500-NH <sub>3</sub> -B	mg/l	0.002	<0.002	-
Chloride	APHA-4500Cl- B	mg/l	0.24	13.69	< 250
Cyanide (CN)	APHA-4500CN E	mg/l	0.01	<0.01	≤ 0.05
Fluoride (F)	APHA-4500F- D	mg/l	0.01	<0.01	≤ 1.5
Nitrite	APHA-4500NO <sub>2</sub> B	mg/l	0.01	0.27	≤ 3 (P)
Nitrate	APHA-4500NO <sub>3</sub> C	mg/l	0.1	0.6	≤ 50
Phenolic Compound	APHA-5530 D	mg/l	0.01	<0.01	-
Residual Chlorine	APHA-4500Cl G	mg/l	0.1	<0.1	0.2-0.5
Aluminium (Al)	APHA-3111Al B	mg/l	0.028	<0.028	≤ 0.2
Cadmium	APHA-3111Cd B	mg/l	0.0028	<0.0028	0.01
Copper	APHA-3111Cu B	mg/l	0.0045	<0.0045	2
Chromium	APHA-3111Cr B	mg/l	0.0054	<0.0054	≤ 0.05 (P)
Mercury	APHA-3112Hg B	mg/l	0.0008	<0.0008	≤ 0.001
Antimony (Sb)	APHA-3111Sb B	mg/l	-	ND	≤ 0.005 (P)
Nickel	APHA-3111Ni C	mg/l	0.008	<0.008	≤ 0.02
Zinc	APHA-3111Zn B	mg/l	0.0033	<0.0033	5.0
Arsenic	APHA-3111As B	mg/l	0.01	<0.01	≤ 0.05 (P)
Barium	APHA-3111Ba B	mg/l	0.031	<0.031	0.7
Manganese	APHA-3111Mn B	mg/l	0.0016	<0.0016	≤ 0.5
Iron	APHA-3111Fe B	mg/l	0.1	<0.1	-
Boron	APHA-4500-B (C)	mg/l	0.1	<0.1	0.3
Lead	APHA-3111Pb B	mg/l	0.013	<0.013	≤ 0.05
Selenium	APHA-3111Se B	mg/l	-	ND	0.01 (P)
MICROBIOLOGICAL ANALYSIS					
Total Coliforms	APHA:9222 B	CFU/100ml		32	0/100ml
Faecal Coliforms (Ecoli)	APHA:9222 D	CFU/100ml		Absent	0/100ml
<b>Abbreviations:</b>					
ND: Not Detected		LOR: Limit of Reporting		PEQS: Punjab Environmental Quality Standards	
<b>Note:</b>					
*Uncertainty of all the parameters and laboratory conditions at the time of analysis will be provided as per client's requirement. The lab environmental conditions are maintained at 25±5°C and humidity at 50±20%.					

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# Green Crescent

Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 6645

## CHEMICAL ANALYSIS TEST REPORT (WASTE WATER)

**Disclaimer:** This report is not valid for Court Cases, Environment Protection Orders, Compliance Report for Operational Phase Approvals, or any regulatory action under Punjab Environmental Protection (Smog Prevention and Control) Rules, 2023 etc.

Sample Details			
Job Ref. No:	GCEC-PK-PU-148/2025	Client Name:	RUDA
Telephone No.	0300-1768319	Consultant Name:	Cleantech Solutions
Sample Date:	14-05-2025	Sample Matrix:	Waste Water Sample
Sample Receipt Date:	15-05-2025	Sampled By:	GCEC
Grab/Composite:	Grab Sampling	Date of Completion of Analysis:	19-05-2025
Address:	Chahar Bagh Enclave, RUDA, Lahore		
Project Name:	Chahar Bagh Grid Station		
Sample Identification			
01	Neat Bhaini Road		

Parameters	Analysis Method	Unit	LOR	Result	PEQS
				01	
PHYSICAL & CHEMICAL ANALYSIS					
Temperature	-	°C	-	1.5	<3
pH	APHA-4500H+ B	pH unit	0.01	8.12	6-9
Total Dissolved Solid (TDS)	APHA-2540 C	mg/l	1.0	2020.0	3500
Oil and Grease	USEPA-1664	mg/l	0.2	<0.2	10
Biological Oxygen Demand	APHA-5210 B	mg/l	1.0	218.0	80
Chemical Oxygen Demand	APHA-5220-D	mg/l	1.0	643.0	150
Total Suspended Solid	APHA-2540-D	mg/l	1.0	256.0	200
Phenolic Compound	APHA-5530 D	mg/l	0.01	<0.01	0.1
Chloride (Cl)	APHA-4500Cl- B	mg/l	0.24	362.01	1000
Fluoride (F)	APHA-4500F- C	mg/l	0.01	0.28	10
Cyanide (CN)	APHA-4500CN F	mg/l	0.01	<0.01	1.0
Detergent	APHA-5540 B	mg/l	-	9.0	20
Sulphate	APHA-4500-SO <sub>4</sub> C	mg/l	0.41	203.33	600
Sulphide	APHA-4500-S <sub>2</sub> -E	mg/l	0.4	<0.4	1.0
Ammonia	APHA-4500-NH <sub>3</sub> -B	mg/l	0.002	1.12	40
Silver	APHA-3500Ag-B	mg/l	0.0032	<0.0032	1.0
Cadmium	APHA-3500Cd B	mg/l	0.0028	<0.0028	0.1
Chromium	APHA-3500Cr B	mg/l	0.0054	0.0649	1.0
Copper	APHA-3500Cu B	mg/l	0.0045	0.0452	1.0
Lead	APHA-3500-Pb B	mg/l	0.013	<0.013	0.5
Mercury	APHA-3500-Hg B	mg/l	0.0008	<0.0008	0.01
Nickel	APHA-3500-Ni B	mg/l	0.008	0.0131	1.0
Zinc	APHA-3500-Zn B	mg/l	0.0033	0.7172	5.0
Arsenic	APHA-3500As B	mg/l	0.01	<0.01	1.0
Barium	APHA-3500Ba B	mg/l	0.031	<0.031	1.5
Manganese	APHA-3500-Mn B	mg/l	0.0016	0.0126	1.5
Iron	APHA-3500-Fe-B	mg/l	0.1	14.1907	8.0
Boron	APHA-4500B-C	mg/l	0.1	<0.1	6.0
Total Chlorine	APHA-4500Cl-B	mg/l	0.1	<0.1	1.0
Selenium	APHA-3500Se C	mg/l	0.23	<0.23	0.5
Total Toxic Metals	By Calculation	mg/l	-	0.1232	2.0

**Abbreviations:**

ND: Not Detected

LOR: Limit of Reporting

PEQS: Punjab Environmental Quality Standards

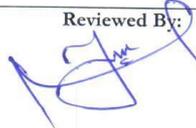
**Note:**

\*Uncertainty of all the parameters and laboratory conditions at the time of analysis will be provided as per client's requirement. The lab environmental conditions are maintained at 25±5°C and humidity at 50±20%.

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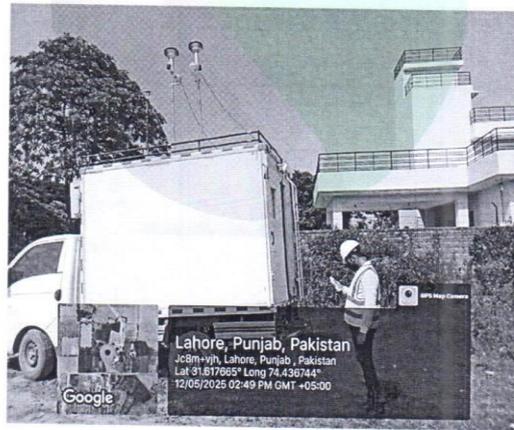
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Ambient Air Monitoring Location #01  
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# Green Crescent

Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 6647

## Ambient Air Quality Monitoring

**Disclaimer:** This report is not valid for Court Cases, Environment Protection Orders, Compliance Report for Operational Phase Approvals, or any regulatory action under Punjab Environmental Protection (Smog Prevention and Control) Rules, 2023 etc.

