Initial Environmental Examination

May 2018

PAK: Proposed Multi-tranche Financing Facility-II (MFF-II) Power Transmission Enhancement Investment Program Tranche 3

Prepared by National Transmission and Despatch Company Limited for the Asian Development Bank.

Power Transmission Enhancement Investment Programme II Tranche 3

Initial Environmental Examination

Sub-Project 3: 220 kV Jauharabad Sub-station with Associated Transmission Line

May 2018

Prepared by National Transmission & Despatch Company Limited (NTDC)
for the Asian Development Bank (ADB)

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CURRENCY EQUIVALENTS

As of 17th May 2018 Currency Unit – Pak Rupees (Pak Rs.)
Pak Rs 1.00 = $ 0.009 US$1.00 = Pak Rs. 118

CONVERSIONS

1 meter = 3.28 feet

1 hectare = 2.47 acre

LOCAL TERMINOLOGY

Kacha	Weak structure (composed of mud/clay)
Pakka	Robust/strong structure (composed of bricks/concrete)
Tehsil	Area of land with a city or town that serves as its administrative centre

Acronyms

ADB	Asian Development Bank
NTDC	National Transmission & Despatch Company Limited
SPS	Safeguard Policy Statement
ESIC	Environment and Social Impact Cell
MFF	Multi-Tranche Financing Facility
NCS	National Conservation Strategy
OPGW	Optical Ground Wire
HVDC	High Voltage Direct Current
PTEIP	Power Transmission Enhancement Investment Program
NEP	National Environmental Policy
ILO	International Labor Organization
EHV	Extra High Voltage
EPA	Environmental Protection Agency
USEPA	United States Environmental Protection Agency
EIA	Environment Impact Assessment
EMP	Environmental Management Plan
EA	Executing Agency
PMU	Project Management Unit
IA	Implementing Agency
GoP	Government of Pakistan
IEE	Initial Environmental Examination
LARP	Land Acquisition and Resettlement Plan
Leq	Equivalent sound pressure level
NEQS	National Environmental Quality Standards
NGO	Non Governmental Organization
WHO	World Health Organization

O&M	Operation & Maintenance
PC	Public consultation
PEPA	Punjab Environmental Protection Agency
PEPC	Pakistan Environmental Protection Council
PEPAct	Pakistan Environment Protection Act 1997
RP	Resettlement Plan
LPG	Liquefied Petroleum Gas
RoW	Right of Way
WAPDA	Water and Power Development Authority
IFC	International Finance Corporation
FI	Financial Intermediary
EMF	Electro-magnetic Field
CSC	Construction Supervision Consultant
ICNIRP	Non-Ionizing Radiation Protection
WB	World Bank
ANSI	American National Standards Institute
PCO	Public Call Office
G.T	Grand Trunk
OHL	Overhead Lines
SSEMP	Site Specific Environmental Management Plan
EC	Erosion Control
REA	Rapid Environmental Assessment

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EXECUTIVE SUMMARY

1. Under Tranche III of the MFF II, the sub-project 3 i.e. '220 kV Jauharabad Sub-station with associated transmission line'' consists of the following activities:

    - 220kV S/S at Jauharabad with three 220/132kV, three 160 MVA transformers along with allied equipment and accessories
    - Four 220kV line bays and eight 132kV line bays
    - Two 220kV D/C T/L of twin bundle Rail conductor for looping In/Out of existing Ludewala – Chashnupp D/C T/L at 220kV Jauharabad (12km)

2. The proposed sub-station site has been finalized by NTDC based on an assessment of three different sites. However, the transmission line alignment has yet to be finalized by NTDC and the finalized alignment and identification of any sensitive receptors and site specific impact analysis shall be included in the updated IEE report. A generic impact analysis and EMP for this transmission line have been provided in this report.

3. This sub-project will contribute to the improvement of the overall performance of the power distribution sector, improving distribution efficiency, broadly widening access to power to drive economic opportunities. The major beneficiaries of this sub-project will be the general public and the industry in the country and all other consumers that use power distribution services directly or indirectly.

4. Public consultations were conducted with the key receptors within the project area of the proposed sub-station site. Primary data was collected which along with the available secondary data was used to develop a clear picture of the environmental and social aspects of the sub-project development landscape for the purpose of this study.

5. The physical environment was observed within a project area of 4 sq. kilometers around the project boundary of the proposed sub-station site with sensitive receptors identified in this area. The existing land use of the proposed sub-station location is mostly agricultural land, although there are certain houses within the project area of the proposed sub-station site.

6. It should be mentioned that the selection of the transmission line alignment shall be conducted to avoid all sensitive receptors as far as possible.

7. Trees will be enumerated species wise and compensatory plantation will be arranged along roads and paths through forestry. To replace the removed trees, sufficient areas will be identified to allow plantation of trees at a rate of 5:1. Moreover, owners of the affected trees will be paid compensation for their loss.

8. Since it shall be ensured once the alignment is finalized that it primarily passes through agricultural land, the resulting impacts during the construction and operation phases of the sub-project shall be minimal and short term.

9. The affected households and the farmers working on the lands along the project corridor shall have to face short-term impacts due to high noise levels, community safety risks due to movement of heavy machinery and equipment and land use change due to installing of the transmission towers in agricultural fields.

10. The risks to ecology are expected to be limited with the cutting of trees to be minimized as far as possible and compensatory planting of trees to be conducted. The proper disposal of any solid and liquid waste, preservation of air quality by limiting dust and limiting toxic gas emissions from equipment and vehicle exhaust are some of the other measures which shall need to be taken. Similarly, capacity development of all project staff to implement recommended mitigation measures have also prescribed.

11. During the operation phase of the sub-project, any potential EMF impacts are not expected to be significant due to the different mitigation measures to be implemented as a part of the EMP while height of any trees close to the OHLs shall be controlled to prevent damage to the lines.

12. An action plan with clear roles and responsibilities of stakeholders has been provided in the report. NTDC, Project Contractor and the Construction Supervision Consultant are the major stakeholders responsible for this plan. This action plan must be implemented prior to commencement of construction work.

13. Mitigation will be assured by a program of environmental monitoring conducted during construction to ensure that all measures in the EMP are implemented and to determine whether the environment is protected as intended. This will include observations on-site, document checks, and interviews with workers and beneficiaries and any requirements for remedial action will be reported.

14. Therefore, the proposed sub-project is unlikely to cause significant adverse impacts. The potential adverse impacts that are associated with design and construction can be mitigated to standard levels without difficulty through proper engineering design and the incorporation or application of recommended mitigation measures and procedures. Based on the findings of this IEE, the classification of the Project as Category ‘B’ is confirmed. It is concluded that the proposed project should proceed, with appropriate mitigation measures and monitoring programs identified in the IEE.

15. As a result of this IEE study, it has been determined that no adverse or harmful impacts of any significance are expected. The sub-project falls under the Category ‘B’ of ADB's Guidelines and thus an IEE is sufficient.

1 Introduction

1.1 Overview

16. Under Tranche III of the MFF II, the sub-project 3 i.e. '220 kV Jauharabad Sub-station with associated transmission line'' consists of the following activities:

    - 220kV S/S at Jauharabad with three 220/132kV, three 160 MVA transformers along with allied equipment and accessories
    - Four 220kV line bays and eight 132kV line bays
    - Two 220kV D/C T/L of twin bundle Rail conductor for looping In/Out of existing Ludewala – Chashnupp D/C T/L at 220kV Jauharabad (12km)

17. The GoP has requested the Asian Development Bank (ADB) to provide finance for the proposed sub-project, to help fulfill the overall objective of the MFF to encourage economic growth and improve transmission efficiency by creating a series of national improvements.

18. The project is part of the NTDC's overall power development program and is proposed to strengthen the transmission system to fulfill the need of secure, safe and reliable power supply and to meet not only the existing requirement but also the future demand of the country for sustained economic growth.

19. This Initial Environmental Examination (IEE) report presents the screening of potential environmental impacts of the proposed scope of work and contains the mitigation measures in order to eliminate or reduce the negative impacts to an acceptable level, describes the institutional requirements and provides an environmental management plan for each of the six activities listed above.

1.2 Environmental Category of the Project

20. According to ADB's Safeguard Policy Statement (SPS) 2009, a Rapid Environmental Assessment (REA) Checklist was prepared for the activities to be conducted under the sub-project 3 (Annexure-I). The Pakistan Environmental Protection Agency's "Guidelines for the Preparation and Review of Environmental Reports (2000)" were also consulted. Based on the initial findings, the proposed activities under this sub-project have been classified as Category 'B'. Thus, an IEE has been conducted.

1.3 Scope of IEE Study and Personnel

The following methodology was employed for this study:

21. This IEE study has included field reconnaissance within the project area for the sub-station development (an area of 2 km x 2 km) and along the entire route of the sub-project corridor with surveys taking place during March 2018. Any sensitive receivers within the project area of the sub-station site were recorded, including any irrigation facilities, water supply, habitable structures, schools, health facilities, hospitals, religious places and sites of heritage or archaeological importance and critical areas[5].

22. Once the alignment of the proposed transmission line is knowm, any sensitive receivers within the corridor of the proposed transmission line route, taken to be 75 meters from either side of the centerline of the transmission line, shall be recorded.

23. The physical environment was observed within a project area of 4 sq. kilometers around the project boundary.

24. The study process began with scoping and field reconnaissance during which the REA was carried out to establish any potential impacts resulting from the development of the sub-station. The environmental impacts and concerns requiring further study in the environmental assessment were then identified. The methodology of the IEE study was then elaborated in order to address all interests.

25. Subsequently, both primary and secondary baseline environmental data was collected and the intensity and likely location of impacts were identified with relation to the sensitive receivers; based on the construction activities to be carried out at the sub-station location[1]. The significance of impacts from the sub-station development and power transmission line works was assessed and, for those impacts requiring mitigation, measures were proposed to reduce impacts to within acceptable limits.

26. The significance of impacts from the proposed sub-project were then assessed and for those impacts requiring mitigation, suitable measures were proposed to reduce impacts to within acceptable limits as per local and international applicable regulations.

27. A detailed environmental management and monitoring plan was developed to ensure compliance to the proposed measures during the development of the sub-project.

1.4 Structure of Report

28. This report reviews information on existing environmental attributes of the areas around the study area. Geological, hydrological and ecological features, air quality, noise, water quality, soils, social and economic aspects and cultural resources are included. The report predicts the probable impacts on the environment due to the proposed sub-project.

29. This IEE report contains the following chapters:

    - *Introduction*
    - *Policy and Legal Framework*
    - *Description of the Project*
    - *Description of Environmental and Social Conditions*
    - *Assessment of Environmental Impacts and Mitigation Measures*

[1] Scoping for transmission line shall be conducted once alignment is known.

- *Institutional Requirements Environmental Management Plan*
- *Public Consultation*
- *Grievance Redressal Mechanism*
- *Conclusions and Recommendations*
- *References*

Project:

Sub-Project 3: 220 kV Jauharabad Sub-Station With Associated Transmission Line

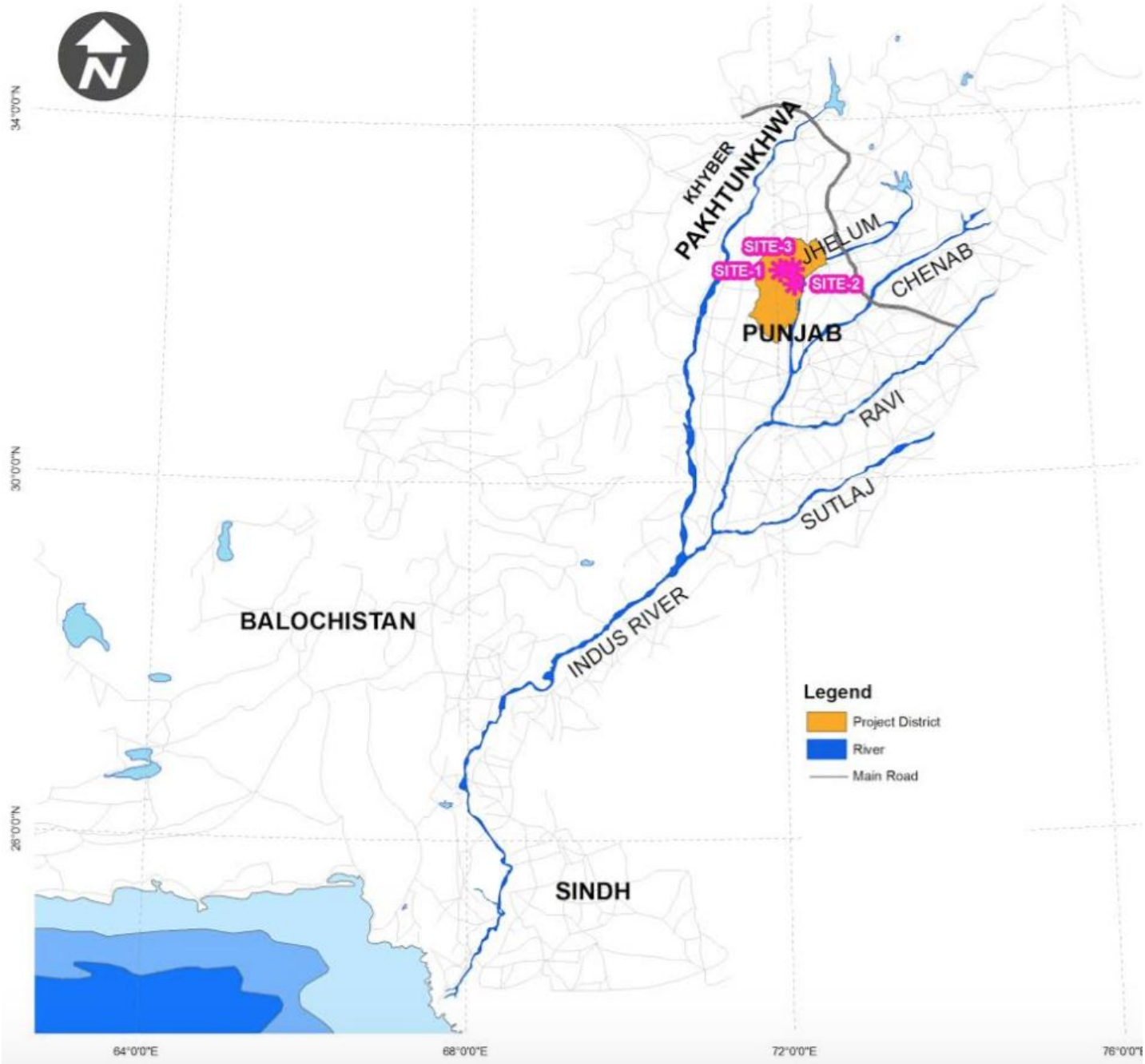
Drawing Title:

Key Map

Drawing Number:

Figure 1.1

Drawing Date: April 2018



2 Policy and Legal Framework in Pakistan

2.1 General

30. This section provides an overview of the policy framework and national legislation that applies to the scope of work to be conducted under the proposed sub-project 3. This sub-project is expected to comply with all national legislation relating to environment in Pakistan, and to obtain all the regulatory clearances required.

2.2 National Policy and Legal Framework

31. The Pakistan National Conservation Strategy (NCS) that was approved by the federal cabinet in March 1992 is the principal policy document on environmental issues in the country (EUAD/IUCN, 1992). The NCS outlines the country's primary approach towards encouraging sustainable development, conserving natural resources, and improving efficiency in the use and management of resources. The NCS has 68 specific programs in 14 core areas in which policy intervention is considered crucial for the preservation of Pakistan's natural and physical environment. The core areas that are relevant in the context of the proposed sub-project are pollution prevention and abatement and increasing energy efficiency while conserving biodiversity.

32. Prior to the adoption of the 18th Constitutional Amendment, the Pakistan Environmental Protection Act (PEPA) 1997 was the governing law for environmental conservation in the country. Under PEPA 1997, the Pakistan Environmental Protection Council (PEPC) and Pak EPA were primarily responsible for administering PEPA 1997. Post the adoption of the 18th Constitutional Amendment in 2011, the subject of environment was devolved and the provinces have been empowered for environmental protection and conservation. Subsequently, the Punjab government amended PEPA 1997 as Punjab Environmental Protection (Amendment) Act 2012, and Punjab EPA (PEPA) is responsible for ensuring the implementation of provisions of the Act in Punjab’s territorial jurisdiction. PEPA is also required to ensure compliance with the NEQS and establish monitoring and evaluation systems.

2.3 Regulations for Environmental Assessment, Pakistan EPA

33. Under Section 12 (and subsequent amendment) of the PEPA (1997), a project falling under any category specified in Schedule I of the IEE/EIA Regulations (SRO 339 (I0/2000), requires the proponent of the project to file an IEE with the concerned provincial EPA. Projects falling under any category specified in Schedule II require the proponent to file an EIA with the provincial agency, which is responsible for its review and accordance of approval or request any additional information deemed necessary.

2.4 Regulatory Clearances, Punjab EPA

34. Post adoption of the 18th Constitutional Amendment in 2011, the subject of environment was devolved and the provinces have been empowered for

environmental protection and conservation. Subsequently, the Punjab government amended PEPA 1997 as Punjab Environmental Protection Act 2012, and Punjab EPA (PEPA) is responsible for ensuring the implementation of provisions of the Act in Punjab's territorial jurisdiction. PEPA is also required to ensure compliance with the NEQS and establish monitoring and evaluation systems. In accordance with provincial regulatory requirements, an IEE/EIA satisfying the requirements of the Punjab Environmental Protection Act (2012) is to be submitted to Punjab environmental protection agency (PEPA) for review and approval, and subsequent issuance of NOC before the commencement of construction.

2.5 Guidelines for Environmental Assessment, Pakistan EPA

35. The Pak-EPA has published a set of environmental guidelines for conducting environmental assessments and the environmental management of different types of development projects. The guidelines that are relevant to the proposed sub-project are listed below:

- Guidelines for the Preparation and Review of Environmental Reports, Pakistan, EPA1997;
- Guidelines for Public Consultations; Pakistan EPA May 1997;

2.6 National Environmental Quality Standards (NEQS) 2000

36. The National Environmental Quality Standards (NEQS), 2000, specify the following standards:

- Maximum allowable concentration of pollutants (32 parameters) in municipal and liquid industrial effluents discharged to inland waters, sewage treatment facilities, and the sea (three separate sets of numbers);
- Maximum allowable concentration of pollutants (16 parameters) in gaseous emissions from industrial sources;
- Maximum allowable concentration of pollutants (two parameters) in gaseous emissions from vehicle exhaust and noise emission from vehicles;
- Maximum allowable noise levels from vehicles;

37. These standards apply to the gaseous emissions and liquid effluents discharged by batching plants, campsites and construction machinery. The standards for vehicles will apply only during the construction phase of the project. Standards for ambient air quality have also been prescribed.

2.7 ADB Policies

2.7.1 ADB's Safeguard Policy Statement (SPS), 2009

38. The Asian Development Bank's Safeguard Policy Statement (SPS) 2009 requires that environmental considerations be incorporated into ADB's funded project to ensure that the project will have minimal environmental impacts and be environmentally sound. Occupational health & safety of the local population should

also be addressed as well as the project workers as stated in SPS. A Grievance Redress Mechanism (GRM) to receive application and facilitate resolution of affected peoples' concerns, complaints, and grievances about the project's environmental performance is also established and provided in **Chapter 8**.

39. All loans and investments are subject to categorization to determine environmental assessment requirements. Categorization is to be undertaken using Rapid Environmental Assessment (REA) checklists, consisting of questions relating to (i) the sensitivity and vulnerability of environmental resources in project area, and (ii) the potential for the project to cause significant adverse environmental impacts. Projects are classified into one of the following environmental categories:

    Category A: A proposed project is classified as category A if it is likely to have significant adverse environmental impacts that are irreversible, diverse or unprecedented. These impacts may affect an area larger than the sites or facilities subject to physical works. An environmental impact assessment (EIA) is required.

    Category B: A proposed project is classified as category B if its potential adverse environmental impacts are less adverse than those of category A projects. These impacts are site-specific, few if any of them are irreversible, and in most cases mitigation measures can be designed more readily than for category A projects. An initial environmental examination (IEE) is required.

    Category C: A proposed project is classified as category C if it is likely to have minimal or no adverse environmental impacts. No environmental assessment is required although environmental implications need to be reviewed.

    Category FI: A proposed project is classified as category FI if it involves investment of ADB funds to or through a financial intermediary (FI).

40. As a result of the completion of the REA checklist, the scope of work to be conducted under the sub-project 3 has been classified as Category ''B'' and thus a detailed and comprehensive IEE study has been prepared, including an EMP for the Jauharabad sub-station development and a separate EMP for the transmission line.

2.7.2 ADB's Public Communication Policy 2011

41. The PCP aims to enhance stakeholders' trust in and ability to engage with ADB, and thereby increase the development impact of ADB operations. The policy promotes transparency, accountability, and participatory development. It establishes the disclosure requirements for documents ADB produces or requires to be produced.

2.7.3 ADB's Accountability Mechanism Policy 2012

42. The objectives of the Accountability Mechanism is providing an independent and effective forum for people adversely affected by ADB-assisted projects to voice their concerns and seek solutions to their problems, and to request compliance review of the alleged noncompliance by ADB with its operational policies and procedures that may have caused, or is likely to cause, them direct and material harm. The Accountability Mechanism a "last resort" mechanism.

2.8 Other Environment Related Legislations

43. The **Table 2.1** provides a summary of all legislations, guidelines, conventions and corporate requirements.

Table 2.1: Environmental Guidelines and Legislations

Legislation/Guideline	Description
National Environmental Policy (2005) (NEP)	NEP is the primary policy of Government of Pakistan addressing environmental issues. The broad Goal of NEP is, "to protect, conserve and restore Pakistan's environment in order to improve the quality of life of the citizens through sustainable development". The NEP identifies a set of sectoral and cross-sectoral guidelines to achieve its goal of sustainable development. It also suggests various policy instruments to overcome the environmental problems throughout the country.
The Forest Act (1927)	The Act empowers the provincial forest departments to declare any forest area as reserved or protected. It empowers the provincial forest departments to prohibit the clearing of forest for cultivation, grazing, hunting, removing forest produce, quarrying and felling, lopping and topping of trees, branches in reserved and protected forests. No protected forests are located in the project areas of sub-project 3.
Punjab Wildlife Protection Ordinance, 1972	It empowers the government to declare certain areas reserved for the protection of wildlife and control activities within in these areas. It also provides protection to endangered species of wildlife. As no activities are planned in these areas, no provision of this law is applicable to the proposed sub-project 3.
The Antiquities Act (1975)	It ensures the protection of Pakistan's cultural resources. The Act defines "antiquities" as ancient products of human activity, historical sites, or sites of anthropological or cultural interest, national monuments, etc. The Act is designed to protect these antiquities from destruction, theft, negligence, unlawful excavation, trade, and export. The law prohibits new construction in the proximity of a protected antiquity and empowers the GOP to prohibit excavation in any area that may contain articles of archaeological significance. Under the Act, the subproject proponents are obligated to ensure that no activity is undertaken in the proximity of a protected antiquity, report to the Department of Archaeology, GOP, any archaeological discovery made during the course of the sub-project.
Pakistan Penal Code (1860)	It authorizes fines, imprisonment or both for voluntary corruption or fouling of public springs or reservoirs so as to make them less fit for ordinary use.
NATIONAL ENVIRONMENTAL AND CONSERVATION STRATEGIES	
National Conservation Strategy	Before the approval of NEP, the National Conservation Strategy (NCS) was considered as the Government's primary policy document on national environmental issues. At the moment, this strategy just exists as a national conservation program. The NCS identifies 14 core areas including conservation of biodiversity, pollution prevention and abatement, soil and water conservation and preservation of cultural heritage and recommends immediate attention to these core areas.
Biodiversity Action Plan	The plan recognizes IEE/EIA as an effective tool for identifying and assessing the effects of a proposed operation on biodiversity.
Environment and	There is a well-established framework for environmental

Legislation/Guideline	Description
Conservation	management in Pakistan. The Ministry of Environment deals with environment and biological resources. Within the ministry, the NCS unit established in 1992 is responsible for overseeing the implementation of the strategy. Two organizations, the Pakistan Environmental Protection Council (PEPC) and the Pak EPA are primarily responsible for administering the provisions of the PEPA, 1997. The PEPC oversees the functioning of the Pak EPA. Its members include representatives of the government, industry, non-governmental organizations and the private sector. The Pak EPA is required to ensure compliance with the NEQS, establish monitoring and evaluation systems, and both identify the need to and institution of legislations whenever necessary. It is thus the primary implementing agency in the hierarchy. The Provincial Environmental Protection Agencies are formed by the respective provinces.
INTERNATIONAL CONVENTIONS	
The Convention on Conservation of Migratory Species of Wild Animals (1981.21)	The Convention requires countries to take action to avoid endangering migratory species. The term "migratory species" refers to the species of wild animals, a significant proportion of whose members cyclically and predictably cross one or more national jurisdictional boundaries. The parties are also required to promote or cooperate with other countries in matters of research on migratory species. There are no endangered species of plant life or animal life in the vicinity of the sub-project 3.
Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973)	The convention requires Pakistan to impose strict regulation (including penalization, confiscation of the specimen) regarding trade of all species threatened with extinction or that may become so, in order not to endanger their survival further.
International Union for Conservation of Nature and Natural Resources Red List (2000)	Lists wildlife species experiencing various levels of threats internationally. Some of the species indicated in the IUCN red list are also present in the wetlands of Pakistan.
Kyoto Protocol/Paris Agreement	SF_6 gas is listed in the Kyoto Protocol as one of the six greenhouse gases subject to monitoring. SF6 has to be used in closed systems in order to avoid emissions. 194 member states agreed to extend the Kyoto protocol until 2020 with the aim of reducing the emission of greenhouse gases. The Paris Convention agreed to reduce climate-damaging greenhouses gases under the United Nations Framework Convention on Climate Change (UNFCCC) as of 2020. 195 member states negotiated and adopted this agreement on the twenty-first session of the Conference of the Parties under the framework convention on climate change in Paris on 12 December 2015.
IEC 62271-4 directive	This directive stipulates SF_6 gas recovery down to a final vacuum of < 20 mbar. The IEC requirements are exceeded by far when using DILO devices as DILO service carts enable a final vacuum of < 1 mbar depending on the type of device.
IEC 60480 guideline	This guideline stipulates the limit values for the re-use of SF_6 gas in medium and high voltage switchgear.
EMF Exposure limits by IFC for 'general public' and 'occupational	These exposure limits have been provided for monitoring of EMF limits in order to prevent any adverse health effects in the general public as well as amongst workers.

Legislation/Guideline	Description
exposure'	

2.9 Comparison of International and Local Environmental Legislations

44. The ADB SPS requires application of pollution prevention and control technologies and practices consistent with international good practice, as reflected in internationally recognized standards. The SPS states that when host country regulations differ from these standards, the EA will achieve whichever is more stringent.

45. A comparison of applicable local and international guidelines for ambient air quality has been provided in **Table 2.5** below. In the case of most pollutants, the NEQS standards for ambient air quality are more stringent in comparison to USEPA and WHO/IFC standards. The applicable and most stringent parameters for each respective pollutant are highlighted in green.

46. Similar to the standards for air quality, the comparison of noise standards provided in **Table 2.6** clearly shows that NEQS standards for noise are more stringent in comparison to the WHO/IFC standards. The only exception is the daytime noise level standard for Industrial areas where the World Bank/IFC standard is more stringent (70 dB(A)) in comparison to NEQS (75 dB(A)) and so for this particular parameter, the WHO/IFC standard will be used. Apart from this one exception, the NEQS standards have been used for this sub-project 3.

47. As far as regulations regarding other environmental parameters are concerned such as acceptable effluent disposal parameters, the local regulations i.e. NEQS take precedence over any other international regulations such as WHO/IFC since these specific IFC standards only cover a limited number of parameters relating to effluent disposal etc and the NEQS are generally more stringent.

2.10 Implications of national policies and regulations on proposed project

48. The Pak-EPA formulated regulations in 2000 for 'Review of IEE and EIA' which categorise development projects under three schedules - Schedules I, II and III. Projects are classified on the basis of expected degree and magnitude of environmental impacts and the level of environmental assessment required is determined from the schedule under which the project is categorised.

49. The projects listed in Schedule-I include those where the range of environmental issues is comparatively narrow and the issues can be understood and managed through less extensive analysis. Schedule-I projects require an IEE to be conducted, rather than a full-fledged EIA, provided that the project is not located in an environmentally sensitive area.

50. The proposed sub-project 3 has been categorized as Schedule-I and thus an IEE study has been conducted.

51. This IEE study will be submitted to the Punjab EPA (PEPA) for review and comments. The PEPA will respond within 10 working days from receipt of the IEE report and confirm the completeness of the report for detailed review or request additional information to be provided in order for the review to take place.

52. The PEPA will make every effort to review the IEE report within 45 days of the issuance of completeness of the report. Upon completion of the review, an NOC will be issued, with conditions from the EPA if felt necessary.

2.11 Implications of ADB's safeguard policies on proposed project

53. The objectives of ADB's safeguards are to:

- avoid adverse impacts of projects on the environment and affected people, where possible;
- minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible; and
- help borrowers/clients to strengthen their safeguard systems.

54. ADB's SPS sets out the policy objectives, scope and triggers, and principles for three key safeguard areas:

- environmental safeguards,
- involuntary resettlement safeguards, and
- Indigenous Peoples safeguards.

55. The objective of the environmental safeguards is to ensure the environmental soundness and sustainability of projects and to support the integration of environmental considerations into the project decision-making process. ADB's policy principles are summarized in **Table 2.4** below.

2.12 EMF Exposure Guidelines

56. Although there is public and scientific concern over the potential health effects associated with exposure to EMF (not only high voltage power lines and substations, but also from everyday household uses of electricity), there is no empirical data demonstrating adverse health effects from exposure to typical EMF levels from power transmissions lines and equipment.