Job Reference Number	GCEC-PK-PU-148/2025
Monitoring Point	Near Chahar Bagh
Date of Intervention	12-May-2025 to 13-May-2025
Monitoring Coordinates	31°37'03.6"N 74°26'12.3"E

Sr. #	Time	CO (mg/m <sup>3</sup> )	NO (µg/m <sup>3</sup> )	NO <sub>2</sub> (µg/m <sup>3</sup> )	NO <sub>x</sub> (µg/m <sup>3</sup> )	SO <sub>2</sub> (µg/m <sup>3</sup> )
1.	14:30	4.92	37.75	62.35	100.11	88.73
2.	15:30	4.68	40.02	83.39	123.42	80.15
3.	16:30	15.47	37.05	68.16	105.21	64.72
4.	17:30	12.99	43.42	70.28	113.70	73.24
5.	18:30	11.79	40.80	62.09	102.89	77.49
6.	19:30	10.76	40.43	70.26	110.69	82.18
7.	20:30	11.01	40.22	73.62	113.84	84.73
8.	21:30	8.12	44.10	70.81	114.91	94.29
9.	22:30	6.96	44.20	66.16	110.36	99.21
10.	23:30	6.13	41.15	75.45	116.61	103.04
11.	00:30	5.13	34.93	72.09	107.02	91.54
12.	01:30	4.21	35.28	72.07	107.35	86.01
13.	02:30	6.48	29.99	81.87	111.86	103.47
14.	03:30	3.36	34.58	85.84	120.42	94.10
15.	04:30	3.29	32.81	74.89	107.70	88.99
16.	05:30	5.20	41.63	79.12	120.75	85.16
17.	06:30	5.10	40.58	84.92	125.50	86.86
18.	07:30	3.88	43.75	58.96	102.71	102.62
19.	08:30	3.84	42.68	80.95	123.63	102.19
20.	09:30	5.34	41.28	78.51	119.79	94.53
21.	10:30	18.22	38.81	71.79	110.60	89.84
22.	11:30	4.88	38.46	78.20	116.66	84.31
23.	12:30	4.47	38.11	81.26	119.36	87.29
24.	13:30	5.12	40.93	78.81	119.74	81.99
<b>Average Concentration</b>		<b>7.14</b>	<b>39.29</b>	<b>74.24</b>	<b>113.53</b>	<b>88.61</b>

Deputy Analyst:

Reviewed By:

Approved By:



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### Ambient Air Quality Monitoring

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Job Reference Number	GCEC-PK-PU-148/2025
Monitoring Point	Near Chahar Bagh
Date of Intervention	12-May-2025 to 13-May-2025
Monitoring Coordinates	31°37'03.6"N 74°26'12.3"E

Parameter	Unit	Monitoring Duration	LDL	Average Obtained Concentration	PEQS
Nitrogen Dioxide (NO <sub>2</sub> )	µg/m <sup>3</sup>	24 Hours	1.00	74.24	80.0
Nitrogen Oxide (NO)	µg/m <sup>3</sup>	24 Hours	1.00	39.29	40.0
NO <sub>x</sub>	µg/m <sup>3</sup>	24 Hours	1.00	113.53	120.0
Sulphur Dioxide (SO <sub>2</sub> )	µg/m <sup>3</sup>	24 Hours	1.00	88.61	120.0
Carbon Monoxide (CO)	mg/m <sup>3</sup>	24 Hours	0.01	7.14	5.0*
Ozone (O <sub>3</sub> )	µg/m <sup>3</sup>	24 Hours	-	61.64	130.0**
Particulate Matter (PM <sub>2.5</sub> )	µg/m <sup>3</sup>	24 Hours	1.00	99.03	35.0
Particulate Matter (PM <sub>10</sub> )	µg/m <sup>3</sup>	24 Hours	1.00	214.48	150.0
Suspended Particulate Matter (SPM)	µg/m <sup>3</sup>	24 Hours	1.00	348.51	500.0
Lead Airborne Particles	µg/m <sup>3</sup>	24 Hours	-	0.36	1.5

**Abbreviations:**  
 µg/m<sup>3</sup>= Micrograms per Cubic Meter  
 mg/m<sup>3</sup>= Milligrams per Cubic Meter  
 LDL= Lowest Detection Limit  
 PEQS= Punjab Environmental Quality Standards  
 \*08 hour standard for CO  
 \*\*01 hour standard for O<sub>3</sub>

Deputy Analyst:  


Reviewed By:  


Approved By:  




# Green Crescent

Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 6649

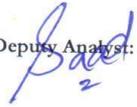
## Meteorological Data

**Disclaimer:** This report is not valid for Court Cases, Environment Protection Orders, Compliance Report for Operational Phase Approvals, or any regulatory action under Punjab Environmental Protection (Smog Prevention and Control) Rules, 2023 etc.

Job Reference Number	GCEC-PK-PU-148/2025
Monitoring Point	Near Chahar Bagh
Date of Intervention	12-May-2025 to 13-May-2025
Monitoring Coordinates	31°37'03.6"N 74°26'12.3"E

Time	Ambient Temperature °C	Wind Direction	Wind Velocity m/s	Humidity %	Pressure (mm of Hg)
14:30	41	WS	4.4	15	762.8
15:30	42	WS	4.3	14	763.5
16:30	42	WS	4.1	13	762.2
17:30	41	W	3.9	12	762.3
18:30	39	SW	3.5	15	764.1
19:30	34	SW	3.2	22	762.4
20:30	35	E	2.9	21	763.2
21:30	32	E	3.0	25	764.5
22:30	31	NE	3.6	28	765.7
23:30	30	NE	3.2	28	765.0
00:30	28	NE	2.9	32	762.8
01:30	27	NE	2.7	32	761.7
02:30	27	E	2.8	32	760.5
03:30	26	SE	2.9	33	762.6
04:30	26	SE	2.3	34	762.6
05:30	25	E	2.4	37	762.3
06:30	28	E	2.5	36	761.6
07:30	30	E	2.4	30	761.4
08:30	33	E	1.8	25	763.6
09:30	35	NE	2.2	22	762.6
10:30	37	NE	2.7	20	764.1
11:30	39	N	2.9	17	762.6
12:30	40	NE	3.1	14	762.6
13:30	42	SE	3.2	12	765.0

Deputy Analyst:



Reviewed By:



Approved By:



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# Green Crescent

Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 6652

## Ambient Air Quality Monitoring

**Disclaimer:** This report is not valid for Court Cases, Environment Protection Orders, Compliance Report for Operational Phase Approvals, or any regulatory action under Punjab Environmental Protection (Smog Prevention and Control) Rules, 2023 etc.

Job Reference Number	GCEC-PK-PU-148/2025
Monitoring Point	Near Grid Station
Date of Intervention	13-May-2025 to 14-May-2025
Monitoring Coordinates	31°35'26.3"N 74°26'11.9"E

Sr. #	Time	CO (mg/m <sup>3</sup> )	NO (µg/m <sup>3</sup> )	NO <sub>2</sub> (µg/m <sup>3</sup> )	NO <sub>x</sub> (µg/m <sup>3</sup> )	SO <sub>2</sub> (µg/m <sup>3</sup> )
1.	15:30	1.88	38.49	63.56	102.05	90.45
2.	16:30	2.57	40.80	85.01	125.81	81.71
3.	17:30	2.16	37.77	69.49	107.26	65.98
4.	18:30	4.81	44.26	71.64	115.91	74.66
5.	19:30	3.47	41.59	63.29	104.89	79.00
6.	20:30	5.27	41.21	71.62	112.84	83.77
7.	21:30	2.01	41.00	75.05	116.05	86.38
8.	22:30	2.63	44.96	72.18	117.14	96.12
9.	23:30	1.74	45.06	67.44	112.50	101.14
10.	00:30	2.31	41.95	76.92	118.87	105.04
11.	01:30	3.29	35.61	73.49	109.10	93.32
12.	02:30	3.22	35.97	73.47	109.44	87.68
13.	03:30	2.71	30.57	83.46	114.03	105.48
14.	04:30	2.54	35.25	87.51	122.75	95.93
15.	05:30	2.48	33.45	76.34	109.79	90.72
16.	06:30	1.87	42.44	80.65	123.10	86.81
17.	07:30	3.47	41.36	86.57	127.93	88.55
18.	08:30	1.39	44.60	60.10	104.70	104.61
19.	09:30	1.36	43.51	82.52	126.03	104.17
20.	10:30	1.71	42.08	80.03	122.11	96.36
21.	11:30	1.62	39.57	73.18	112.75	91.59
22.	12:30	1.68	39.21	79.72	118.93	85.94
23.	13:30	2.63	38.85	82.83	121.68	88.98
24.	14:30	2.90	41.72	80.34	122.07	83.58
<b>Average Concentration</b>		<b>2.57</b>	<b>40.05</b>	<b>75.68</b>	<b>115.74</b>	<b>90.33</b>

Deputy Analyst:

*Saeed*

Reviewed By:

*[Signature]*

Approved By:



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# Green Crescent

Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 6653

## Ambient Air Quality Monitoring

**Disclaimer:** This report is not valid for Court Cases, Environment Protection Orders, Compliance Report for Operational Phase Approvals, or any regulatory action under Punjab Environmental Protection (Smog Prevention and Control) Rules, 2023 etc.