57. However, while the evidence of adverse health risks is weak, it is still sufficient to warrant limited concern. **Table 2.2** lists exposure limits for general public exposure to electric and magnetic fields published by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) while **Table 2.3** provides the exposure limits for occupational exposure.

58. It is important to mention that no national guidelines on EMF exposure exist at present.

Table 2.2: ICNIRP exposure limits for general public exposure to electric and magnetic fields

Frequency	Electric Field (V/m)	Magnetic Field (uT)
50 Hz	5000	100
60 Hz	4150	83

Source: ICNIRP (1998): "Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz).

Table 2.3: ICNIRP exposure limits for occupational exposure to electric and magnetic fields

Frequency	Electric Field (V/m)	Magnetic Field (uT)
50 Hz	10,000	500
60 Hz	8300	415

Source: ICNIRP (1998): "Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz).

Table 2.4: ADB Policy Principles

	Policy principle	Summary
1	Screening and categorization	Screening process initiated early to determine the appropriate extent and type of environmental assessment.
2	Environmental assessment	Conduct an environmental assessment to identify potential impacts and risks in the context of the project's area of influence.
3	Alternatives	Examine alternatives to the project's location, design, technology, and components and their potential environmental and social impacts, including no project alternative.
4	Impact mitigation	Avoid, and where avoidance is not possible, minimize, mitigate, and/or offset adverse impacts and enhance positive impacts. Prepare an environmental

		management plan (EMP).
5	Public consultations	Carry out meaningful consultation with affected people and facilitate their informed participation. Involve stakeholders early in the project preparation process and ensure that their views and concerns are made known to and understood by decision makers and taken into account. Continue consultations with stakeholders throughout project implementation. Establish a grievance redress mechanism.
6	Disclosure of environmental assessment	Disclose a draft environmental assessment in a timely manner, in an accessible place and in a form and language(s) understandable to stakeholders. Disclose the final environmental assessment to stakeholders.
7	Environmental management plan	Implement the EMP and monitor its effectiveness. Document monitoring results, and disclose monitoring reports.
8	Biodiversity	Do not implement project activities in areas of critical habitats.
9	Pollution prevention	Apply pollution prevention and control technologies and practices consistent with international good practices. Adopt cleaner production processes and good energy efficiency practices. Avoid pollution, or, when avoidance is not possible, minimize or control the intensity or load of pollutant emissions and discharges. Avoid the use of hazardous materials subject to international bans or phaseouts.
10	Occupational health and safety Community safety.	Provide workers with safe and healthy working conditions and prevent accidents, injuries, and disease. Establish preventive and emergency preparedness and response measures to avoid, and where avoidance is not possible, to minimize, adverse impacts and risks to the health and safety of local communities
11	Physical cultural resources	Conserve physical cultural resources and avoid destroying or damaging them. Provide for the use of “chance find” procedures.

Table 2.5: Comparison of International and local Air Quality Standards*

Pollutants	USEPA		WHO/IFC		Pak. NEQS	
	Avg. Time	Standard	Avg. Time	Standard	Avg. Time	Standard
SO_2	3 hrs 1 hr	0.5 ppm 75 ppb	24 hr 10 min	20 ug/m^3 500 ug/m^3	Annual Mean 24 hrs	80 ug/m^3 120 ug/m^3
CO	8 hrs 1 hr	9 ppm (11 mg/m^3) 35 ppm (43 mg/m^3)	-	-	8 hrs 1 hr	5 mg/m^3 10 mg/m^3
NO_2	Annual Mean 1 hr	100 ug/m^3 (53 ppb) 100 ppb	1 yr 1 hr	40 ug/m^3 200 ug/m^3	Annual Mean 24 hrs	40 ug/m^3 80 ug/m^3
O_3	8 hrs	0.07ppm (148 ug/m^3)	8 hrs	100 ug/m^3	1 hr	130 ug/m^3
TSP	-	-	-	-	Annual Mean 24 hrs	360 ug/m^3 500 ug/m^3
PM_{10}	24 hrs	150 ug/m^3	1 yr	20 ug/m^3	Annual Mean	120 ug/m^3

			24 hr	50 ug/m^3	24 hrs	150 ug/m^3
$PM_{2.5}$	Annual Mean 24 hrs	15 ug/m^3 35 ug/m^3	1 yr 24 hr	10 ug/m^3 25 ug/m^3	Annual Average 24 hrs 1 hr	15 ug/m^3 35 ug/m^3 15 ug/m^3

*: The standards highlighted in green for each respective pollutant are the most stringent based on a comparison between local and international regulations and thus shall be applicable for the proposed project.

Table 2.6: Comparison of International and Local Noise Standards*

Category of Area/Zone	Limit in dB(A) Leq			
	NEQS		WHO/IFC	
	Day Time	Night Time	Day Time	Night Time
Residential area (A)	55	45	55	45
Commercial area (B)	65	55	70	70
Industrial area (C)	75	65	70	70
Silence zone (D)	50	45	55	45

*: The standards highlighted in green for each respective Area/Zone are the most stringent based on a comparison between local and international regulations and thus shall be applicable for the proposed project.

3 Description of the Project

3.1 General

59. This chapter provides an overview of the scope of works to be conducted under the sub-project 3 consisting of the Jauharabad sub-station development and proposed transmission line (12 km), project components, design considerations, construction procedures, operation and maintenance activities. The safety parameters to be followed by NTDC (WAPDA) during construction and operation stages are also provided.

3.2 Scope of Work

60. The scope of work under this sub-project 3 will consist of the following activities:

- 220kV S/S at Jauharabad with three 220/132kV, three 160 MVA transformers along with allied equipment and accessories
- Four 220kV line bays and eight 132kV line bays
- Two 220kV D/C T/L of twin bundle Rail conductor for looping In/Out of existing Ludewala – Chashnupp D/C T/L at 220kV Jauharabad (12km)

3.3 Alignment of TL of Sub-Project

61. The TL of 12 km length to be developed under the sub-project will be on 'turn-key' basis i.e. construction by a contractor/ developer and hand over to NTDC in a ready-to-use condition which includes design, supply and installation. In this context, the proposed design has yet to be developed and finalized by NTDC but shall be included in the updated IEE report once the alignment has been finalized and the required surveys have been completed by NTDC.

62. Once the detailed design work has been completed, NTDC will review these designs before contracts are finalized and modifications will be incorporated, if considered necessary. Certification to ADB that the detailed designs comply with IEE (including EMP) recommendations will be required before contracts can be made effective.

3.4 Width of RoW

63. In consultation with the Survey & Investigation section of NTDC and the E&SIC (PMU), NTDC, the width of RoW for T/L considered was 50 m, i.e. 25 m on either side from the center of transmission line and it was 225 m^2 (i.e. 15m x15m) in case of tower spotting.

3.5 Categorization of Sub-Project

64. The **Figure 3.1** clearly shows the proposed sub-station location and the proximity of this sub-station to the different sensitive receptors lying in the project area.

65. The existing land use of the transmission line corridor, although the alignment is yet to be finalized, is expected to be mostly agricultural land.

66. The selection of the line alignment shall be conducted to avoid all sensitive receptors as far as possible. Based on the implementation of the mitigation measures proposed in the EMP, no significant long term adverse impacts are expected either during the construction or operation phases of the scope of work to be conducted under this sub-project 3.

67. The aspects of the sub-project with potential for significant environmental impacts were assessed in detail and environmental assessment has focused on potential significant impacts from the construction aspects as well as consultation with the local communities at the proposed sub-station location.

68. Based on the proposed scope of project works and assessment conducted of potential impacts during the different project phases, this sub-project is categorized as Category 'B'.

3.6 Need for Sub-Project

69. Pakistan is a country with an economy of improving performance with a wide network of power distribution. However, the standards and conditions of the power distribution are inadequate to meet rapidly growing power demand. This situation limits reliable power distribution and therefore the contribution of the power sector to national development and economic growth. To cope with the constraints, the existing power distribution infrastructure has to be improved and upgraded. The overall contribution of power infrastructure also requires institutional arrangements and capacity that support strategic management of the sector, and planning and management of investments.

70. This sub-project will contribute to the improvement of the overall performance of the power distribution sector, improving distribution efficiency, broadly widening access to power to drive economic opportunities. The beneficiaries of the sub-project will be people, companies, and government and non-government agencies in Pakistan that use power distribution services directly and indirectly. Communities indirectly served by the sub-project will benefit from improved, secure faster distribution services. Power users will benefit in terms of secure power and improved power safety and potentially increased productivity.

71. In order to achieve economic growth and poverty reduction, it is essential to ensure a reliable power supply to an increasing number of industrial, agricultural, commercial and domestic consumers. Average increase in power demand of country during next 10 years is about 4.96% per annum. To cope with this growth in demand, additional capacity will be required annually.

72. As a result of this enhancement, additional capacity of NTDC transmission system is required which will also result in overall power system efficiency and stability to deliver adequate and quality power to the consumers.

3.7 Cost of Sub-project

73. The estimated cost of this sub-project is **PKR 3147.12 million** from which PKR 1432.02 million shall be local financing and PKR 1715.09 million shall be FEC. The detailed breakdown of capital cost estimates from the PC-1 are provided in **Table 3.1** below.

Table 3.1: Capital Cost Estimate of Sub-project 3*

Sr. No.	Description	Total Estimated Cost (MRs.)		
		Local	FEC	Total
A-	**220 kV Grid Station**			
1-	220 kV Jauharabad Substaion with 3x 160 MVA 220/132kV T/Fs and allied Equipment	553.25	1478.03	2031.28
B-	**Transmission Lines**			
1-	Two 220 kV double circuit twin bundled T/L for looping In/Out of existing Ludewala - Chashnupp at 220kV Jauharabad (6+6km)	185.86	143.18	329.04
	Sub-Total (A+B)	**739.11**	**1621.21**	**2360.32**
C-	**General Items**			
1-	a) Non-Residential Buildings.	28.80	0.00	28.80
	b) Office furniture	2.00	0.00	2.00
	c) Transportation and Vehicles	6.00	0.00	6.00
	d) Residential Colony	30.99	0.00	30.99
	Sub-Total (1)	**67.79**	**0.00**	**67.79**
2-	Engineering & Consultancy	22.27	61.46	83.72
3-	GST at Transmission Line material @ 17%	197.26	0.00	197.26
4-	Administration & Supervision	47.39	0.00	47.39
5-	Contingencies @ 2%	14.78	32.42	47.21
6-	Inland transportation and handling charges	44.55	0.00	44.55
	Subtotal	**394.04**	**93.88**	**487.92**
D-	Interest During Construction	298.87	0.00	298.87

	Total Cost	**1432.02**	**1715.09**	**3147.12**

Source: *: PC-1

3.8 Design Aspects

3.8.1 Design Standards for Transmission Lines

74. NTDC has developed design parameters for the planning and design of transmission systems in Pakistan. The design parameters are based on standard NTDC's existing specifications and practices for transmission lines. The parameters considered for the system and human safety are described below in detail.

3.8.2 Climatic Consideration

75. Local climatic conditions, i.e. the temperature, wind velocity, thunder storm levels, relative humidity, etc., control the selection of materials to be used. The following climate parameters were considered in the design criteria provided in **Table 3.2** below.

Table 3.2: Design Criteria

S/No.	Criteria	Value
1	Maximum Temperature	41.5^{o}C
2	Minimum Temperature	2.1^{o}C
3	Annual Mean temperature	29.6^{o}C (max) to 14.6^{o}C (min)
4	Maximum Rainfall	420 mm/month
5	Annual Relative Humidity	60.1%

3.9 Equipment & Machinery

76. The equipment to be used for construction of the proposed sub-station and transmission lines are provided in **Tables 3.3** and **3.4** below.

Table 3.3: Equipment for Jauharabad Sub-station

Sr. No.	Item	Unit	Qty.
220 kV equipment			
1.	Circuit Breaker	Set	11
2.	Bus Isolator	Set	25

Sr. No.	Item	Unit	Qty.
3.	Line Isolator	Set	4
4.	C.T	No.	44
5.	CVT	No.	17
6.	Lightning arrestor	No.	3
7.	Autotransformer 220/132 kV, 160 MVA	No.	21
132 kV equipment			
1.	Circuit Breaker	Set	13
2.	Bus Isolator	Set	26
3.	Line Isolator	Set	8
4.	C.T	No.	48
5.	PT	No.	15
6.	Lightning arrestor	No.	12
7.	Autotransformer 132/11 kV, 10/13 MVA	No.	1

Table 3.4: Equipment for 12km TL from Jauharabad to Ludewala - Chashnupp

S/No.	Item	Unit	Qty.
220 kV D/C Transmission Line			
i	**Towers**		
	Light angle (DAI)	No.	8
	Heavy angle (DDI)	No.	5
	Suspension (DSI)	No.	23
	Total		**36**
ii	**Conductor (Rail)**	km	151

iii	**OPGW (Optical Ground Wire)**	km	13
iv	**Insulators**		
	Suspension 80 kN	No.	2284
	Tension 160 kN	No.	7749
	Total		**10033**
v	**Hardware**	Lot	1

3.9.1 Tower Structures for Transmission Lines

77. All the towers shall be self-supporting type, lattice steel structures, fabricated from galvanized structural steel shapes. The steel employed will be in accordance with the latest edition of the standards. All towers will be equipped with danger plates, number plates and anti-climbing devices.

78. The normal foundations (inverted T shaped) as shown in **Figure 3.5** would be laid/ applied for the erection of new towers which would be placed on plain field. The tower height will be 5 to 10 meters higher and the foundation span will be changed to 1 to 5 meters wider.

79. The choice of foundation is usually influenced by the type of terrain encountered and the underlying geotechnical conditions. The actual size and type of foundation to be installed will depend on the soil bearing capacity (actual sub-soil conditions).

80. All towers will be equipped with danger plates, number plates and anti-climbing devices. The other tower designs to be used are provided as **Figures 3.6 and 3.7** below.

3.9.2 Safety Parameters

81. There are two types of safety considerations for EHV lines. The first type is related to the safety of the system while the second type is related to the safety of the public. Due to this reason, NTDC (WAPDA) has adopted a 50 m wide (25 m either side from the centerline) corridor as the ROW for the allied 220 kV transmission lines.

    The aspects to be considered in this regard are as follows:

    (i) System Safety

82. ***Conductor to Tower Clearance:*** In order to ensure safety of the system, it is imperative that any factor that may interrupt the power supply should be considered in the design. The clearance of the conductor from tower legs and trusses is of prime importance. Therefore, in the design, a minimum clearance of 1.55 m has been adopted under extreme wind conditions. This is based on regulations of GOP/WAPDA and minimum requirements of National Electric Safety Code (ANSI C2). With this clearance, there is 99% probability of withstanding switching surge of 3-sigma margin due to maximum over voltage under adverse climatic conditions.

83. ***Earthing of the System:*** Every tower is connected to an earthing system. This is to keep tower footings resistance at a level lower than 10 ohms. For this, two earth electrodes of copper-clad steel rods are sunk vertically into the ground to a minimum depth of 3 m and the locations where the required resistance is not achieved, crow footing will be performed.

84. ***Lightning Performance:*** The tower alignment, clearance and insulation of the system are designed to perform safely within the permitted lightning intensities. In this respect, consideration has been given to the tower footing resistance and Isokeraunic level of the area. The accepted level is one tripout/ 100 km/ year due to lightning.