Job Reference Number	GCEC-PK-PU-148/2025
Monitoring Point	Near Grid Station
Date of Intervention	13-May-2025 to 14-May-2025
Monitoring Coordinates	31°35'26.3"N 74°26'11.9"E

Parameter	Unit	Monitoring Duration	LDL	Average Obtained Concentration	PEQS
Nitrogen Dioxide (NO <sub>2</sub> )	µg/m <sup>3</sup>	24 Hours	1.00	75.68	80.0
Nitrogen Oxide (NO)	µg/m <sup>3</sup>	24 Hours	1.00	40.05	40.0
NO <sub>x</sub>	µg/m <sup>3</sup>	24 Hours	1.00	115.74	120.0
Sulphur Dioxide (SO <sub>2</sub> )	µg/m <sup>3</sup>	24 Hours	1.00	90.33	120.0
Carbon Monoxide (CO)	mg/m <sup>3</sup>	24 Hours	0.01	2.57	5.0*
Ozone (O <sub>3</sub> )	µg/m <sup>3</sup>	24 Hours	-	62.83	130.0**
Particulate Matter (PM <sub>2.5</sub> )	µg/m <sup>3</sup>	24 Hours	1.00	481.12	35.0
Particulate Matter (PM <sub>10</sub> )	µg/m <sup>3</sup>	24 Hours	1.00	491.66	150.0
Suspended Particulate Matter (SPM)	µg/m <sup>3</sup>	24 Hours	1.00	1004.78	500.0
Lead Airborne Particles	µg/m <sup>3</sup>	24 Hours	-	0.67	1.5

**Abbreviations:**

µg/m<sup>3</sup>= Micrograms per Cubic Meter

mg/m<sup>3</sup>= Milligrams per Cubic Meter

LDL= Lowest Detection Limit

PEQS= Punjab Environmental Quality Standards

\*08 hour standard for CO

\*\*01 hour standard for O<sub>3</sub>

Deputy Analyst:

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**Green Crescent**  
Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 6654

### Meteorological Data

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Job Reference Number	GCEC-PK-PU-148/2025
Monitoring Point	Near Grid Station
Date of Intervention	13-May-2025 to 14-May-2025
Monitoring Coordinates	31°35'26.3"N 74°26'11.9"E

Time	Ambient Temperature °C	Wind Direction	Wind Velocity m/s	Humidity %	Pressure (mm of Hg)
15:30	43	SE	3.9	10	759.8
16:30	43	NE	3.8	10	760.5
17:30	42	NE	3.6	9	759.2
18:30	41	NE	3.4	11	759.3
19:30	36	NE	3.1	15	761.0
20:30	36	NE	2.9	16	759.4
21:30	36	NE	2.5	16	760.2
22:30	34	SE	2.7	16	761.4
23:30	32	SE	3.2	17	762.7
00:30	30	E	2.9	21	761.9
01:30	29	E	2.6	23	759.8
02:30	28	E	2.4	24	758.6
03:30	28	E	2.5	25	757.5
04:30	27	NE	2.6	26	759.6
05:30	27	NE	2.0	26	759.6
06:30	28	N	2.1	24	759.3
07:30	31	N	2.2	20	758.5
08:30	33	SE	2.1	17	758.3
09:30	35	SE	1.6	15	760.6
10:30	37	SE	1.9	12	759.6
11:30	39	SE	2.4	11	761.0
12:30	40	SE	2.6	10	759.6
13:30	41	SE	2.7	9	759.6
14:30	42	SE	2.8	9	761.9

Deputy Analyst:



Reviewed By:



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**Green Crescent**  
Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 6655

### Noise Level Monitoring Report

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Job Reference Number	GCEC-PK-PU-148/2025
Monitoring Point	Near Grid Station
Date of Intervention	13-May-2025 to 14-May-2025
Monitoring Coordinates	31°35'26.3"N 74°26'11.9"E

Sr. #	Time	Method/Technique	Unit	Results LAavg	PEQS (Commercial)
<b>Night Time</b>					
1.	23:12	Noise Meter	dB	64.6	55.0
2.	00:12	Noise Meter	dB	65.3	
3.	01:12	Noise Meter	dB	64.3	
4.	02:12	Noise Meter	dB	61.9	
5.	03:12	Noise Meter	dB	67.8	
6.	04:12	Noise Meter	dB	69.7	
7.	05:12	Noise Meter	dB	60.2	
8.	06:12	Noise Meter	dB	59.5	
<b>Night Time Average</b>				<b>64.16</b>	<b>55.0</b>
<b>Day Time</b>					
9.	07:12	Noise Meter	dB	72.5	65.0
10.	08:12	Noise Meter	dB	69.9	
11.	09:12	Noise Meter	dB	72.5	
12.	10:12	Noise Meter	dB	73.9	
13.	11:12	Noise Meter	dB	70.3	
14.	12:12	Noise Meter	dB	71.7	
15.	13:12	Noise Meter	dB	70.9	
16.	14:12	Noise Meter	dB	75.2	
17.	15:12	Noise Meter	dB	69.4	
18.	16:12	Noise Meter	dB	70.9	
19.	17:12	Noise Meter	dB	74.5	
20.	18:12	Noise Meter	dB	71.7	
21.	19:12	Noise Meter	dB	60.9	
22.	20:12	Noise Meter	dB	67.7	
23.	21:12	Noise Meter	dB	72.8	
24.	22:12	Noise Meter	dB	63.4	
<b>Day Time Average</b>				<b>70.52</b>	<b>65.0</b>

Deputy Analyst:



Reviewed By:



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**Green Crescent**  
Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 6651

Ambient Air Monitoring Location #02  
**NEAR GRID STATION**  
(Lahore)



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**Green Crescent**  
Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 6652

### Ambient Air Quality Monitoring

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Job Reference Number	GCEC-PK-PU-148/2025
Monitoring Point	Near Grid Station
Date of Intervention	13-May-2025 to 14-May-2025
Monitoring Coordinates	31°35'26.3"N 74°26'11.9"E

Sr. #	Time	CO (mg/m <sup>3</sup> )	NO (µg/m <sup>3</sup> )	NO <sub>2</sub> (µg/m <sup>3</sup> )	NO <sub>x</sub> (µg/m <sup>3</sup> )	SO <sub>2</sub> (µg/m <sup>3</sup> )
1.	15:30	1.88	38.49	63.56	102.05	90.45
2.	16:30	2.57	40.80	85.01	125.81	81.71
3.	17:30	2.16	37.77	69.49	107.26	65.98
4.	18:30	4.81	44.26	71.64	115.91	74.66
5.	19:30	3.47	41.59	63.29	104.89	79.00
6.	20:30	5.27	41.21	71.62	112.84	83.77
7.	21:30	2.01	41.00	75.05	116.05	86.38
8.	22:30	2.63	44.96	72.18	117.14	96.12
9.	23:30	1.74	45.06	67.44	112.50	101.14
10.	00:30	2.31	41.95	76.92	118.87	105.04
11.	01:30	3.29	35.61	73.49	109.10	93.32
12.	02:30	3.22	35.97	73.47	109.44	87.68
13.	03:30	2.71	30.57	83.46	114.03	105.48
14.	04:30	2.54	35.25	87.51	122.75	95.93
15.	05:30	2.48	33.45	76.34	109.79	90.72
16.	06:30	1.87	42.44	80.65	123.10	86.81
17.	07:30	3.47	41.36	86.57	127.93	88.55
18.	08:30	1.39	44.60	60.10	104.70	104.61
19.	09:30	1.36	43.51	82.52	126.03	104.17
20.	10:30	1.71	42.08	80.03	122.11	96.36
21.	11:30	1.62	39.57	73.18	112.75	91.59
22.	12:30	1.68	39.21	79.72	118.93	85.94
23.	13:30	2.63	38.85	82.83	121.68	88.98
24.	14:30	2.90	41.72	80.34	122.07	83.58
<b>Average Concentration</b>		<b>2.57</b>	<b>40.05</b>	<b>75.68</b>	<b>115.74</b>	<b>90.33</b>

Deputy Analyst:

Reviewed By:

Approved By:



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**Green Crescent**  
Environmental Consultants Pvt. Ltd.

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### Ambient Air Quality Monitoring

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Job Reference Number	GCEC-PK-PU-148/2025
Monitoring Point	Near Grid Station
Date of Intervention	13-May-2025 to 14-May-2025
Monitoring Coordinates	31°35'26.3"N 74°26'11.9"E

Parameter	Unit	Monitoring Duration	LDL	Average Obtained Concentration	PEQS
Nitrogen Dioxide (NO <sub>2</sub> )	µg/m <sup>3</sup>	24 Hours	1.00	75.68	80.0
Nitrogen Oxide (NO)	µg/m <sup>3</sup>	24 Hours	1.00	40.05	40.0
NO <sub>x</sub>	µg/m <sup>3</sup>	24 Hours	1.00	115.74	120.0
Sulphur Dioxide (SO <sub>2</sub> )	µg/m <sup>3</sup>	24 Hours	1.00	90.33	120.0
Carbon Monoxide (CO)	mg/m <sup>3</sup>	24 Hours	0.01	2.57	5.0*
Ozone (O <sub>3</sub> )	µg/m <sup>3</sup>	24 Hours	-	62.83	130.0**
Particulate Matter (PM <sub>2.5</sub> )	µg/m <sup>3</sup>	24 Hours	1.00	481.12	35.0
Particulate Matter (PM <sub>10</sub> )	µg/m <sup>3</sup>	24 Hours	1.00	491.66	150.0
Suspended Particulate Matter (SPM)	µg/m <sup>3</sup>	24 Hours	1.00	1004.78	500.0
Lead Airborne Particles	µg/m <sup>3</sup>	24 Hours	-	0.67	1.5

Abbreviations:  
 µg/m<sup>3</sup>= Micrograms per Cubic Meter  
 mg/m<sup>3</sup>= Milligrams per Cubic Meter  
 LDL= Lowest Detection Limit  
 PEQS= Punjab Environmental Quality Standards  
 \*08 hour standard for CO  
 \*\*01 hour standard for O<sub>3</sub>

Deputy Analyst:

Reviewed By:

Approved By:

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**Green Crescent**  
Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 6654

### Meteorological Data

*Disclaimer: This report is not valid for Court Cases, Environment Protection Orders, Compliance Report for Operational Phase Approval, or any regulatory action under Punjab Environmental Protection (Smog Prevention and Control) Rules, 2023 etc.*

Job Reference Number	GCEC-PK-PU-148/2025
Monitoring Point	Near Grid Station
Date of Intervention	13-May-2025 to 14-May-2025
Monitoring Coordinates	31°35'26.3"N 74°26'11.9"E

Time	Ambient Temperature °C	Wind Direction	Wind Velocity m/s	Humidity %	Pressure (mm of Hg)
15:30	43	SE	3.9	10	759.8
16:30	43	NE	3.8	10	760.5
17:30	42	NE	3.6	9	759.2
18:30	41	NE	3.4	11	759.3
19:30	36	NE	3.1	15	761.0
20:30	36	NE	2.9	16	759.4
21:30	36	NE	2.5	16	760.2
22:30	34	SE	2.7	16	761.4
23:30	32	SE	3.2	17	762.7
00:30	30	E	2.9	21	761.9
01:30	29	E	2.6	23	759.8
02:30	28	E	2.4	24	758.6
03:30	28	E	2.5	25	757.5
04:30	27	NE	2.6	26	759.6
05:30	27	NE	2.0	26	759.6
06:30	28	N	2.1	24	759.3
07:30	31	N	2.2	20	758.5
08:30	33	SE	2.1	17	758.3
09:30	35	SE	1.6	15	760.6
10:30	37	SE	1.9	12	759.6
11:30	39	SE	2.4	11	761.0
12:30	40	SE	2.6	10	759.6
13:30	41	SE	2.7	9	759.6
14:30	42	SE	2.8	9	761.9

Deputy Analyst:

Reviewed By:

Approved By:



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**Green Crescent**  
Environmental Consultants Pvt. Ltd.

Sr. No# 25A/ 6655

### Noise Level Monitoring Report

*Disclaimer: This report is not valid for Court Cases, Environment Protection Orders, Compliance Report for Operational Phase Approval, or any regulatory action under Punjab Environmental Protection (Soag Prevention and Control) Rules, 2023 etc.*

Job Reference Number	GCEC-PK-PU-148/2025
Monitoring Point	Near Grid Station
Date of Intervention	13-May-2025 to 14-May-2025
Monitoring Coordinates	31°35'26.3"N 74°26'11.9"E

Sr. #	Time	Method/Technique	Unit	Results LAavg	PEQS (Commercial)
<b>Night Time</b>					
1.	23:12	Noise Meter	dB	64.6	55.0
2.	00:12	Noise Meter	dB	65.3	
3.	01:12	Noise Meter	dB	64.3	
4.	02:12	Noise Meter	dB	61.9	
5.	03:12	Noise Meter	dB	67.8	
6.	04:12	Noise Meter	dB	69.7	
7.	05:12	Noise Meter	dB	60.2	
8.	06:12	Noise Meter	dB	59.5	
<b>Night Time Average</b>				<b>64.16</b>	<b>55.0</b>
<b>Day Time</b>					
9.	07:12	Noise Meter	dB	72.5	65.0
10.	08:12	Noise Meter	dB	69.9	
11.	09:12	Noise Meter	dB	72.5	
12.	10:12	Noise Meter	dB	73.9	
13.	11:12	Noise Meter	dB	70.3	
14.	12:12	Noise Meter	dB	71.7	
15.	13:12	Noise Meter	dB	70.9	
16.	14:12	Noise Meter	dB	75.2	
17.	15:12	Noise Meter	dB	69.4	
18.	16:12	Noise Meter	dB	70.9	
19.	17:12	Noise Meter	dB	74.5	
20.	18:12	Noise Meter	dB	71.7	
21.	19:12	Noise Meter	dB	60.9	
22.	20:12	Noise Meter	dB	67.7	
23.	21:12	Noise Meter	dB	72.8	
24.	22:12	Noise Meter	dB	63.4	
<b>Day Time Average</b>				<b>70.52</b>	<b>65.0</b>

Deputy Analyst:  
*Saad*

Reviewed By:  
*[Signature]*

Approved By:  
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## ANNEX-4 EPA Validation form for Environmental Monitoring



**ENVIRONMENTAL PROTECTION AGENCY  
GOVERNMENT OF THE PUNJAB  
National Hockey Stadium, Gate No. 08  
Gaddafi Stadium Complex, Lahore**

**EPA**  
Environmental Protection Agency

~~Validation~~ : 4827 / Validation : 4827<sup>ⓑ</sup>  
Dated : 03-06-25

### Validation for Sampling of Wastewater & Drinking Water / Ground water

(Read conditions of certificate along with Regulation 9(1)(d) of CELR, 2000 )

Nature Of Sample		Waste water		Drinking Water / Ground water				
Description of Sample source /Site		Wastewater		Drinking Water				
Name and category of Project /Unit		Chahar Bagh Grid Station, Lahore						
Standard Method used for Sampling		APHA - 1060 B & L						
Field Tested Parameters ,		Field Tested parameter		Lab Tested Parameters (Not validated)				
Waste Water Treatment facility		Primary		Secondary Tertiary				
Total WW collected Sample <u>01</u>		Total Collected Drinking water samples <u>01</u>						
Sample Tag for testing parameter is assigned on sample container		Yes <input checked="" type="checkbox"/>		NO <input type="checkbox"/> NA <input type="checkbox"/>				
Sample is preserved properly for each testing parameter		Yes <input checked="" type="checkbox"/>		NO <input type="checkbox"/> NA <input type="checkbox"/>				
Sample size is adequate for testing the target parameters		Yes <input checked="" type="checkbox"/>		NO <input type="checkbox"/> NA <input type="checkbox"/>				
Wastewater Flow Measurement performed to ensure sample representativeness		Yes <input type="checkbox"/>		NO <input checked="" type="checkbox"/> NA <input type="checkbox"/>				
No. of Waste Water outlets	Waste Water Flow m <sup>3</sup> /hr from each outlet (Optional)	Water intake m <sup>3</sup> /hr(Optional)	Water Mass balance (Optional)	Sample Type				
				Yes <input type="checkbox"/>	No <input type="checkbox"/> Grab <input checked="" type="checkbox"/> Composite <input type="checkbox"/>			
Parameter	Matrix		Container	Sample Size	Preservation	Yes <input type="checkbox"/> NO <input type="checkbox"/> NA <input type="checkbox"/>		
	W	WW				Yes	NO	NA
Coliform, Total or Fecal	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Sterile Container	100mL	Refrigerate 6C	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coliform, Total or Fecal, Chlorinated Water	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Sterile Container	100mL	0.008% Thiosulphate & cooled 6C	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Color, Turbidity	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	P, G	500mL	Cool 6C	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hardness, Total	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	P, G	500ml	HNO <sub>3</sub> to pH < 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nitrogen, Nitrate + Nitrite, Phenolic Compounds, Oil & Grease, COD, NH <sub>3</sub>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	P, G	2000 mL	H <sub>2</sub> SO <sub>4</sub> to pH < 2, Cool 6C	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Metals, General	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	P, G Rinsed 1.1 HNO <sub>3</sub>	500mL	HNO <sub>3</sub> to pH < 2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cyanide, Total	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	P, G	500mL	NaOH to pH > 12, Cool 6C	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pesticides, General	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Glass	1 Liter	Cool 6C	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Field Parameters								
Field parameter			pH meter, Model Make	Measurement Method	Calibrated in Field	Measured value		
pH			Lowland	APHA-4500p	Yes <input checked="" type="checkbox"/> NO <input type="checkbox"/>			
Temp			Digital Thermometer					
Cl								

**Remarks / Caution:** (1) The Validation is quality control check under Regulation 9(1)(d) for sampling & monitoring. (2) The Sampling / monitoring performed under Regulation 3(a) by Technical & Scientific Staff of private Laboratory as allowed through Conditions of Certificate (3) The Scope of quality check of validation does not cover quality check of results declared with Report (4) The validated sampling / monitoring of the tests report is for non punitive actions such as baseline study EIA/IEE, Self monitoring, reporting under conditions of EIA/IEE, etc. (5) The tests Report cannot be used as evidence against any non compliance SMR /report issued by EPA official Laboratory (6) The EPA officer as well as certified Laboratory should also comply directions issued vide letter No. 01-DD(Labs)/EPA dated 25.07.2022 while considering test report.