85. ***Work Uniform and Health and Safety Equipment:*** Transmission line construction is a specialized job and the labor working on such works requires special protective uniform and personal protection equipment to cope up with safety and health requirements. It will be ensured that the labor engaged in handling rough construction materials, mixing of concrete and handling transmission lines etc. shall have long boots, overall dresses, goggles, gloves and safety hats. They will invariably have their company identity cards worn around their necks with the help of a ribbon. As an overall Safety, Health and Environment measure, any personnel entering the construction area shall wear safety helmets and safety shoes. Special arrangements must be made for Fire Protection by providing appropriate types of fire extinguishers along with conducting firefighting trainings to the concerned personnel.

(ii) Public Safety

86. ***General Aspects:*** In order to ensure public safety, NTDC has adopted a policy that shall ensure that the existing orchards having fruit trees with a height up to 2.5 m shall be allowed to remain under the lines. Similarly, open wells, including Persian wheels, shall be allowed to remain under the transmission lines. However, tube wells and peter pumps shall not be permitted under the high voltage conductors since the piping and cranes used to refurbish such wells could potentially come into contact with the lines.

87. ***No residential or other public buildings*** such as factory, school, hospital, etc. are permitted within the corridor. However, farm buildings, which are not used for residential purposes are allowed to remain under the high voltage lines, provided a 7.0 m minimum clearance is maintained. The height of the towers can be increased to accommodate such buildings.

88. ***Conductor to Ground Clearance:*** The conductor to ground clearance is desirable to be worked out based on over voltage due to switching surge. In this consideration, safe clearance is required to be provided for moving objects under the line with a height of 4.5 m, withstanding switching surge of 3-sigma margin with 99.7% probability under adverse atmospheric conditions. This should keep the maximum voltage gradient at ground level and maximum current induced in a person less than the internationally allowable values. As such, the total conductor to ground clearance

shall in no way be less than 7.0 meters. This is in accordance with the regulations of the Government of Pakistan (GoP) and NTDC practice.

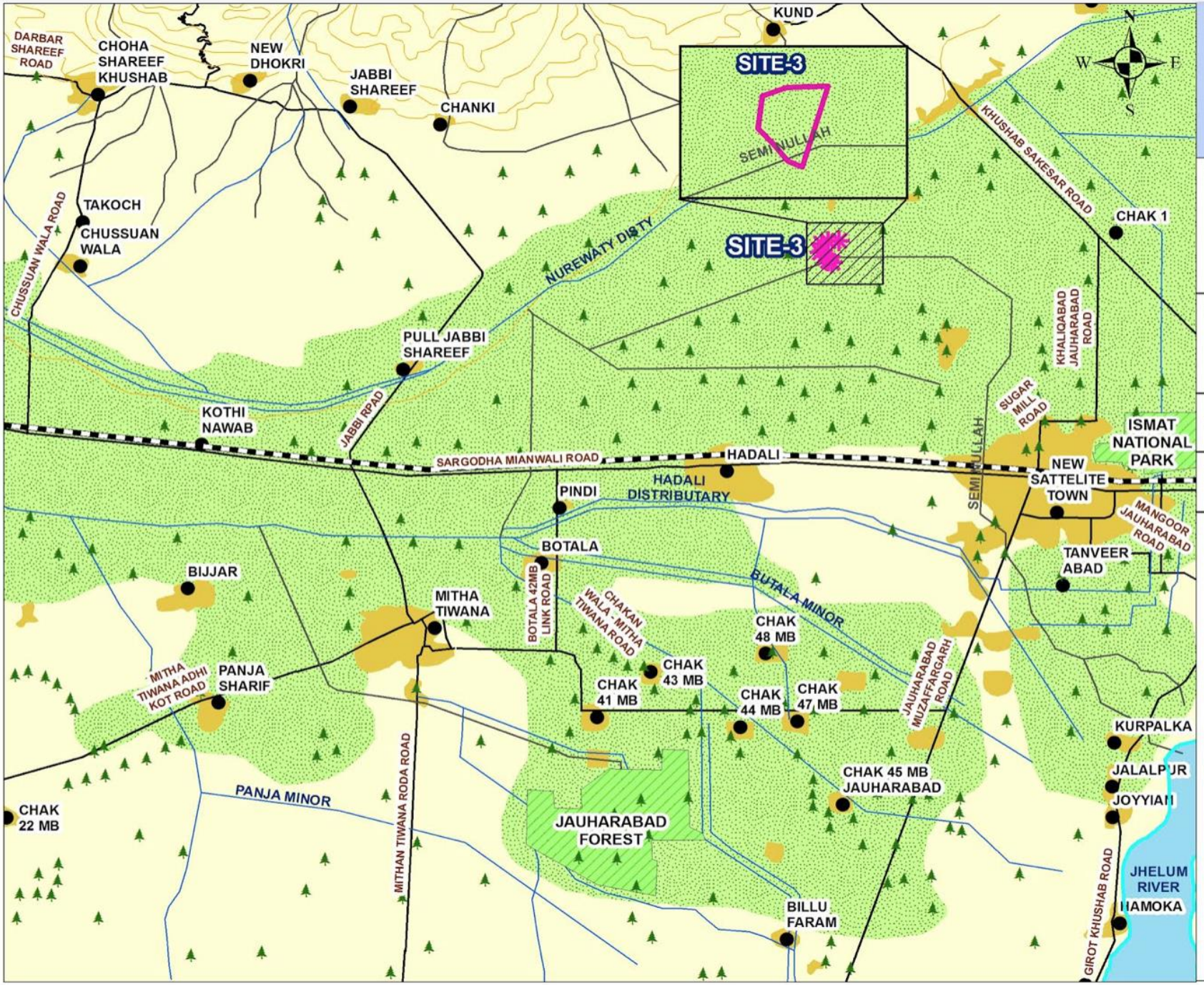
3.9.3 Tower Erection and Scale of Project

89. Tower erection is carried out on the concreted pile pad locations with the help of derrick poles or cranes. The required working area for this activity is about 500 m^2 for each tower. The tower is erected in panels. The panels are assembled on the ground, lifted in parts with the help of derrick poles/crane and then joined together with nuts and bolts, which are tightened at the specified torque.

90. In aligning the high-voltage transmission line, the design aims to avoid cultivated fields and pass through the area as thinly populated as possible. As such, the accessibility will not be a problem. There are tracks and katcha ways and the contractor may have to develop a few tracks for transporting the materials. This should result in very little, if any, damage to the vegetation or disruption of the farmland in the vicinity of the route of transmission line. The transmission line route is easily accessible mostly through metalled road or by kacha tracks or village roads. Almost all the village tracks are linked to the metalled roads and are thus accessible to vehicles. The contractor is unlikely to need to transport the materials manually. In any event, care will be taken that the disruption to the vegetation is kept to a minimum.

91. The environmental impacts are likely to be localized near the supporting tower construction at most places and impacts are reviewed in the environmental impact section of the report. The impacts will need to be reviewed and amended if necessary if the locations change and when the detailed designs are available.

92. The entire sub-project tract is flat with no considerable elevation difference.



Project:
Sub-Project 3: 220 kV Jauharabad Sub-Station With Associated Transmission Line

Drawing Title:
Project Area Map

Drawing Number:
Figure 3.1

Drawing Date: April 2018

Drawing Source: Google Earth/ SOP

Legend

- Site_Location
- City-Town
- Main Road
- Railway Track
- River
- Main Nullah
- Major Cannal
- Revserve Park
- Contour
- Build
- Tree

3.10 Project Alternatives

93. This sub-project of Tranche 3 of MFF-II will contribute to the improvement of the overall performance of the power transmission sector, improving transmission efficiency, broadly widening access to power to drive economic opportunities. The beneficiaries of the subproject will be people, companies, and government and non-government agencies in Pakistan that use power transmission services. Power users will benefit in terms of secure power and improved power safety and potentially increased productivity.

94. Reliable supply of power to industrial, agricultural, commercial and domestic consumers is a lifeline for development and production in these key sectors, which owe a significant contribution in economic growth of the country alleviating poverty. Statistics demonstrate an average increase of 5.30 % per annum in power demand of the country during next 10 years.

95. In the existing system, 132kV Jauharabad has two sources of supply. From one side, it is supported by 220/132kV Ludewala and from the other side by the 220/132kV Daud Khel grid stations. The area loads are on the increasing trend and are expected to rise from 242 MW to 290 MW from 2018 to summer of 2023.

96. Currently, due to transmission constraints, the Quaidabad substation is operated in split mode. This arrangement is done to support overloading, reactive power and voltages of the area in real time.

97. In summer months, voltages fall in the range of 115 to 109 kV on the 132 kV Grid stations in the area. 220/132kV Ludewala transformers (3x 160 = 480MVA) have reached 100% loading of transformers.

98. In order to remove above system constraints and to improve the power supply position for future load growth in FESCO area, a 220/132kV Jauharabad substation has been proposed. Load flow studies have been carried out for future years and it has been observed that a new 220/132kV substation of Jauharabad would significantly improve the system network in that area.

3.10.1 No Project Alternative

99. Electricity demand has been increasing during the past several years and this trend is expected to continue as a result of the on-going economic uplift in the country. The key factors fueling the increasing power demand include increasing population, rapid urbanization, industrialization, improvement in per capita income and village electrification. In order to match the increasing trend in the power demand, regular investments in various segments of the power network generation, transmission and distribution is vitally important. Otherwise, the gap between the supply and demand will continue to increase.

100. In the absence of the sub-project, the potential for interruptions to power supply will increase and socio-economic development of the province could be affected in the short to medium term. In an un-enhanced state, the wear and tear on existing facilities will rise. In the short term, the power supply would improve and more reliable access to secure power would be available.

In consideration of all the rationale provided above, the 'No Project' option is not a preferred alternative.

3.10.2 Alternative Construction Methods

101. The feasibility of the sub-station and transmission line towers is well established locally and installation of equipment is well practiced in the international context (even if some types of equipment are new to Pakistan). The process basically includes the transportation of equipment to site and the assembly of pre-fabricated units' in-situ. Thus, the impacts from construction activities are very manageable from the environmental viewpoint.

3.10.3 Alternative Sub-station location

102. Two other alternative locations were assessed prior to finalizing the proposed site for the sub-station. The major criteria while selecting the sub-station location was as follows:

(i) To identify a location with the least sensitive receptors in close proximity to the identified site.

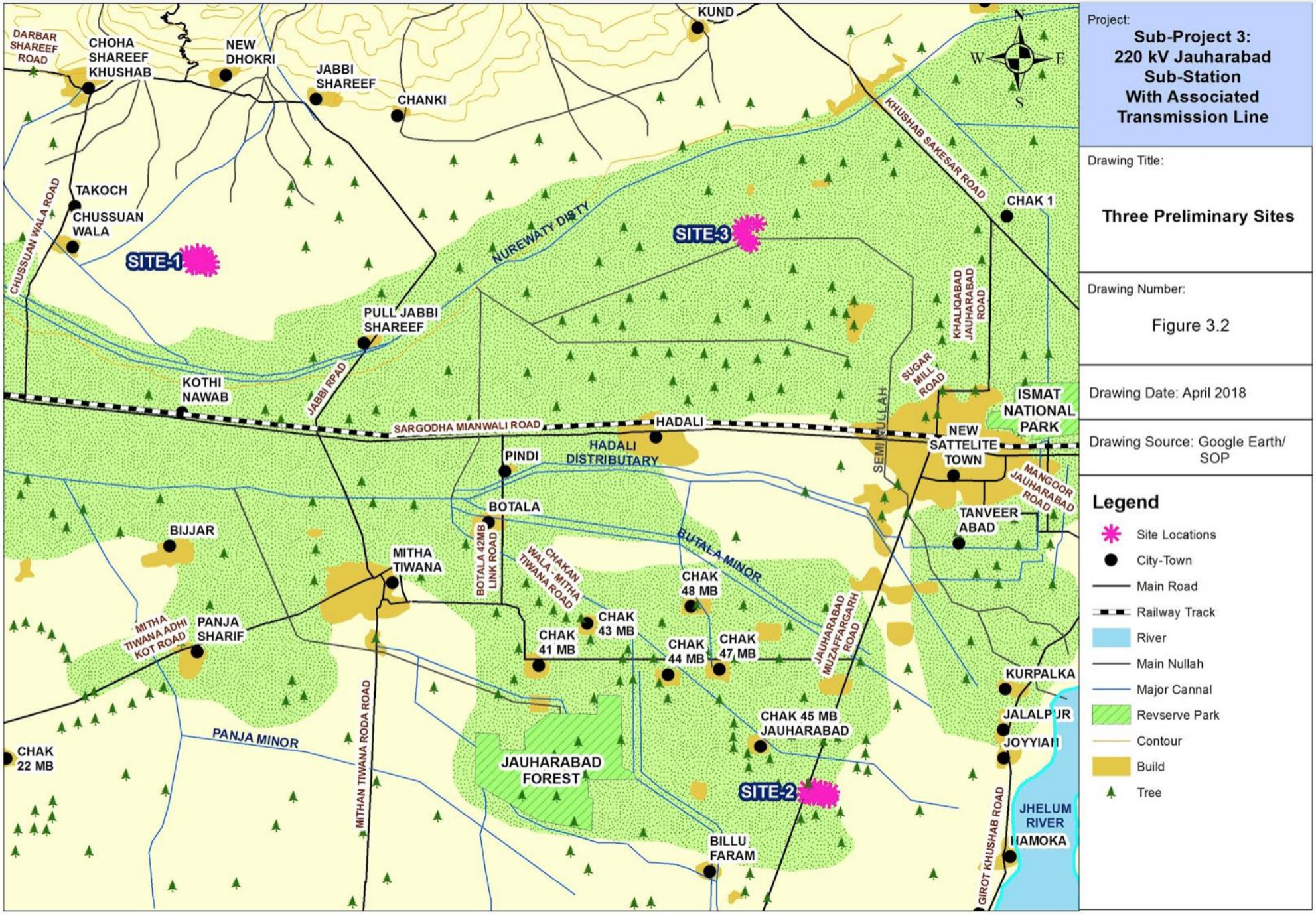
(ii) To identify a location which minimizes the respective distances of the different transmission lines and provides an optimized scenario.

As can be observed in **Figure 3.2**, the Site 2 was located in close proximity to the Jauharabad forest along with a number of other villages and thus was not felt to be a viable location for development of the sub-station. Similarly, Site 1 was also assessed to be located in close proximity to a number of villages and thus was not assessed to be a viable option.

The selected Site 3 is felt to be the most suitable location from both the perspectives mentioned above since it is located within a sparely populated area comprising of agricultural fields and also minimizes the transmission line lengths as far as possible compared to the other two site options.

3.10.4 Alternative Alignment

103. The design and route of the transmission line is being developed to ensure it is as short as possible and avoids the local villages as far as possible by erecting angle towers. The transmission line routes and the settlements shall be avoided as far as possible by passing the lines through cultivated and semi-forested land.