*(Signature)*  
Research Officer  
Environmental Protection Agency  
Punjab Lahore

Dated  
14-05-25





**ENVIRONMENTAL PROTECTION AGENCY**  
**GOVERNMENT OF THE PUNJAB**  
 National Hockey Stadium, Gate No. 08  
 Gaddafi Stadium Complex, Lahore



Validation = 4827 (A)  
 Date = 03-06-2027

**Validation for Monitoring / Sampling of Stack Emission, Noise, Ambient air, Vehicular emissions**  
 (Read conditions of certificate along with Regulation 9(1)(d) of CELR, 2000)

Cautions Related to scope, use & legal foundation of Validation				
1. The Validation is quality control check under Regulation 9(1)(d) for sampling & monitoring.				
2. The Sampling / monitoring performed under Regulation 3(a) by Technical & Scientific Staff of private Laboratory as allowed through Conditions of Certificate.				
3. The Scope of quality check of validation does not cover quality check of results declared with Report.				
4. "The validated sampling / monitoring of the tests report is for non punitive actions such as baseline study EIA/IEE, Self monitoring, reporting under conditions of EIA/IEE, etc. while the report is not valid for Court cases, EPO, compliance reporting for operational Phase approvals, punitive actions such as Smog prevention & control Rules, 2023, complaint cases, etc". The same shall be exhibit at top of Report during its issuance under Regulation 12.				
5. The tests Report cannot be used as evidence against any non compliance SMR /report issued by EPA official Laboratory.				
6. The EPA officer as well as certified Laboratory should also comply directions issued by authority wide letter No. 01-DD(Labs)/EPA dated 25.07.2022 while considering test report.				
Nature Of Sample	Stack Emissions	Ambient Air	Vehicular Emission	Ambient Noise
Description of monitored source / Site	Near Farmhouse, Near Grid Station			
Name and category of Unit	Chahar Bagh Grid Station, Lahore			
Standard Method	USEPA standards			
Equipment, Model,	Horiba - 370 (AGMS)			
Field Tested Parameters,	CO, NO, NO <sub>2</sub> , NO <sub>x</sub> , SO <sub>2</sub>	Lab Tested Parameters (Not Validated)	Declared Results	
<b>Industrial Gaseous Emissions</b>				
Values of tested Field Parameters: CO .....mg/nM3, NO <sub>x</sub> .....mg/nM3, excess air (%age):				
(i) 5 min Ramp-Up phase (ii) flow rate & EC Temp. measured during calibration & testing (iii) Data recorded with 15 min interval (iv) complied all QA/QC checks	Yes	NO	NA	
<b>Stack Particulate Matter (PM) Monitoring / Sampling under USEPA Method 5 / 17</b>				
(i) Sample train is complete (ii) Leak Test Performed (iii) data sheet filled (iv) "K" & "Y" calculated (v) QA/QC complied (vi) suitability of filter ensured	Yes	No	NA	
<b>Stack SO<sub>x</sub> sampling as per Method 8 (Thorin Indicator Method)</b>				
(i) Absorbent solution available (ii) Flow rate as per method (iii) sampling as per Method	Yes	No	NA	
<b>Ambient Air Quality Monitoring by Automatic Monitors for CO, O<sub>3</sub>, SO<sub>2</sub>, NO<sub>x</sub>, PM2.5 &amp; PM10</b>				
Zero/span check is performed (ii) CE of NO <sub>x</sub> 96% - 104.1%, Compliance of Critical Criteria (iii) Compliance of operational Criteria (iv) Comply PEQS measuring technique	Yes	No	NA	
<b>Ambient Air Sampling of SPM, PM10, Pb by High Volume Sampler</b>				
(i) The flow rate of sampler 1.1m <sup>3</sup> /min, (ii) Calibration performed	Yes	No	NA	
<b>Vehicular Emissions &amp; Noise Measurement</b>				
Vehicle emissions and noise measurement performed as per method	Yes	No	NA	

Remarks:-

*[Signature]*  
 Research Officer  
 Environment Protection Agency  
 Punjab Lahore

Dated  
 12-05-2025  
 14-05-2025



## ANNEX-5 PPE Cost for Health and Safety Compliance

A. Basic PPE				
Item	Unit Cost (PKR)	Qty	Subtotal (PKR)	Standard
Safety Helmet	2000	150	300,000.00	EN 397 / ANSI Z89.1
High-Visibility Safety Vest	600	150	90,000.00	EN ISO 20471
Protective Gloves	500	500	250,000.00	EN 388
Safety Shoes (steel toe)	3500	100	350,000.00	EN ISO 20345 / ASTM F2413
Dust Mask (N95 / FFP2)	300	2000	600,000.00	NIOSH N95 / EN 149 FFP2
Safety Goggles	600	100	60,000.00	EN 166
Ear Protection (plugs/muffs)	300	150	45,000.00	EN 352
First Aid Box	3000	5	15,000.00	One First Aid Box is proposed for 10 labourers and for 50 labourers 5 first aid boxes are estimated.
<b>B. Optional PPE (If Required)</b>				
Full Body Harness	5000	15	75,000.00	EN 361
Welding Face Shield	1500	15	22,500.00	EN 166 + EN 170
Total			<b>1,807,500.00</b>	

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## **ANNEX-6 EMP- Associated Plans**

### **EMP-Sub-Plan 1. Worker Accommodation Plan**

Worker Accommodation Plan (WAP) for the Project covers guidelines, the standards and practices to be used in the design and management of workers' accommodation by RUDA, its contractors, and subcontractors. The WAP shall largely be implemented by the Construction Contractor. The scope and applicability of the WAP are limited to the design and management of the worker accommodations provided during the construction phase of the Project. RUDA and its contractors will ensure sufficient resources are allocated on an ongoing basis to achieve the effective implementation of the worker accommodation plan.

#### **Accommodation Planning and Arrangement**

Worker Accommodation Plan (WAP) for the Project covers guidelines, standards and practices to be used in the design and management of workers' accommodation by RUDA, its contractors and subcontractors. The WAP shall largely be implemented by the CC. The scope and applicability of the WAP are limited to the design and management of the worker accommodations provided during the construction phase of the Project. RUDA and its contractors will ensure sufficient resources are allocated on an on-going basis to achieve the effective implementation of the worker accommodation plan.

Worker accommodations will be located within the Project site and will be provided during the construction phase of the Project. The worker accommodations will be located in areas where it shall not interfere with the construction activities.

A worker accommodation plan (WAP) will be prepared by the contractor as part of SSEMP. An emergency response plan and fire management plan will also be prepared by the contractor as part of site specific EMP.

## **EMP-Sub-Plan 2. Waste Management Plan**

This section provides the waste disposal plan that will be employed during the construction and operations of the proposed Project. The main types of waste that will be generated are non-hazardous and hazardous.

The solid and liquid waste to be generated from the project activities and camps is to be disposed of as per prescribed measures.

### **A. Non-hazardous Waste Management Plan**

#### **Construction Phase**

A Waste and Hazardous Waste Management Plan will be integrated into Construction Management Plan for the construction period. The Construction Contractor is responsible for preparing a Waste and Hazardous Waste Management Plan for the construction phase of the Project.

- Reuse opportunities for waste generated from the Project will be actively investigated. Used oil and other waste will be identified, and if any, it will be stored in a separate designated and contained facility.
- As a standard practice, all metal parts (such as iron and copper) or wooden components generated as waste during the construction of the Project will be recycled or stored in a dedicated existing scrap yard for auction.
- Even after the implementation of the control measures, it is possible that some littering may take place. Periodic monitoring and cleanup will be undertaken to minimize the residual impact.

#### **Operational Phase**

There will be not much waste generated during the operational phase of the project other than during maintenance activities at the substation and most of which will be considered hazardous waste.

- Solid waste materials will be regularly collected from the site, sorted, and stored in demarcated spaces. The waste will be disposed of in a government-approved landfill.

### **B. Hazardous Wastes Management Plan**

The oils, lubricants, and coolant used in the substation are all considered hazardous waste and must be disposed of appropriately.

### **C. Management and Mitigation Measures:**

Storage and handling of hazardous materials will be in accordance with international standards and appropriate to their hazard characteristics. Storage and liquid impoundment areas for fuels and hazardous process chemicals will be designed with secondary containment to prevent spills

and contamination of soil and groundwater. The secondary containment will be impervious with a capacity of at least 110% of the largest single container.

- Labels will be placed on all storage vessels in accordance with national and international standards. The labeling will clearly identify the stored materials.
- Supporting information such as Material Safety Data Sheet (MSDS) will be available for all hazardous materials.
- A Hazardous Materials Register will be in place that covers:
  - Hazardous Material name
  - HAZCHEM/United Nations Code
  - Material Safety Data Sheet (MSDS)
  - Summary of maximum inventory
  - Storage requirements and precautions
  - Location, physical properties of the materials where they are used
  - Approved disposal methods

#### **D. Management Level Mitigation Measures**

In addition to the above-mentioned assessment and project design measures to minimize the waste, and handling options, the following general management-level mitigation measures will be taken:

- On-site handling
- Recyclable material will be separated at the source. Separate bins will be placed at each site for the different types of materials—plastic, paper, metal, glass, wood, and cotton etc. The recyclable waste will be delivered to approved waste contractors.
- All hazardous waste will be separated from other wastes.
- Hazardous waste that cannot be disposed of through acceptable means will be stored in an on-site storage facility until an off-site hazardous waste disposal facility is available.

#### **E. Audits**

- On-site audits of waste management will be undertaken regularly.
- Audits of the waste disposal contractors and waste disposal facilities will be undertaken regularly to check that procedures are being followed.

#### **F. Records**

Records of all waste generated will be maintained. Quantities of waste disposed of, recycled, or reused will be logged on a Waste Tracking Register.

#### **G. Disposal**

- All non-hazardous waste material that cannot be recycled or reused will be transferred to approved landfill sites in Karachi.

- 
- Depending on the nature and quantity of the hazardous waste, it will either be disposed of by licensed hazardous waste contractors or will be incinerated at an incineration facility equipped to handle hazardous waste.
  - The possibility of returning the packaging to the manufacturers for reuse will be explored.
  - Recyclable waste will be disposed of via approved waste contractors.
  - Chemical containers (including partially full containers) will be returned to vendors.
  - Other management measures
  - An emergency response plan will be developed for hazardous waste (and substances).
  - Training will be provided to personnel for identification, segregation, and management of waste.
  - All containers of hazardous waste will be appropriately labeled.
  - Equipment and material containing asbestos, poly-chlorinated biphenyls (PCBs), and ozone-depleting substances (ODSs) will not be used during Project operations.
  - The equipment used at substation and transmission lines does not contain any Persistent Organic Pollutants (POPs) such as polychlorinated biphenyls (PCB). The use of such chemicals has been discontinued in the early 1990s.

### EMP-Sub-Plan 3. Plantation Plan

As part of the environmental enhancement measures for the proposed 132kV GS, a structured plantation program will be implemented within the project area. The roadside corridors and available open spaces in Chahar Bagh and will be utilized for greenbelt development and landscaping. A total of 500 mature plants, including trees, shrubs, and flowering species, will be planted. These plants will have an average height of 4 to 5 feet and a stem diameter of 1.0 to 1.5 inches to ensure healthy establishment and early growth. Indigenous and pollution-tolerant species will be selected to enhance the local environment, improve air quality, and contribute to the overall ecological sustainability of the project area. However, the cost of plantation and its maintenance will not be included in the contractor's scope of work, it will be covered under RUDA Chahar Bagh's own maintenance budget.

The plantation of recommended indigenous species will be carried out at a distance of 8 feet having a distance of 8-10 feet between rows (in case of multiple rows). The plantation plan consists of trees, shrubs, and flowering plants which are recommended for plantation.

#### A. Trees (20 ft. and above)

The trees comprising shady, flowering, fruit trees have been recommended for plantation.

##### Recommended Trees

Sr #	Botanical Name	Description
1	Pongamia glabra	Large flowering tree valued for timber and drought tolerance.
2	Alstonia scholaris	Evergreen tropical tree with air-purifying qualities.
3	Pilkan	Medicinal plant suited for arid/semi-arid zones; low nutritional value.
4	Bauhinia variegata	Ornamental flowering tree known for its aesthetic value.
5	Ficus religiosa	Shade-giving tree with cultural and ecological significance.
6	Syzygium cumini	Fruiting tree that thrives in semi-arid conditions.
7	Dalbergia sissoo	Fast-growing, large shade tree with timber value.
8	Melia azedarach	Broad-canopy tree, ideal for roadside and urban plantations.

#### B. Shrubs (under 20 ft.)

The evergreen, flowering and ornamental shrubs having a variety of colours have been recommended for gardens and landscaping at the substation.

Table 0-1 Recommended Shrubs

Sr #	Botanical Name	Description
1	Nerium oleander	Hardy ornamental shrub with pink/white flowers; tolerant to dry conditions.
2	Hibiscus rosa-sinensis	Flowering shrub providing aesthetic value and butterfly habitat.
3	Callistemon citrinus	Also known as bottlebrush; drought-tolerant with bright red flowers.

### C. Flowering Plants

The flowering plants having positive psychological effects have been recommended at the substation.

Recommended Flowering Plants

Sr #	Botanical Name	Description
1	Tecoma stans	Bright yellow flowering plant; fast-growing and hardy.
2	Tagetes erecta	Common marigold; useful for borders and pest control in plantations.
3	Petunia spp.	Seasonal flowering plant ideal for visual enhancement in public spaces.

## **EMP-Sub-Plan 4. Occupational Health and Safety (OHS) Plan**

### **A. Introduction**

The Occupational Health and Safety (OHS) Plan aims to prevent accidents, injuries, and occupational illnesses during the construction of the 132 kV Grid Station at Chahar Bagh, Lahore. This plan outlines site-specific procedures and controls to ensure a safe and healthy working environment for all personnel involved in the project, in accordance with the World Bank Environmental and Social Standards (ESS 2), Pakistan Labor Laws, and ILO core conventions.

### **B. Objectives**

- To ensure zero fatalities and reduce lost-time injuries.
- To establish a proactive safety culture.
- To identify and mitigate worksite hazards.
- To define responsibilities and emergency response procedures.

### **C. Applicable Regulations and Standards**

- a. Pakistan Factories Act, 1934 (amended)
- b. Pakistan Labor Code
- c. World Bank ESS 2 & ESS 4
- d. IFC EHS Guidelines (Power Transmission and Distribution)
- e. ISO 45001:2018 (where applicable)

### **D. Key Health and Safety Risks**

- a. Electrical hazards (live wires, grounding failures)
- b. Falls from height (scaffolding, poles, gantries)
- c. Heavy machinery movement (cranes, trucks, concrete mixers)
- d. Confined space work (transformer pits)
- e. Exposure to dust, noise, fumes
- f. Manual handling injuries
- g. Fire and explosion risks

### **E. OHS Management Procedures**

#### **a. Site Induction and Training**

- All workers will undergo OHS induction before starting work.
- Toolbox talks conducted daily.
- Specific training for crane operators, electricians, welders, and confined-space workers.

#### **b. Personal Protective Equipment (PPE)**

Mandatory PPE includes:

- Helmets, safety shoes, reflective vests
- Safety goggles, earplugs, gloves

- Fall protection harnesses for height work
- Welding shields, face masks (dust/fume)

**c. Worksite Safety Measures**

- Barricading of hazardous zones (e.g., transformer areas, open trenches)
- Display of warning signs and safety instructions
- Safe scaffolding and ladder use procedures
- Regular site inspection and safety audits

**d. Electrical Safety**

- Lock-out/tag-out (LOTO) systems
- Grounding and insulation checks
- Use of rubber mats, insulated tools

**e. Machinery and Vehicle Safety**

- Pre-operation checks and regular maintenance
- Use of trained operators only
- Designated movement paths for vehicles
- Speed limits within site area

**f. Emergency Response Plan**

- On-site first aid kits and trained first aiders
- Emergency contact list displayed at site
- Nearest hospital: [Insert name and location]
- Fire extinguishers placed at key locations
- Emergency evacuation drill every 3 months

**g. Incident Reporting and Investigation**

- All incidents, near-misses, and injuries will be recorded
- Root cause analysis and corrective action report prepared
- Monthly OHS reports submitted to project management and relevant authorities

**h. Monitoring and Compliance**

- OHS Officer will conduct daily inspections
- Third-party HSE audits (as per EMP)
- Non-compliance to result in penalties or suspension from site
- Workers can report unsafe practices anonymously

**i. Roles and Responsibilities**

Role	Responsibilities
Project Manager	Ensure implementation and resource allocation

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<b>Site Engineer</b>	Monitor daily compliance
<b>OHS Officer</b>	Conduct trainings, inspections, audits
<b>Contractor</b>	Provide PPE and enforce discipline
<b>Workers</b>	Follow safety instructions and report hazards

## **EMP-Sub-Plan 5. Emergency Response Plan (ERP)**

### **A. Introduction**

This Emergency Response Plan (ERP) provides a comprehensive framework to manage potential emergencies that may occur during the construction phase of the 132 kV Grid Station at Chahar Bagh, Lahore. It aims to ensure the safety and security of workers, contractors, visitors, and nearby communities, while minimizing damage to property and the environment. The plan is aligned with national laws and international standards, including the World Bank Environmental and Social Framework (ESF) and Occupational Health and Safety (OHS) Guidelines.

### **B. Objectives**

- To establish clear procedures for dealing with workplace emergencies.
- To minimize response time and ensure quick medical, fire, and environmental control interventions.
- To protect human life, project assets, and the natural environment.
- To assign responsibilities and define emergency roles and communication flow.
- To ensure compliance with applicable laws, including the Factories Act, 1934, and IFC EHS Guidelines.

### **C. Types of Potential Emergencies**

The following types of emergencies are foreseen during the project:

#### **a. Safety-Related Incidents**

- Fire and explosion (fuel storage, electrical faults)
- Electrical shocks and arc flashes
- Falls from height (during tower erection or gantry installation)
- Machinery-related accidents (e.g., crane, concrete mixer)
- Collapse of scaffolding or temporary structures

#### **b. Health-Related Incidents**

- Heat exhaustion or stroke (due to outdoor labor)
- Serious injuries (cuts, fractures, burns)
- Infectious diseases outbreaks (e.g., COVID-19, Hepatitis)

#### **c. Environmental Emergencies**

- Fuel, oil, or chemical spills
- Hazardous material leakage
- Dust and air quality exceedances
- Noise complaints from neighboring areas

#### **d. Natural Disasters**

- Earthquakes
- Urban flooding (especially during monsoon)
- Lightning strikes during outdoor work

## D. Emergency Preparedness

### a. Emergency Equipment On-Site

- Fire extinguishers (ABC type) placed at all key locations
- Sand buckets and spill containment kits
- First aid kits in control room, rest area, and mobile teams
- Battery-operated emergency lighting
- Emergency sirens or alarms

### b. Medical Facilities

- Nearest government hospital: [Insert Name, Address, Contact]
- Private clinic/ambulance backup: [Insert if contracted]
- Trained First Aiders: Available on each shift
- Evacuation transport: Contractor to maintain one standby vehicle

### c. Emergency Assembly Points

Designated open spaces within the project site will serve as assembly points, marked with signs and included in the site layout plan.