KUND
DARBAR SHAREEF ROAD
CHOHA SHAREEF KHUSHAB
NEW DHOKRI
JABBI SHAREEF
CHANKI
KHUSHAB SAKESAR ROAD
CHAK 1
TAKOCH
CHUSSUAN WALA
CHUSSUAN WALA ROAD
SITE-1
SITE-3
NUREWATY DISTY
PULL JABBI SHAREEF
JABBI RPAD
KOTHI NAWAB
SARGODHA MIANWALI ROAD
HADALI
KHALIQABAD JAUHARABAD ROAD
SUGAR MILL ROAD
ISMAT NATIONAL PARK
NEW SATTELITE TOWN
SEMI ULLAH
PINDI
HADALI DISTRIBUTARY
MANGOOR JAUHARABAD ROAD
BOTALA
TANVEER ABAD
BIJJAR
MITHA TIWANA
BOTALA 42MB LINK ROAD
CHAKAN WALA - MITHA TIWANA ROAD
BUTALA MINOR
CHAK 48 MB
CHAK 43 MB
CHAK 41 MB
CHAK 44 MB
CHAK 47 MB
JAUHARABAD MUZAFFARGARH ROAD
MITHA TIWANA ADHI KOT ROAD
PANJA SHARIF
KURPALKA
JALALPUR
JOYYIAN
CHAK 45 MB JAUHARABAD
PANJA MINOR
MITHAN TIWANA RODA ROAD
CHAK 22 MB
JAUHARABAD FOREST
SITE-2
JHELUM RIVER
HAMOKA
GIROT KHUSHAB ROAD
BILLU FARAM
N
W
E
S
Project:
Sub-Project 3:
220 kV Jauharabad
Sub-Station
With Associated
Transmission Line
Drawing Title:
Three Preliminary Sites
Drawing Number:
Figure 3.2
Drawing Date: April 2018
Drawing Source: Google Earth/ SOP
Legend
Site Locations
City-Town
Main Road
Railway Track
River
Main Nullah
Major Cannal
Revserve Park
Contour
Build
Tree

3.11 Proposed Schedule for Implementation

104. There will be land acquisition for the development of the sub-station and crop compensation for the transmission line towers. Designs, power transmission arrangements, access, review of environmental management and construction processes will also need to be completed. The Project Proponent (NTDC) plans to have this tranche-III sub-project commenced by 2018-19 and completed by 2021-22 after completing the necessary arrangements.

Figure 3.3: Inverted 'T' Type Tower Foundation

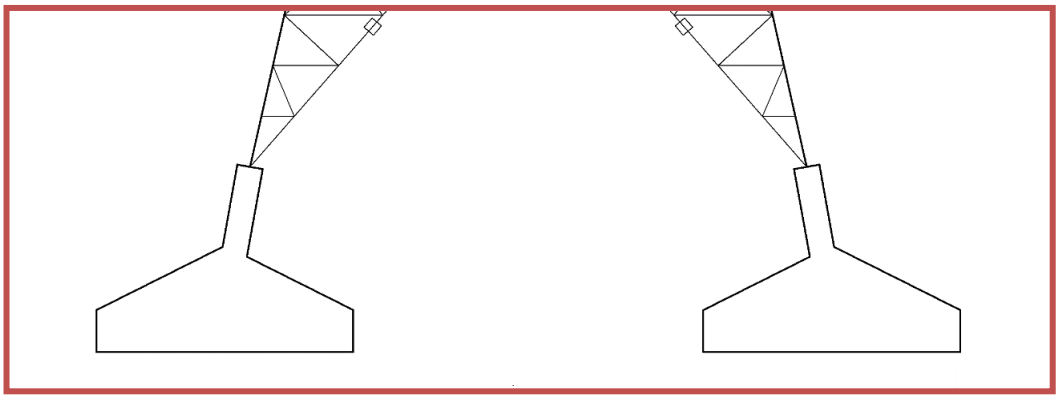


Figure 3.4: Proposed Elevation of Strain Tower

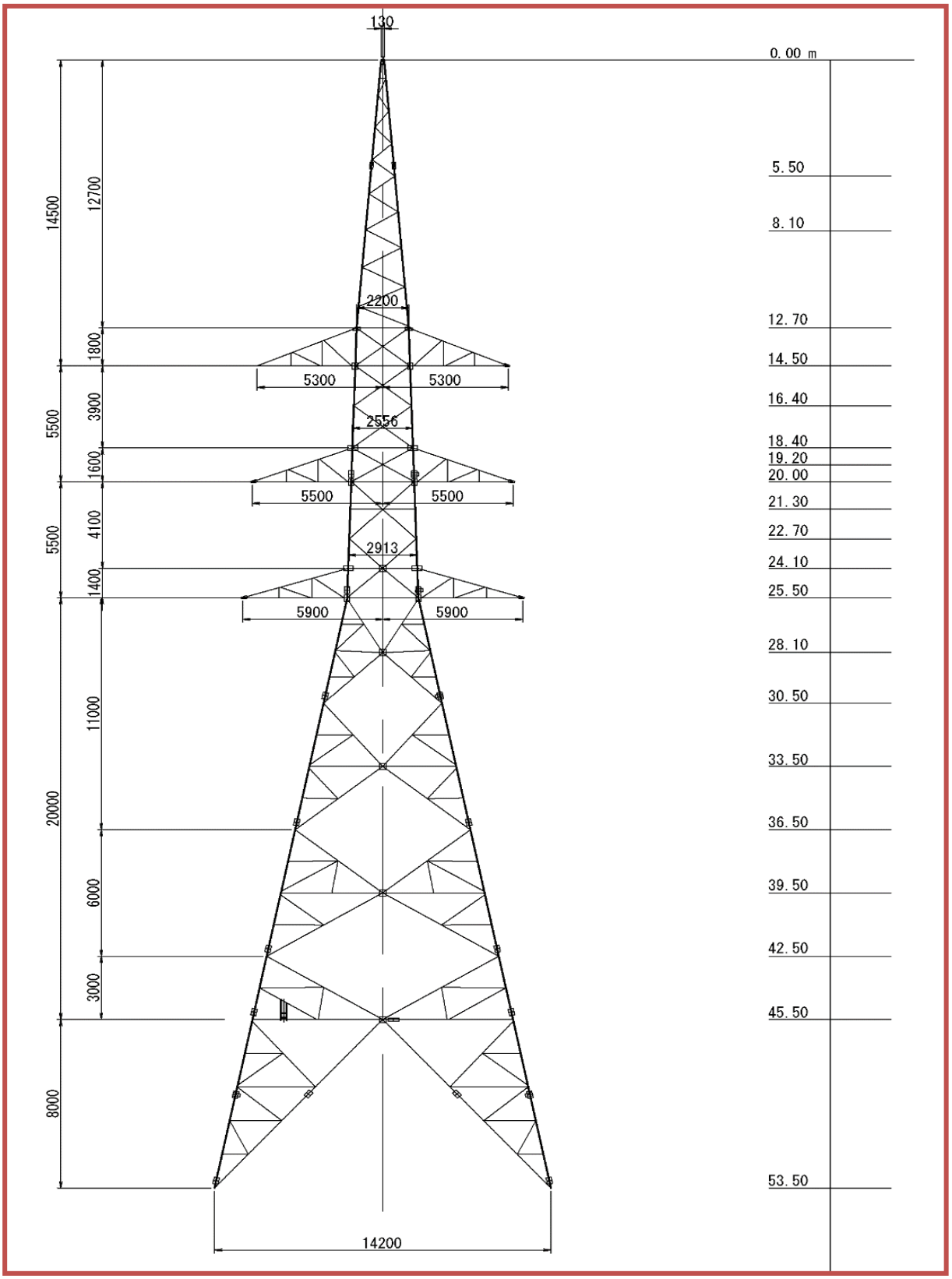
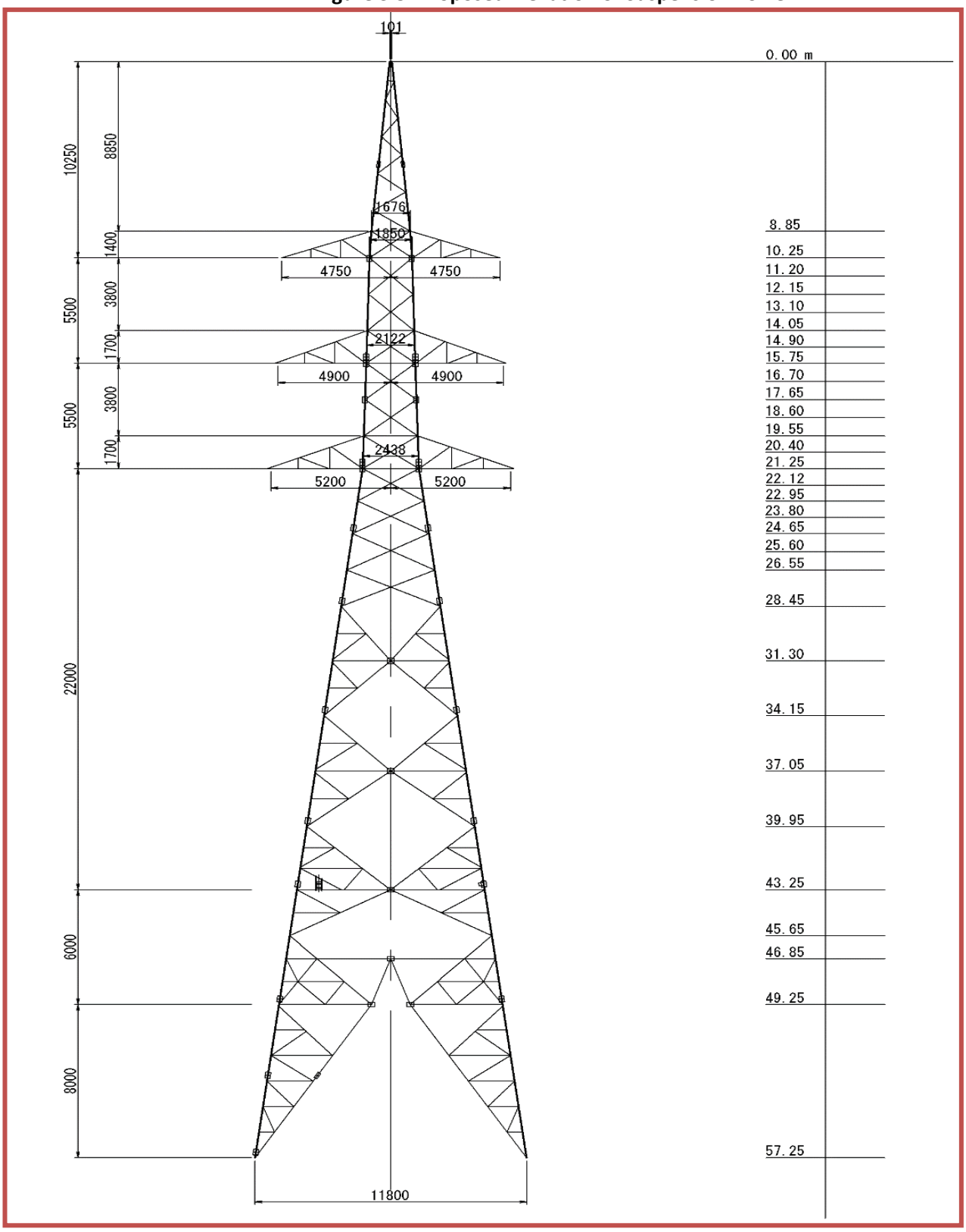


Figure 3.5: Proposed Elevation of Suspension Tower



4 Description of Environment

4.1 General

105. The proposed sub-station 3 consists of development of a sub-station and transmission line in Jauharabad, which is the district headquarters of Khushab district in Punjab province of Pakistan. The detailed description of the project area environment is provided below.

4.2 Physical Resources

4.2.1 Physiography and Geology

106. Khushab is situated between the cities of Sargodha and Mianwali, near the river Jhelum and is located at 32°1′12.62″N72°12′27.02″E. The district headquarters is situated at Jauharabad. Khushab consists of agricultural lowland plains, lakes, and hills. Parts of the Thal desert touch the district, which has a breadth of over 70 miles (110 km) and is situated between the Indus river and the Jhelum river. The district is rich in natural resources (salt and coal). Most people are associated with farming and agriculture. In the 1980s, the district was classified as a tax-relief zone for new industries.

107. This led to the establishment of many industries including cement, sugar, and textiles. There are three lakes (Ochali, Khabbaki and Sodhi Jay Wali) in the district. Garden Kanhatti Garden near Khabbaki village is located in the Soon valley area, which is the largest forest in Khushab district. Katha Saghral area is semi-hilly and mineral area, noted for its coal and salt mining. Khabikki Lake is a salt-water lake in the southern Salt Range area in Pakistan. The lake is one kilometre wide and two kilometres long. Khabikki is also the name of a neighbouring village.

108. Sakaser is the highest mountain in the Salt Range area in Pothohar in Pakistan. It is 1522 metre / 4946 feet high. It is situated in Khushab District but it can be seen from adjoining districts of Mianwali and Chakwal. Ochali or Uchhali Lake is just below the Sakaser mountain, it is a salt-water lake in the southern Salt Range area in Pakistan. Sakaser (1522 metre / 4946 feet), the highest mountain in the Salt Range, looms over the lake. Due to its brackish water, the lake is lifeless.

109. The Soon Valley, or Soon Sakesar is one of the famous valleys of Pakistan situated in the central Punjab province. The Valley is situated in the north west of Khushab. Naushehra is the main town of the Valley. The Valley starts from Padhrar village and ends at Sakesar, which is the highest peak of the Salt Range. The length of Soon Valley is 35 miles (56 km) with an average width of 9 miles (14 km). The area of Soon Valley is 300-square-mile (780 km^2). Although not as cold as the valleys up North, Soon valley consists of beautiful lakes, waterfalls, jungles, natural pools and ponds.

110. Soon valley is also blessed with ancient civilization, natural resources, and fertile farms. There are some special features of this valley that distinguish it from other areas, without knowing about them it is very hard to understand its importance. Sabhral, Khura, Naushehra, Mardwal,Kufri, Angah, Ugali, Uchali, Tiveen and Bagh Shams-ud-Din are important towns in soon valley. Kanhatti Garden, Sodhi Garden, Da'ep and Sakesar are resorts to visit. Awan tribe is settled in Soon Valley of 159 m above mean sea level and lies on the left bank of the Indus river.

111. The district was created in 1981 with Bhakkar city (known as Bakhar in Thalochi dialect of Punjabi language) as the capital. It is an area of 3,134 square miles (8,120 km^2), most of it lies in the desolate plain of the Thal, but the Kachhi or strip of riverine land along the Indus is of great fertility. Its area consists of riverine tract along theInduscalled Kacha and the Thal historically called Chol-e-Jalali. Most of its area comprises greater Thal. Mankera in centre of The Great. Thal is a place of great antiquity.

112. The Indus Valley is that part of the district which lies between two high banks of Indus River. The area close to the main stream is called as “Kacha” and beyond that is known as “Pacca”. The entire area is generally called as “Nasheb”. The floods in Indus, supply water to the cultivated land of “Kacha” area of the district. Thal, the sandy desert and prairie lie above the high banks of the Indus River.

113. Jauharabad lies at the confluence of the Thal desert and the Potohar in flat agricultural territory immediately south of the Salt Range, which marks the end of the Pothohar Plateau and the start of the Punjab plains. The Jhelum River passes 7 km southeast of Jauharabad and on the west of Jauharabad lies the Thal desert. On the east of Jauharabad is the Khushab Reserve Forest, spread over approximately 4 km^2.[2]

4.2.2 Climate & Air Quality [3]

114. The climate of most parts of the project area is arid to semi-arid characterized by four seasons in a year, that is, winter from mid November to February, spring during March and April summer from May to mid September and autumn from mid September to mid November. There exist several meteorological stations in the project area; data recorded at some of these stations is provided in the following sections.

115. There is negligible variation of altitude above sea level in the area over which this sub-project is located. The climate in general is typical of that of Central Punjab. The climate in the project area is hot during the summers and moderately cold in the winters.

[2] https://en.wikipedia.org/wiki/Jauharabad

[3] https://en.climate-data.org/location/3511/

https://www.meteoblue.com/en/weather/forecast/modelclimate/jauharabad_pakistan_1165221

116. The mean maximum and minimum temperatures in summers are 40°C and 27°C, while in winters it is 19°C and 7°C respectively. The summer season starts from April and continues till October. May, June and July are the hottest months. The winter season on the other hand starts from November and continues till March. December, January and February are the coldest months as shown in **Figure 4.1** below.

117. The rainy season starts in July and ends in September. Annual rainfall is 888 mm. More rain occurs in July and August than any other months. Most of the winter rains are received in the months of July, August and September. Winter rainfalls are rare and scanty as shown in **Figure 4.2** below.

118. The relative humidity during the rainy season is as high as 60-70%. During the dry months, it falls below 50%. The average daily relative humidity for July is around 69% as shown in **Figure 4.3** below.

119. The air quality in the sub-project corridor appears good based on observations during the study period. Emissions, if any, shall be controlled at source under the EMP. There will be a few items of powered mechanical equipment to be used in the proposed works that may give rise to limited quantities of dust and other emissions. However, these should be minor and easily dissipated. Domestic sources of air pollution, such as emissions from wood and kerosene burning stoves as well as small diesel standby generators in some households, are minor.

120. The project area corridor is distant from major sources of air pollution such as industries or urban type traffic, domestic sources such as burning of wood and kerosene stoves etc. or fugitive sources such as burning of solid wastes. Air quality in the project corridor appeared good during the study period. It should be possible to control and manage emissions from project activities at source, under the EMP.

121. The activities to be conducted for development of the sub-project or its subsequent operation are not expected to result in any increase in vulnerability to climate related impacts such as floods, cyclone winds etc. This is largely due to the nature of the project, which does not involve contribution to global warming or climate change in any way.

Figure 4.1: Annual variation in Temperature in Project Area[4]

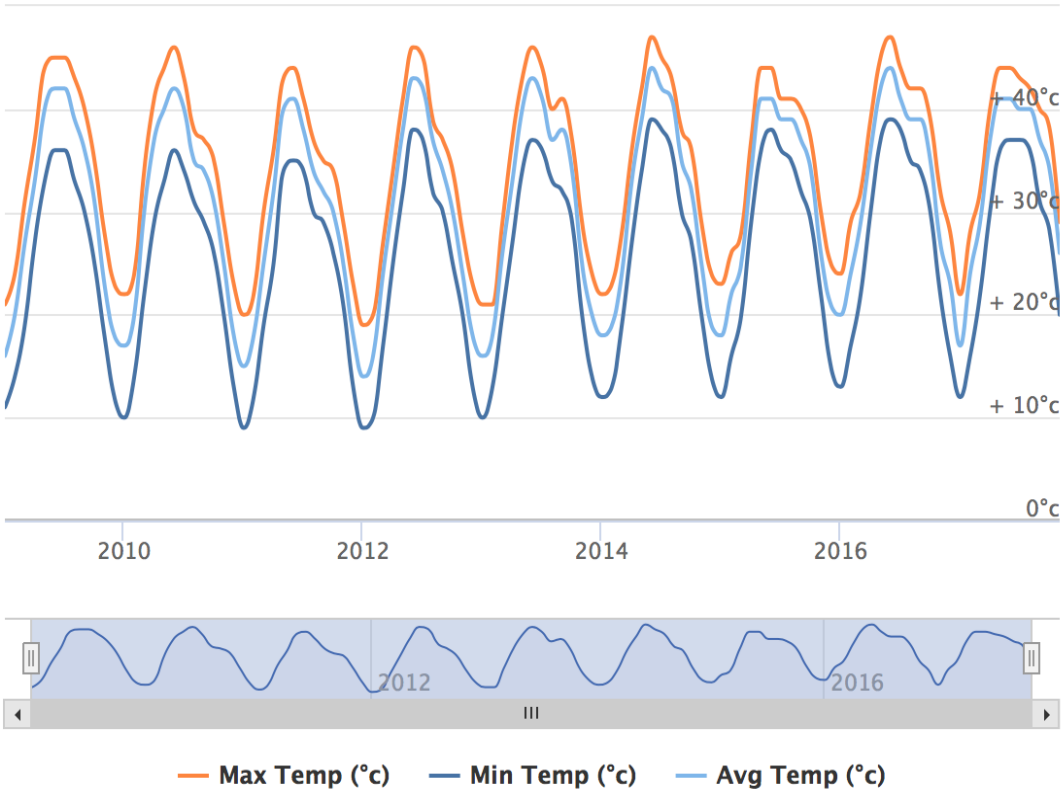
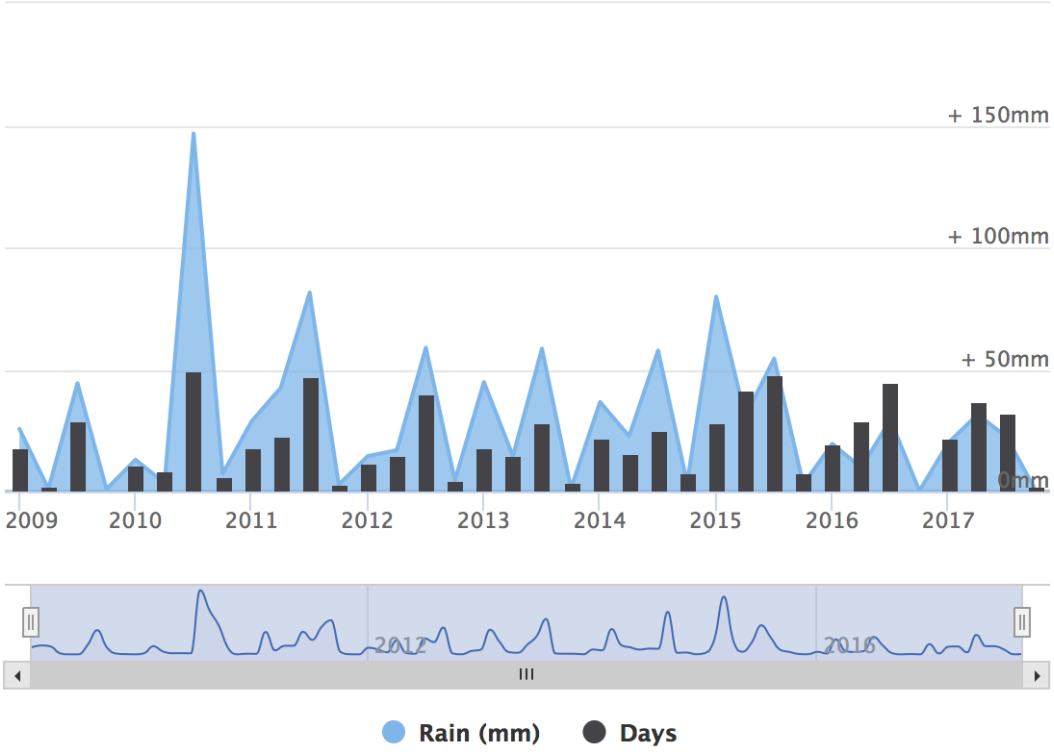


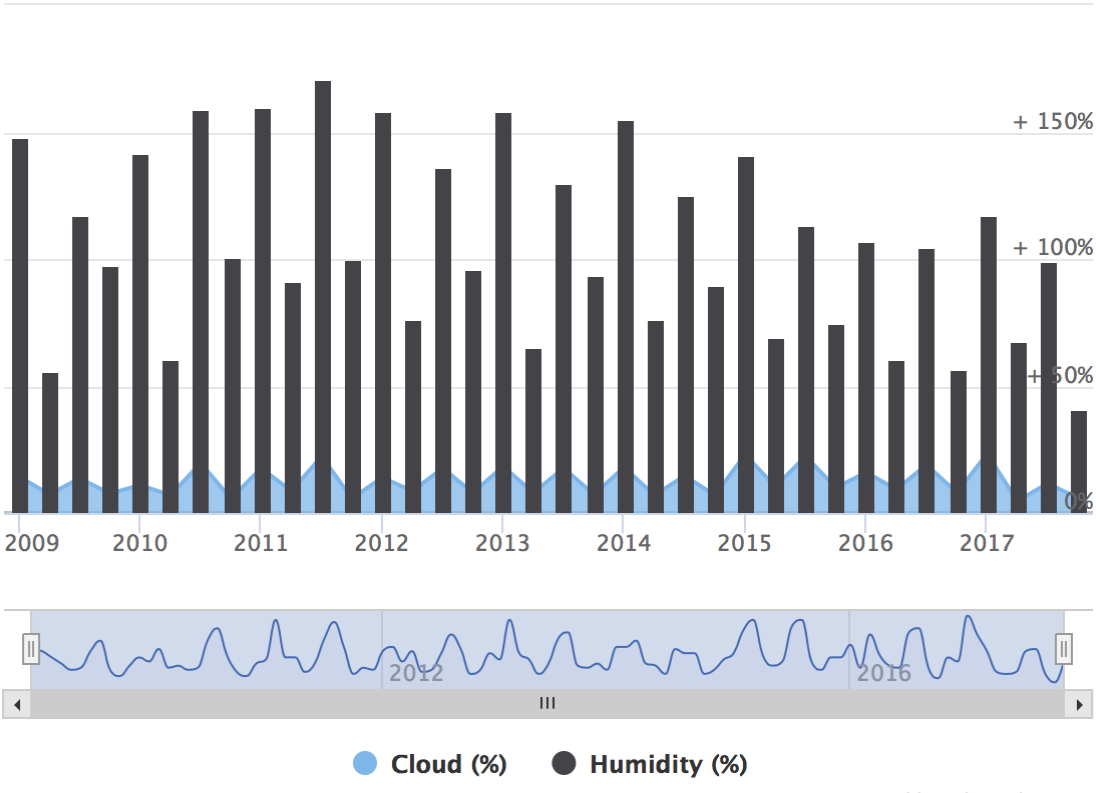
Figure 4.2: Annual variation in Rainfall in Project Area[5]



[4] https://www.worldweatheronline.com/lang/en-pk/jauharabad-weather-averages/punjab/pk.aspx

[5] https://www.worldweatheronline.com/lang/en-pk/Jauharabad-weather-averages/punjab/pk.aspx

Figure 4.3: Annual variation in Humidity in Project Area[6]



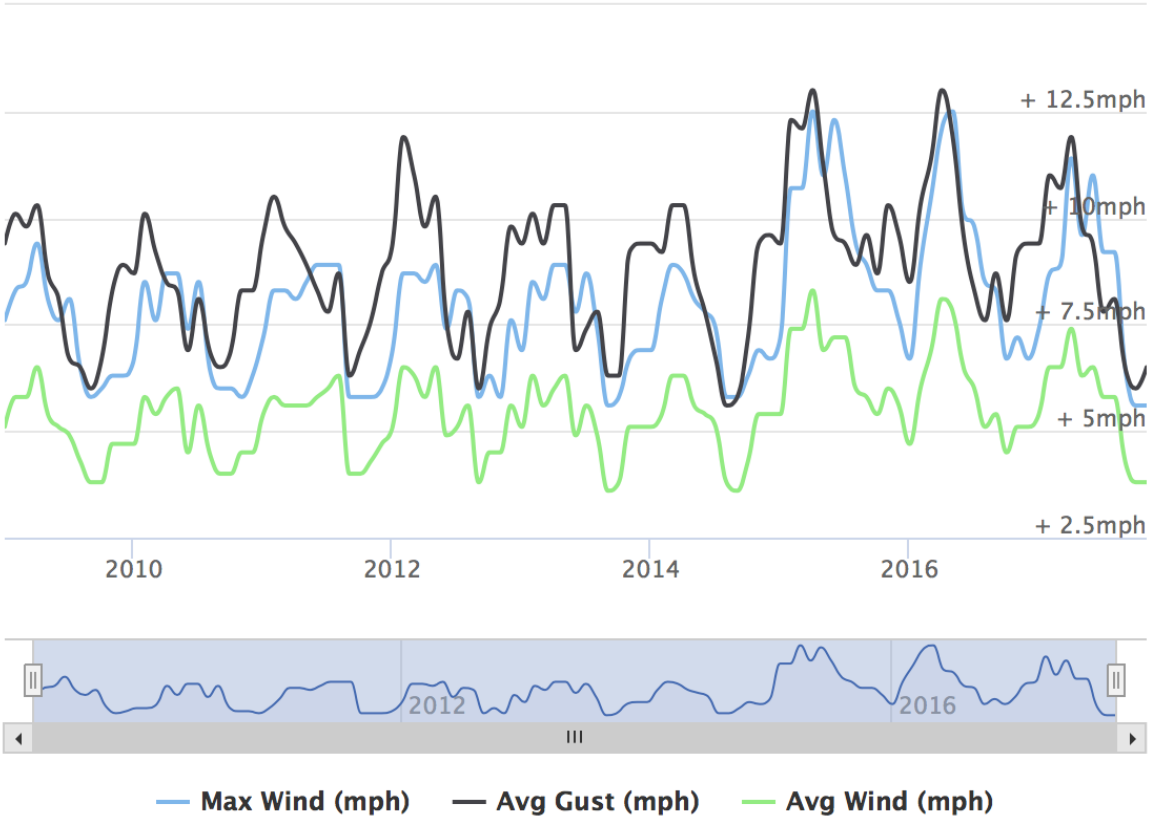
4.2.3 Wind velocity[7]

122. The average daily wind speed in July has been recorded to be around 4 km/hr, which is the equivalent to about 3 mph, or 2 knots. In recent years, the maximum sustained wind speed has reached 61 km/hr, which is the equivalent of around 38 mph, or 33 knots. Prevalent wind velocity is 10 to 25 km/hr as shown in **Figure 4.4** below.

[6] https://www.worldweatheronline.com/lang/en-pk/Jauharabad-weather-averages/punjab/pk.aspx

[7] https://www.meteoblue.com/en/weather/forecast/modelclimate/jauharabad_pakistan_1165221

Figure 4.4: Annual variation in Wind Speeds in Project Area[8]



4.2.4 Geology and Soils[9]

123. The area has both piedmont and floodplain deposits. The piedmont material originates from the Himalaya foothills. The foothills consist of sedimentary rocks that were eroded from igneous, metamorphic and old sedimentary rocks without much pre-weathering.