## E. Roles and Responsibilities

Designation	Responsibilities
Project Manager	Authorizes ERP activation, communicates with external agencies
OHS/HSE Officer	Coordinates emergency response, ensures training and drills
First Aiders	Provide first response medical aid, maintain kits
Site Supervisors	Facilitate evacuation, headcounts, hazard isolation
Security Team	Secure the area, control entry and prevent chaos
Workers	Follow safety protocols and evacuation routes

## F. Emergency Response Procedures

### a. Fire Emergency

- Activate fire alarm and evacuate nearby areas.
- Use extinguisher only if fire is small and safe to control.
- Contact Rescue 1122 and inform Project Manager.
- Evacuate to assembly point. Conduct headcount.
- Record incident and preserve evidence for investigation.

### b. Medical Emergency

- Notify HSE Officer and apply basic first aid.

- Do not move victim unnecessarily in case of fractures.
  - Call ambulance immediately if required.
  - Inform hospital in advance for trauma cases.
  - Maintain log of time, cause, and action taken.
- c. Fuel or Chemical Spill**
- Immediately stop source if safe to do so.
  - Block drains or access to water bodies.
  - Use spill kits (absorbent pads, booms).
  - Inform EPA Punjab if spill exceeds threshold limits.
  - Collect contaminated material for disposal as hazardous waste.
- d. Natural Disasters**
- Evacuate workers to the safest open zone.
  - Stop all machinery and disconnect power sources.
  - Maintain contact with local authorities for updates.
  - Resume work only after risk is officially cleared.
- G. Communication Flow**
- Worker reports incident →
  - Supervisor informs HSE Officer →
  - HSE Officer activates ERP, informs Project Manager →
  - Project Manager contacts external services (ambulance/fire dept) →
  - Logbook updated and report submitted to regulatory authorities.
- H. Emergency Drills**
- Mock drills for fire, evacuation, and spill response will be conducted quarterly.
  - Drill records (type, date, duration, performance gaps) will be documented.
  - Feedback used to revise ERP if necessary.
- I. Training**
- ERP induction training for all new workers
  - Refresher every 6 months
  - Posters, pictograms, and flowcharts displayed in Urdu and English
- J. Post-Emergency Recovery**
- Inspection and assessment of damage
  - Counseling support (in case of fatality or trauma)
  - Repair/replacement of affected equipment
  - Incident report submission within 24 hours
- K. Record Keeping**
- Emergency Drill Logs
  - Incident Reports
  - First Aid Usage Register
  - Visitor Incident Reports

- ERP Update History

#### **L. Annexures**

The contractor will provide the following annexures.

- Annex I: Emergency Contact List (Local Hospitals, Fire Services, Police)
- Annex II: Site Evacuation Map with Assembly Points
- Annex III: Emergency Reporting Forms
- Annex IV: Fire Extinguisher and First Aid Box Locations
- Annex V: Drill Record Sheet

## **EMP-Sub-Plan 6. Spoil Management Plan**

Spoil is defined as 'rock' or 'other than rock' resulting from construction excavation. This Plan addresses and details the following issues:

- Excavation, handling, haulage, disposal and reuse methodology, including on-site storage and stockpiling arrangements.
- Processes and procedures that will be used for the management of spoil.
- Measures that will be implemented to both reduce spoil quantities and maximize the beneficial reuse of spoil that will be generated during the performance of the works.
- Nominated quantities for reuse of spoil within the construction site, for beneficial reuse of spoil off-site and for spoil disposal.
- Processes and procedures for the management of the environmental and social impacts of spoil transfer and reuse.
- The Spoil Management Plan (SMP) will be updated for each specific construction work prior to the commencement of any excavation works and other works that may generate spoil. The updated SMP will incorporate detailed information on the handling of spoil generated during construction. It should be consistent with the Traffic Management Plan to allow for ready access to spoil and spoil disposal areas and to avoid disturbance to the non-Project related traffic.

### **A. Spoil Production**

- Spoil will be produced from construction activities during the construction of grid stations and towers.

### **Mitigation Hierarchy**

Where feasible and reasonable, spoil should be managed according to the following hierarchy:

- Minimization of spoil generation through design and management
- Reuse of spoil within the Project
- Beneficial reuse of spoil outside the Project for environmental and community works
- Beneficial reuse of spoil outside the Project for site leveling, development or rehabilitation
- Disposal of spoil outside the Project for non-beneficial uses (landfilling)
- On-site Management
- On-site management includes management of stockpiling sites, spoil transport, spoil tracking and spoil testing for re-use.

### **B. Stockpiles**

- On-site management of spoil material stockpiling sites involves planning for stockpiling including selection of stockpiling sites, their accessibility to the road network, management of stockpiles to minimize wind and water erosion, management of

stockpiles to minimize dust from exposed surfaces and management of noise and dust during loading and unloading.

- The stockpile sites need to:
- Have ready access to the road network
- Be located on leveled land where possible
- Not affect land use of adjacent properties
- Be located in areas so that the erosion control measures can be implemented
- Be located in areas so that flooding does not result in runoff
- Be located in areas such that they do not result in the disturbance of species of conservation importance
- Be positioned in areas where there are minimal visual, noise and vibration impacts anticipated on nearby residents
- Be located within the Project approved boundary
- Be located in areas such that they do not affect cultural heritage
- Ensure land care and avoid loss of habitat and spread of invasive plant species
- Avoid flooding of trees and waterlogging of soils
- Have contaminated materials stockpiled separately
- Have erosion and sedimentation controls in place
- Be subjected to regular inspection
- Stockpile must be located no less than 250 meters from the nearest residence
- Any long-term stored topsoil stockpiles are to be protected from water and wind erosion by stabilizing with hydro-seed or by covering with a geo-textile fabric until required.

### **C. Spoil Transport**

The following need to be considered for spoil transport:

- Spoil transport/haulage routes should be identified, assessed and if necessary, upgraded
- Haulage routes should be assessed and if necessary, upgraded
- The routes should be selected to minimize impacts on sensitive receptors including people, ecology and the landscape
- Transport should be undertaken with minimization of noise and dust

### **D. Spoil Tracking**

A spoil tracking system should be developed which should include fields such as:

- Date
- Docket Number
- Haulage Company (if other than EPC Contractor)
- Material Classification
- Quantity in Tonnes to be Transported

- Truck Identification Number
- Location of Spoil Generation Site
- Location of Spoil Receiving Site

#### **E. Spoil Testing**

It is necessary to determine if the waste material is hazardous or non-hazardous and whether or not it requires any special treatment before disposal or re-use. Spoil testing before re-use is important to answer questions such as the following:

- Are manufactured chemicals or process residues present?
- Are sulfidic ores or soil present?
- Are naturally occurring asbestos soils present?
- Is there any other waste present?

## **EMP-Sub-Plan 7. Traffic Management Plan**

### **A. Introduction**

The construction material will be transported to the project sites via the existing road network. There will be one site entrance/exit for the construction site which will be the existing entrance. The entrance of the camp will be controlled by a security gateman located within a security hut at the site entrance. During the hours of site operation, the site entrance gates will remain open and vehicle access to the site will be controlled via a manual barrier, set back from the road to prevent vehicles from parking on the access road.

The barrier will be controlled by a security gateman at all times and all drivers will have to register upon entering and leaving the site. Drivers will also be given verbal instruction as to the correct access to be taken onto the site (dependent on construction site activities).

Following measures will be taken on the site during the construction phase to avoid traffic congestion or any traffic accident, however, a detailed traffic management plan will be prepared by the contractor for the construction phase of the project:

- Efforts will be made to minimize the use of heavy trucks by preferring transport of equipment and supplies by 4x4 pickups, wherever possible.
- A speed limit of not more than 30 km/h shall be imposed on unpaved roads and link roads for reducing traffic accident risks and dust generation.
- All light vehicles (cars, jeeps, etc.) and heavy vehicles will be parked in a designated area.
- Speed breakers will be followed properly.
- Experienced license holders (drivers and operators) will be hired for transportation.
- All the heavy machinery will be checked properly and inspected regularly.
- Speed limit signboards will be installed at the project site.
- All the headlights, backlights, indicators, etc. of vehicles and machines will be checked and maintained regularly.
- All the warning lights, reverse alarms will be maintained properly.

The purpose of this Traffic Management Plan (TMP) is to identify, manage, and mitigate risks associated with vehicular and pedestrian traffic during the construction phase of the 132 kV Grid Station at Chahar Bagh. It ensures the safety of site workers, local residents, and road users while minimizing disruption to normal traffic flow in the area.