124. The soil is alluvial and fertile. The types of soil commonly found in the sub-project area are Gora, Rohi, Doshai, Maira, Tibba, Kallar and Riverine.

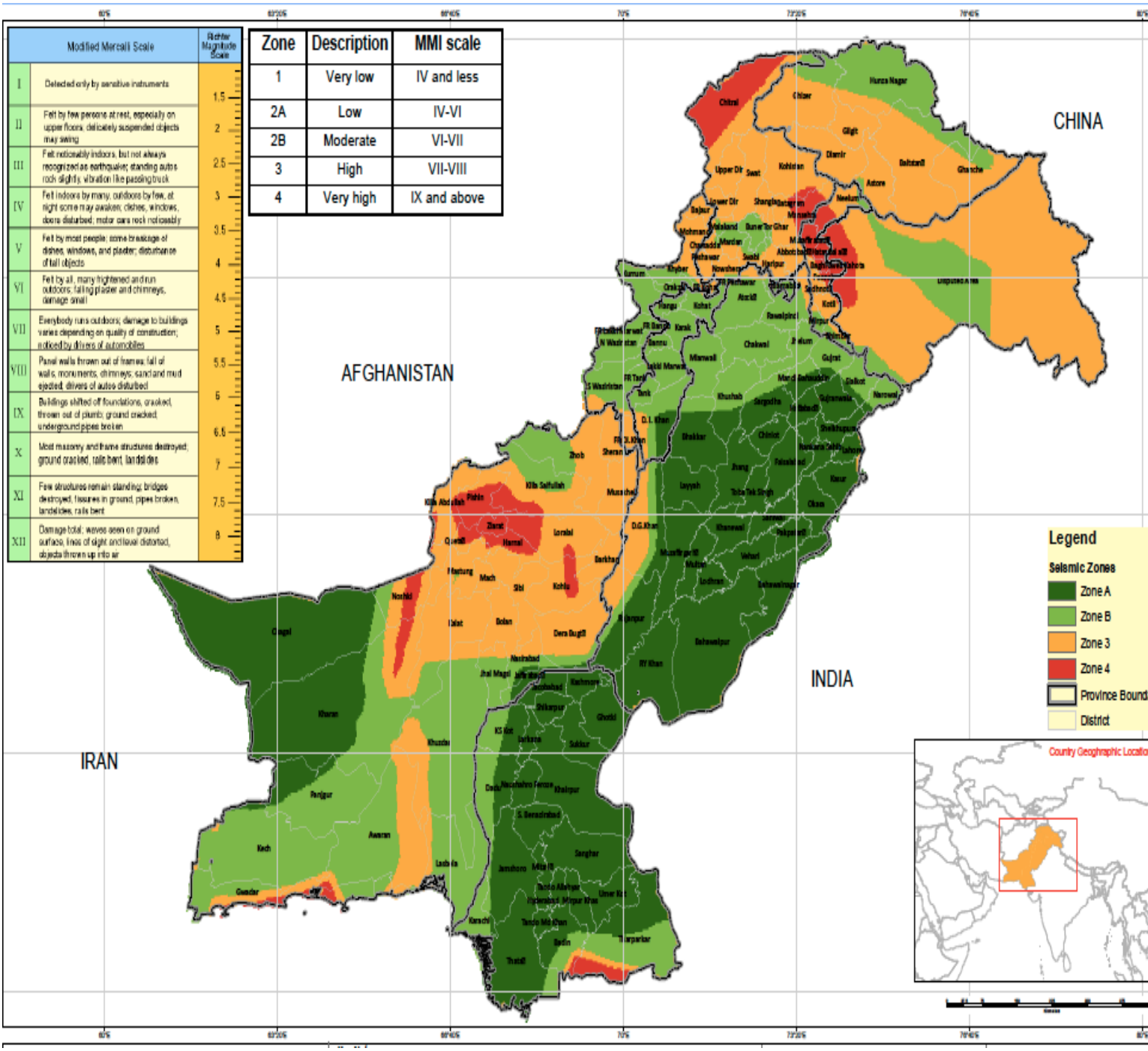
4.2.5 Seismology

125. The seismic zone map of Pakistan is shown in **Figure 4.5** below. As can be observed, the project location lies in the green colored 'Zone 2A' which depicts low risk.

[8] https://www.worldweatheronline.com/lang/en-pk/jauharabad-weather-averages/punjab/pk.aspx

[9] Geologicla Survey of Pakistan, www.gsp.com.pk

Figure 4.5: Seismic Zones of Pakistan



4.2.6 Surface and Groundwater

126. The major surface water source in the area is the Indus river which flows at the right side of Bhakkar district. In addition to that there are few other surface water sources, which are used for irrigation purposes for agricultural lands in the area.

127. The strata are water bearing in the sub-project area, giving good groundwater potential through the sub-project districts and the water table is near the surface in the plains. The depth to groundwater varies from 10 to 30 meters. The water table in the project area rises during the rainy season (July and August) and

declines during the dry season (October to December) when the ground water abstraction is higher.

128. Boring of tube wells to obtain underground water is standard practice being implemented by residents in the area to ensure continuous supply of water. Sufficient underground water reserves with rapid recharge in the project area are evident since no shortage of water has ever been experienced by the residents, even during the summer seasons despite scarcity of rains.

4.2.7 Groundwater Quality

129. The secondary baseline data of ground water quality collected in the project area is provided in **Table 4.1** below.

Table 4.1: Water Quality in Jauharabad[10]

S/No.	Water Quality Parameter	Unit	WHO Standard for Drinking Water	Water Quality Results	
				January 2012	January 2013
1	pH	-	6.5-8.5	7.39	7.10
2	Conductivity	ms/cm	NG	5.04	5.48
3	Total Dissolved Salts (TDS)	mg/l	1000 (WHO)	3225	3507
4	Hardness	mg/l	500 (WHO)	326	984
5	Alkalinity	mg/l	NG	152	490
6	Chromium	mg/l	0.05	<0.01	<0.01
7	Lead	mg/l	0.01	<0.01	<0.01
8	Turbidity	*FAU	NG	<1 FAU	<1 FAU
9	Total Coliform	0 cfu/100ml	Nil (WHO)	95	20

4.2.8 Noise

[10] http://fesco.com.pk/Downloads/Approved%20%20IEE%20Report%20Tranche-4(merged).pdf

130. Noise from vehicles and other powered mechanical equipment is intermittent. There are also the occasional calls to prayer from the PA systems at the local mosques but there are no significant disturbances to the typical setting.

131. Noise and vibration from compaction during construction of foundations may be a significant local impact, particularly to the households lying either in close proximity or directly under the OHL or the sub-station location.

4.3 Ecological Resources

4.3.1 Flora

132. The habitat is mostly modified due to human interventions in the area for many decades. The flora present in the sub-project area is provided in the **Table 4.2** below.

Table 4.2: Existing Flora in Project Area[11]

Trees			
Common Name	**Scientific Name**	**Common Name**	**Scientific Name**
Bohar	Ficus Bengalensis	**Kikar/Babul**	Acacia nilotica
Mulberry	Morus alba	**Simal**	Bombax ceiba
Lasoora	Cordia Obliqua	**Peepal**	Ficus relifiosa
Siris	Albizzia lebbela	**Sheesham/Talli**	Dalbergia sissoo
Amaltas	Cassia fistula	**Sufaida**	Eucalyptus Camelduleusis
Dharek/Bakain	Melia azedarach	**Ber**	Zizyphus jujuba
Other Plants			
Harmal	Peganum harmala	**Khabbal**	Cynodon dactylon
Pohli	Argemone maxicana	**Datura**	Datura alba
Khardar	Alhaji camelorum	**Phog**	Calligonum polygnoides
Malla	Zizyphus numularia	**Laily**	Convolvulus arvensis
Shahtara	Fumaria parviflora	**Saunchal**	Malva parviflora
Dhodhak	Euphorbia sp.	**It sit**	Boerhauid diffusa
AK	Calotropis procera	**Bathu**	Chenopodium album
Aksin	Ipomea crassicaulis	**Datura**	Datura inrokia
Dib Koonder	Typha elephantina	**Jantar**	Sesbania sesbans
Deela	Cyperus rotundus	**Bhang**	Cannabis sativa
Tropical Thorn Forest Flora			
Jand	Prosopis Spicigera	**Var**	Salvadora oleoides
Karir	Capparis aphylla	**Peeloo**	Salvadora Persica

[11] http://uu.urbanunit.gov.pk/Documents/Publications/0/115.pdf

133. Agricultural crops include wheat, maize, sugarcane and tobacco in Rabi season and rice and pulses in Kharif season. The flora plays a significant role in the local economy by way of timber and fuel wood production, protection from wind and water erosion, habitat of birds and animals environmental balance, cultural identification and rehabilitation of soils affected by water logging and salinity.

134. Trees will be enumerated species wise and compensatory plantation will be arranged along roads and paths through forestry. To replace the removed trees, sufficient areas will be identified to allow plantation of trees at a rate of 5:1. Moreover, owners of the affected trees will be paid compensation for their loss.

4.3.2 Fauna

135. The immediate and surrounding area of the project has been under human interference for a long time and, therefore, a large number of wildlife species have already shifted to other sites where they could find protection. The species left behind are those which have either adjusted with the present state of habitat or have adapted so they keep migrating between alternate habitats to strike their best balance with physical, biological or human factors of environment. No threatened species were observed to be present in the project area.

136. The fauna present in the project area is provided in the **Table 4.3** below.

Table 4.3: Existing Fauna in Project Area[12]

Mammals			
Common Name	**Scientific Name**	**Common Name**	**Scientific Name**
Jungle Cat	Felis chaus	**Hare/Siah**	Lepus nigricolus
Bat/Changadar	Pipistralius terwis	**Wild boar/Soor/Khinzeer**	Sus scrofa
Gheese/House Shrew	Suncus marinus	**Jackal/Gidder**	Canis auries
Black Rat	Ratus ratus	**Hedge Hog**	Hemiechinus Sp.
House Rat	Mus musculus	**Porcupine/She**	Hystrise indirca
Mole Rat	Bandicota bengalensis	**Squirrel/Gulehri**	Fumbulus penanti
Birds (Seed Eating Birds)			
Dove/Common Dove	Streptophelia senegalusis	**Indian Sand Martins**	Riparia paludicola
Dove/Common Dove	Streptophelia tranquefabria	**Indian River Tern**	Sterna auranlia
Larks	Mirfa erythroptra	**Black Partridge**	Francolinus francolinus
Stark/Bagla	Bagla	**Common Babler/Bagla/Chakkira**	Turdoides candatus

[12] http://uu.urbanunit.gov.pk/Documents/Publications/0/115.pdf

Weaver Bird	Ploceus phillipinus	**Grey Partridge**	Pyeronotus xythopygos
Dove (Ring necked)	Streptopelia dacaocto	**Woody-Wood Pecker (Chakki Ra)**	Chakki Ra
Resident Birds of Prey			
Brahminy Kite	Haliaster Indus	**Black Kite**	Milvus rigrans
White breasted King Fisher	Heleyon sinyrnensis		
Common Terrestrial Birds			
Grey Partridge	Pyeronotus xynthopygos	**House Sparrow**	Passer spp
Jungle Pigeon	Teron walia	**Russian Sparrow**	Hirundo rustica
Sun Bird	Necterine spp	**Crow**	Corcias abyssinicus
Owl	Bubo Africans	**Parakeets/Tota**	Psittaciformes
Shrikes	Passeriformes	**Rollers**	Passeriformes
Tree-pies	Passeriformes	**Neel Kanth**	Gracius garrulous
Fly Catchers	Passeriformes	**Common Babler**	Turdiodes cardatus
Mynas	Passeriformes	**Munias**	Passeriformes
Bee-eaters	Passeriformes	**Koel**	Koel
Minivits	Passeriformes	**Parrot**	Psittacula krameri
Quail (Batera)	Pycnonotus cafer	**Black Rock Pigeon**	Columbia livia
Reptiles			
Chequered Keel back Snake	Natrix piscator	**Common Field Lizard**	Uromastrix hardwickir
Dark-bellied marsh Snake	Xenochrophis cerasogaster	**Common House Lizard**	Geko geko
Indian Monitor Lizard	Veranus bengalensis	**Frogs**	Rara Tigrina

Protected and Religious Trees

137. There are no protected or religious trees at the sub-station site or along the corridor of the proposed transmission line route. The works, however, must deal with any trees that need to be lopped or removed for safety reasons, with the necessary permissions and compensation if required.

4.3.3 Transmission Infrastructure over roads & Overhead Lines (OHLs)

138. It shall be ensured during the selection of the OHL alignment that buildings and trees are avoided as far as possible. In instances where the OHLs do pass over any households or trees, all necessary safety measures shall be implemented to ensure the safety of the households through necessary grounding and preventive inspection and maintenance of the lines, particularly after strong winds or storms etc.

139. In the case of trees coming in the path of the OHLs, all efforts shall be made to ensure that the height of the OHL is considerably greater than any trees to prevent

any issues. Furthermore, any such trees lying in the path of the OHL shall be trimmed to ensure their branches do not come into contact with the line and do not cause any damage or accident.

4.3.4 Protected Areas/National Sanctuaries

140. There is no protected area in the vicinity of the sub-project area.

4.3.5 Game Reserves & Wildlife Sanctuaries

141. No game reserves and wildlife sanctuaries exist in the vicinity of the project corridor.

4.4 Socioeconomic Resources

4.4.1 Sensitive Receptors

142. The alignment of the transmission line shall be designed to ensure settlements are avoided as far as possible in order to minimize potential environmental and social impacts resulting from the construction and operation of the line.

143. Once the recommended mitigation measures are implemented for the construction and operation phases of the project, no long-term significant adverse impacts are expected.

4.4.2 Land Acquisition & Resettlement

144. A detailed LARP shall be prepared for the scope of work to be conducted for this sub-project 3.

4.4.3 Human and Economic Development

Administrative Setup

145. The scope of work for the sub-project lies in Khushab district. As per Provincial Local Government Ordinances, 2001, Union Council is the lowest tier of the local government system. It is constituted of selected council normally representing five to ten villages depending upon population, while four to five union councils form the next higher tier of governance, viz., Tehsil Council. Tehsils are sub-units of a district, which is the highest tier of local government system and deals with the administrative and revenue matters. District is normally constituted of three to five tehsils, and is governed by District Council.

146. In the existing local government system of the project area, the union councils consist of members directly elected through open competition, who also form the Electoral College for the selection of members of the next higher tiers. In this way, it has also been ensured that the councils have a sizeable representation

from the vulnerable groups particularly the labor and female members of communities.

147. Khushab district is spread over 6,511 km^2 and has a population of 1.281 million (2017) and comprises of four tehsils i.e. Khushab, Noorpur Thal, Quaidabad and Naushera.

Religion

148. The project area consists primarily of Muslim communities with a few minorities residing in peace and harmony. The area has no past record of communal riots or presence of any terrorist activity within the immediate area.