### **B. Objectives**

- To ensure safe movement of construction vehicles, personnel, and materials.
- To minimize traffic congestion and road obstructions.
- To prevent accidents, injuries, and property damage.
- To maintain access for emergency services and the local community.

### **C. Site Access and Transportation Routes**

The project site is accessible via [insert main approach road, e.g., Ring Road or Tehri Road]. All transportation of equipment and construction materials will be routed through designated haul routes to avoid congested or residential areas.

**Designated Access Points:**

- Main Gate: For heavy vehicle entry/exit
- Secondary Gate (if any): For staff vehicles and light deliveries
- Pedestrian Access: A separate, marked walkway for staff and visitors

**D. Key Traffic Activities**

Activity	Time Period	Risk Level	Control Measures
Delivery of transformers/equipment	Mid-construction	High	Police escort, early morning delivery
Concrete pouring and curing	Throughout phase	Medium	Traffic marshals, one-way routing
Soil excavation and filling	Initial weeks	High	Watering for dust suppression
Waste material disposal	Continuous	Medium	Covered trucks, off-peak movements

**E. Potential Risks and Impacts**

- Traffic congestion on surrounding roads
- Dust and noise from material transport
- Accidents involving vehicles or pedestrians
- Damage to local roads by heavy machinery
- Restricted access for local residents or emergency vehicles

**F. Mitigation Measures**

**a. Site-Level Controls**

- Installation of warning signs, speed limit boards (maximum 15 km/h inside site).
- Deployment of flagmen or traffic marshals at entry/exit points.
- Clearly marked haul routes within and outside the site.
- Use of covered trucks and vehicle washing to reduce dust and spillage.
- Dedicated parking space for machinery, staff, and delivery trucks.
- Timing of heavy transport during early morning or non-peak hours.

**b. External Coordination**

- Informing local traffic police about peak transport dates.

- Coordinating with municipal authorities if partial road closures or diversions are required.
- Public notice or community consultation for major deliveries.

#### **G. Emergency Access Management**

- Access routes for ambulances, fire brigade, and police will remain unobstructed.
- Emergency vehicle access points will be marked on the site map.
- Drills to test emergency route clearance will be held every quarter.

#### **H. Communication and Signage**

- All traffic routes, rules, and restrictions will be displayed visibly in Urdu and English.
- Signboards indicating “Men at Work,” “Slow – Construction Site,” “No Entry – Heavy Vehicle” etc., will be placed 100 m before the site approach.
- Reflective cones and barricades to be used at night.

#### **I. Roles and Responsibilities**

<b>Designation</b>	<b>Responsibilities</b>
Site Engineer	Overall implementation of TMP
HSE Officer	Ensures safety compliance and traffic safety
Traffic Marshal	Controls entry/exit, guides vehicles
Logistics Incharge	Schedules deliveries and equipment movement
Contractor/Driver	Adheres to assigned routes and timings

#### **J. Monitoring and Review**

Daily logbooks of vehicle movements maintained by gate staff.

Weekly inspections by the HSE Officer to ensure signage, PPE use, and traffic flow.

Incident Reporting Mechanism: All traffic-related complaints or accidents will be recorded, investigated, and addressed.

#### **K. Training**

All drivers to be trained in defensive driving, site-specific routing, and vehicle safety protocols.

Regular toolbox talks for site workers and security staff on safe crossing and walking zones.

#### **L. Annexures**

The contractor will provide the following annexures.

- Annex I: Site Access Map and Haul Routes
- Annex II: Daily Vehicle Log Sheet Template

- Annex III: Emergency Contact Numbers and Traffic Police Coordination Record
- Annex IV: Public Notice for Equipment Delivery Schedule

## **EMP-Sub-Plan 8. Framework for Restoration and Rehabilitation Plan**

This framework is intended to guide how RUDA and contractor(s) will minimize a project's area of disturbance, create a stable landscape, and restore land and vegetation of disturbed areas. To help accomplish these goals, the RUDA project contractor(s) will develop and implement a Site Restoration and Rehabilitation Plan that meets the requirements of this framework for each site where construction or other activities would result in adverse impacts on vegetation or landscape if no restoration activities were undertaken. Contractor(s) will be responsible for preparing a Plan and RUDA will be responsible for reviewing and approving the Plan before it is implemented.

### **Approach and Activities**

The key objective of the restoration and rehabilitation works is to restore disturbed land and vegetation, so they are at least equivalent to their pre-existing condition, with self-sustaining vegetation and minimal visual disturbance.

The Plan will be based in part on baseline conditions that existed prior to project disturbance, which would be described in the Environmental Impact Assessment (EIA) or other assessment documents. If this information is not available, those who prepare the Plan will need to develop an understanding of baseline conditions.

The Plan will include a comprehensive site layout and a detailed description of the location and area of disturbance. It will establish goals for ultimate land use and describe the details of how and when site restoration will be implemented and completed. Mitigation measures required by the EIA or other assessment documents will be the starting point, but additional measures will be adopted as needed to achieve the goals of the Plan.

For all project activities that involve land clearing, vegetation removal, or other major landscape disturbance, the Plan should introduce rehabilitation strategies including:

- Keeping the construction disturbance footprint as small as possible.
- Rehabilitating disturbed areas is not required for ongoing use in as timely a manner as possible (so-called "concurrent reclamation").
- Salvaging topsoil and subsoil for use in site rehabilitation and storing it so it maintains its value as a growth medium (e.g., limits to pile sizes, erosion controls).
- Covering disturbed areas, including road and earthworks batters, with subsoil and topsoil as needed, prior to seeding or planting grasses or other native species.
- Screening new visual objects with trees or other measures so they "blend" into the landscape.
- Using native (and local) species of grass and other plants for all reinstatement and landscaping work, with local seed sources used where practical. The plan should define the preferable and required plant species, based on flora baseline surveys, and identify appropriate sources, which may include seed collection in nearby areas to serve future rehabilitation.

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- Monitoring rehabilitated areas regularly during and after construction until vegetation is self-sustaining for at least three years, with remediation works undertaken as required. This may call for watering in dry periods, protective sleeves for plants, or other measures to ensure vegetation survives until it can become self-sustaining.
  - Maintaining site vegetation and landscaping works on project sites as long as the project remains.
  - The Plan must define rehabilitation completion criteria for determining whether and when a disturbed area is completely rehabilitated. The Plan should define realistic but achievable goals, including at least general guidelines on the desired percentage of ground cover, tree or shrub height, canopy cover, the complexity of different kinds of vegetation communities based on the land use prior to clearing, pre-existing health and integrity of the landscape, and land use requirements.
  - The Plan will require local consultations to ensure that local stakeholders' concerns and wishes are considered when developing and implementing rehabilitation and landscaping measures.

### ANNEX-7 Checklist

ISSUES	None	Minor/Small	Moderate/Medium	Significant/Large	Mitigation Measures/Further Actions
<b>A. Zoning and Land Use Planning</b>					
Will the project affect land use zoning and planning or conflict with prevalent land use patterns?		✓			Ensure compliance with local land use regulations.
Will the project involve significant land disturbance or site clearance?		✓			Minimize land clearing and protect existing vegetation.
Will the project land be subject to potential encroachment by urban or industrial use or located in an area intended for urban or industrial development?		✓			Engage with local authorities for proper zoning considerations.
<b>B. Utilities and Facilities</b>					
Will the project require the setting up of ancillary facilities?		✓			Temporary worker camps and site offices should be planned with adequate facilities.
Will the project make significant demands on utilities and services?	✓				No major impact expected on utilities.
Will the project require significant levels of accommodation or service amenities to support the workforce during construction?	✓				Workforce will be accommodated through local arrangements.
<b>C. Water and Soil Contamination</b>					
Will the project require large amounts of raw materials or construction materials?		✓			Implement a material sourcing and reuse plan.
Will the project generate large amounts of residual wastes, construction material waste, or cause soil erosion?		✓			Develop a waste management and erosion control plan.

Will the project result in potential soil or water contamination (e.g., from oil, grease, and fuel from equipment yards)?		✓			Implement spill prevention and containment measures.
Will the project lead to contamination of ground and surface waters by herbicides for vegetation control and chemicals for dust control?	✓				No use of herbicides or chemicals planned.
<b>D. Noise and Air Pollution Hazardous Substances</b>					
Will the project increase the levels of harmful air emissions?		✓			Dust suppression measures to be implemented.
Will the project increase ambient noise levels?		✓			Noise barriers and scheduling of work to minimize disturbances.
<b>E. Fauna and Flora</b>					
Will the project involve the disturbance or modification of existing drainage channels (rivers, canals) or surface water bodies (wetlands, marshes)?	✓				No major impact on drainage.
Will the project lead to the destruction or damage of terrestrial or aquatic ecosystems or endangered species directly or by induced development?	✓				No endangered species identified.
Will the project lead to the disruption/destruction of wildlife through interruption of migratory routes, disturbance of wildlife habitats, and noise-related problems?	✓				No
<b>F. Social and Land Use Impacts</b>					

Will the project lead to the displacement of people or loss of livelihood?	✓				no
Will the project have an impact on cultural heritage sites or religious sites?	✓				No heritage or religious sites in the vicinity.