Languages

149. The mother tongue in the area is Punjabi with Urdu spoken as the national language.

Occupations

150. The majority of males and females work in agricultural fields as labor. A considerable number of poor families also work on brick kilns as an inherited family profession. Others work in trade, agri-marketing and other low-income professions such as cobblers, barbers, motorcycle mechanics and vendors.

Archaeological and Cultural Heritage

151. No archaeological or cultural heritage has been observed during the survey and neither was it reported. However, if at any stage any archaeological or physical heritage is discovered, it shall be managed as per established protocol from the department of Museum and Archaeology, GOP.

Energy Supplies

152. Almost all villages in the sub-project area are connected to the WAPDA grid. Unfortunately, only 20 percent of the households have been provided Sui gas connections while the remaining communities are forced to use LPG cylinders or firewood. Some poor communities also use cow dung for cooking purposes.

Communication

153. Majority of the community members possess cellular phones. PTCL line is present in the area but is not used commonly except in Public Call offices (PCOs). Some youth is IT literate and use desktop computers and have access to the internet. Postal service is available in all villages in the area. On special occasions, messages are also conveyed through word of mouth or on mosque loud speakers. Less than 10% of the community members have televisions at home while over 60 percent of the communities use radios to stay updated.

4.4.4 Economic Development

Agriculture, Livestock and Industries

154. The agriculture is by far the main economic activity in central/ southern Punjab. The main crops during Rabi are wheat, gram, rape, mustard, barley and oil seeds. In Kharif, cotton, jawar, sugarcane, bajra, maize and rice are grown. In addition, there are subsidiary crops known as Zaid Rabi like Kharbooza, tobacco and potatoes and Zaid Kharif like potatoes and chilies. The main fruits grown are mangoes, date, malta, orange, water and musk melon, guava, citrus, falsa, jaman and pomegranate.

155. In the beginning of the cultivation era, the inhabitants used to eat Pilu and Bair, the only wild fruits that grows intermittently. With the introduction of canal irrigation, mango and other fruits are being grown on commercial basis. Wheat, cotton, sugarcane and rice are the major crops, whereas mango and citrus are the major fruits of the area. As per cropping pattern, wheat and sugarcane are the highest grown crops in the area.

156. Livestock breeding is one of the main pursuits and means of livelihood of the communities in the project area. Buffalo, sheep, goats and cows are common livestock animals and serve as an important source of income.

157. Roads are the means of transportation for the movement of both people and goods in the district and connect the areas with other parts of the country. These project area district is connected with other parts of the country through the G.T road as well as the Motorway (M-2). The nearest airport is located in Lahore, located at a distance of approximately 40 kilometers.

158. **Horticulture:** The main fruits grown in this project district are Jaman, falsa, malta, kino, fruiter, sweet lemon, plum, mulberry, guava and pomegranate. The principal vegetables grown in the district are onions, potatoes, ginger, egg plant, arum, lady finger, spinach, mint, tomato, turnip, carrot, cauliflower, bitter gourd, garlic, pea, reddish and cucumber etc.

159. The soil as well as climate is quite suitable for growing citrus fruits like malta, kino, lemon etc, and guava. Horticulture is being practiced on about 8,000 acres, which produces about 3000 tons of fruits and vegetables.

160. **Industry**: Different types of industrial units are present in the district, including cotton ginning & pressing, dairy products, rice and four mills, brick kilns etc. However, agriculture is the mainstream activity in the area. These industries are contributing towards the Gross domestic product (GDP) of the country.

161. **Transportation:** The mode of transport in the local areas are through vans, motorbikes, chingchi rickshaws, buses etc., people of the areas used all mode of transport for their purposes.

4.4.5 Social and Cultural Resources

Communities and Employment

162. According to Punjab Development Statics 2008, the total poulation of Khushab district is 1,063,000 out of which 532,000 are male and 531,000 are female. The district consists of three tehsils, Khushab, Noorpur Thal and Quaidabad and a sub-tehsil Naushehra. Inhabitants of Khushab district speak a great variety of Punjabi dialects: which are as follows:

- Shapuri (Main dialect of the district)
- Majhi or standard (in cities)
- Pothohari (Northern Hilly Side),
- Thalochi (southern areas near bhakar)
- Jandali (western areas near Mianwali).
- Urdu being national language is spoken and understood by most of the population.
- English is also understood and spoken by the educated elite.

163. The population of the district consists of self-employed (including farming and trade), private employees and government employees.

164. The main occupation of women in rural areas is house-keeping, which includes attending to the cattle, extracting butter and ghee from milk, weaving and sewing of family clothes. In addition, they generally help their men-folk on farms with the lighter duties like transplanting of seedlings, threshing and winnowing of grains and sometimes they also help in harvesting. In the city, the women are housewives or work as doctors, nurses and teachers.

Education

165. According to the official website of district Khushab, the literacy ratio of the district is has incresed from 21.4 % (1981) to 40.5% (1988). The number of educational institutions and their enrolement 2007-08 is given in the **Table 4.4** below

Table 4.4: Educational Institutions by Level of Education, 2008

Name of Institute	Civil District	Institute		Enrolment		Teaching Staff	
		Male	Female	Male	Female	Male	Female
Primary	Khushab	484	351	47,263	32,738	1444	1000
Middle		65	53	18,076	12,926	660	482
High/Secondary		55	19	26,844	9,443	949	397
Higher		6	4	192	533	34	38

Secondary							
Intermediate and Degree Colleges		4	8	1720	2541	67	99
Intermediate Colleges		-	4	-	515	-	58
Degree Colleges		4	4	1720	2026	67	41
Mosque Schools		164	-	6099	-	171	-

Source: Punjab Development Statistics, Bureau of Statistics Punjab, 2009

Health Care

166. Sufficient medical and health facilities are available in the project area. District headquarter & taulka headquarter hospitals are established at district & tehsil headquarters respectively. In rural areas, dispensaries & rural health centers are functional. There are also other hospitals of voluntary organizations, which provide health cover to the general public. The **Table 4.5** shows the number of health institutions in Khushab district.

Table 4.5: Number of Health Institutions with Bed Capacity, 2008

Institute	**Civil District**	**Number**	**Beds Capacity**
Hospitals	Khushab	8	393
Dispensary		34	-
Rural Health Center		5	60
Basic Health Center		41	76
T.B. Clinic		1	-
Sub-health Center		9	-
M.C.H Centers		7	-

Source: Punjab Development Statistics, Bureau of Statistics Punjab, 2009

5 Potential Environmental Impacts and Mitigation Measures

167. This chapter presents the potential environmental impacts related to construction and operation phases of the proposed sub-project 3. Following is a description of the environmental impacts and the proposed mitigation measures to minimize the negative impacts, if any.

168. Since the scope of work for this sub-project consists of the following two major components:

- Jauharabad sub-station development
- Laying of transmission line (12 km)

Thus, this impact analysis contains the following two components:

(i) Impact analysis for Jauharabad sub-station development

(ii) Impact analysis for the transmission line development

5.1 Project Location Impact Assessment and Mitigation

169. The location and scale of the works are very important in predicting the environmental impacts. This process of impact prediction is the core of the IEE process. It is critical that the recommendations and mitigation measures are carried out according to the conditions on the ground in the affected areas in the spirit of the environmental assessment process.

170. The environmental management plans (**Tables 6.1 and 6.2**) has been compiled based on the available information and shall be reviewed in due course at project inception and through construction in order to receive feedback and provide updated mitigation requirements for any significant unpredicted impacts. The analysis primarily focuses on the key environmental issues likely to arise from the sub-project implementation, to prescribe mitigation measures to be integrated in the project design, to design monitoring and evaluation schedules to be implemented during sub-project construction and to estimate costs required for implementing sub-project mitigation measures.

171. The EMP plan must be reviewed when the sub-project reaches the inception stage by the project management team and be approved before any construction activity is initiated, to take account of any subsequent changes and fine tuning of the proposals.

5.2 General Approach to Mitigation

172. During the preparation of the construction phase for this sub-project, the future contractors must be notified and prepared to co-operate with the executing

agency, project management, supervising consultants and local population in the mitigation of impacts. Furthermore, the contractor must be primed through bidding stages and the contract documentation to implement the EMP in full and be ready to engage trained environmental management staff to audit the effectiveness and review mitigation measures as the project proceeds.

173. Furthermore, prior to the onset of the construction activity, the Construction Contractor will be obliged to develop a site-specific environmental management plan (SSEMP), which must be submitted to NTDC for approval. The Construction Contractor will be entitled to start the construction works only after the SSEMP is approved by NTDC.

Jauharabad Sub-station development

5.3 Potential Environmental Impacts during Pre-Construction Stage

5.3.1 Impact due to Land Acquisition

Impact analysis

174. Land will be required for construction of the proposed grid station, which is presently being used for agriculture. The exact status of the number of owners of the identified plot of land has yet to be determined and shall be provided once known.

Mitigation measures

175. The acquisition of this plot of land shall be conducted in accordance with the LARP, which is in the process of being developed in accordance with ADB SPS 2009 regulations, and it shall be ensured that the entire land acquisition process is completely fair and transparent.

5.3.2 Cultural Heritage & Religious Sites

Impact analysis

176. The location of cultural and other heritage sites with respect to the sub-project has been reviewed in Chapter 4. No temples or religious sites are in close proximity to the proposed sub-station site to cause a nuisance. However, in case the need arises, the 'Chance find' procedures are provided as **Annexure VI.**

Mitigation measures

No measures required.

5.3.3 Soil Contamination

Impact analysis

177. It must be ensured that the proposed sub-station does not contaminate the soil in the sub-project area.

Mitigation measures

178. The following measures will be implemented:

- The containment and bunds under all newly installed transformers will be designed to retain all transformer oil contents.
- Contingency measures will be developed to recondition or dispose of any oil released during an emergency.

5.3.4 Encroachment, Landscape and Physical Disfiguration

Impact analysis

179. The extent of the proposed sub-station development is moderate and will not extend beyond the proposed location. No significant landscape impacts are expected from construction of the sub-station.

180. Disposal of surplus materials will be negotiated through local authority approvals prior to the commencement of construction, so that no toxic/hazardous material is produced in the scrap.

Mitigation measures

No measures required.

5.3.5 Waste Disposal

Impact analysis

181. To ensure adequate disposal options for all waste including unsuitable soils, scrap metal etc.

Mitigation measures

182. The following measures shall be implemented:

- Identify sufficient locations for disposal of transformer oils, unsuitable soils, and scrap metal “cradle to grave”.
- Include in contracts for unit rates for re-measurement for disposal.
- Designate disposal sites in the contract and cost unit disposal rates accordingly.

5.3.6 Temporary drainage and erosion control

Impact analysis

183. Include mitigation in preliminary and detailed designs for erosion control and temporary drainage.

Mitigation measures

184. The following measures shall be implemented:

- Identify locations where drainage or irrigation in the project area may be affected by works.
- Include in protection works Contract as a payment milestone(s).

5.3.7 Site Specific EMP

Impact analysis

185. The absence of a site specific EMP will make it difficult for the project Contractor(s) to effectively mitigate possible impacts resulting from the project development.

Mitigation measures

186. The following measures shall be taken:

- Define boundaries.
- Identify sensitive receptors & environmental values.
- Specify construction activities.
- Conduct risk assessment.
- Assign environmental management measures.
- Prepare monitoring plan.
- Prepare site plans.
- Prepare environmental work plan.

5.4 Potential Environmental Impacts during Construction Stage

187. The summary of the key potential impacts during the Construction phase is provided in **Table 5.1** below.

Table 5.1: Summary of key potential Impacts during Construction Phase

S/No.	Environmental Aspect	Potential Issue from Environmental Aspect	Potential of Impact	Mitigation Measures
1	Ambient Air Quality	Dust emissions from site preparation, excavation, material handling & other construction activities at site.	Dust emissions expected at work site and at closest key receptors. However, minor and short-term impact expected which will be temporary in nature.	Regular water sprinkling on the exposed surfaces to reduce dust emissions and proper maintenance of all equipment at regular intervals to minimize impact of exhaust emissions
2	Noise	Noise generated from construction activities, operation of construction machinery, equipment and their movement.	Noise levels expected to vary during activity based upon the nature of work being conducted. Higher noise levels expected at site but minor impact expected at key receptors. Impact expected to be short term in nature.	Necessary control equipment and techniques to be applied to control noise levels and limit their nuisance effects
3	Community Safety	The village communities, particularly children, might not exercise due care during movement of heavy machinery and during the civil works, resulting in a high potential of accidents taking place.	Kids might have accidents either through accidents with construction vehicles or by getting hurt/electrocuted during the electrical works at the sub-station.	(i) Awareness workshops must be conducted prior to commencement of works in the project area (ii) Work site must be cordoned off to villagers, particularly children. (iii) Construction vehicles must ensure controlling of speed limits to prevent accidents with village communities, particularly children.
4	Water Quality	Surface runoff from project site of Oil/fuel and waste spills as well as improper disposal of debris and	Minor negative impact expected.	Construction methods and techniques and mechanism for disposal

		discharge of sewage from labor camp.		of effluent to be designed for proper drainage and control of discharge
5	Solid Waste	Disposal of excavated soil, construction debris and other waste including domestic waste, which can cause soil contamination and other health and safety issues.	Minor negative impact expected.	Proper solid waste management programme to be designed and implemented
6	Land Use	Soil excavation of agricultural land at sub-station site requiring rehabilitation	Minor negative impact expected	Excavation and rehabilitation to be conducted as per EMP.
7	Soils	Excavation activity leading to topsoil removal and erosion.	Minor negative impact expected	Necessary measures to be taken to replace removed soil as per EMP.
8	Ecology Flora & Fauna	Habitat disturbance during construction activity.	Project is being developed in a rural environment with scarce flora and fauna present in project area. Minor and short term impact expected	Necessary steps to be taken to minimize ecological disturbance wherever applicable, particularly the prohibition of hunting and killing of animals.
9	Socio-economy	Increase in job opportunities expected for residents of neighboring areas. .	Overall positive impact expected	Fair and transparent hiring policy must be maintained for the project. Project sustainability must be ensured through regular and proper maintenance of infrastructure.
10	Traffic condition	Vehicle movement and possibility of traffic congestion on the road.	Minor negative impact	Traffic management plan to be prepared and implemented one month before commencement of construction work

Physical Resources

5.4.1 Air Quality

Impact analysis

188. Air quality will be affected by the fugitive dust and emissions from the construction machinery, and vehicular traffic during the construction phase. Emissions may be carried over long distances, depending on wind speed and direction, the temperature of the surrounding air, and atmospheric stability.

189. The critical sources of air pollution during the construction phase are as follows:

- Earth haulage trucks that generate dust, particularly during transportation, loading and unloading processes.
- Noxious gases emission by Construction equipment and vehicles including batching plants that will be set up at the proposed sub-station site to lay the foundations.

Mitigation measures

190. The following mitigation measures are proposed:

- Concrete batching plants will be located at a minimum distance of 500 meters from any residences and will be equipped with dust control equipment such as fabric filters or wet scrubbers to reduce the level of dust emissions.
- The applicable NEQS/international regulations for gaseous emissions generated by the construction vehicles, equipment and machinery will be enforced during the construction works. Contractor should make sure that all equipment and vehicles are tested for emissions. Regular maintenance of equipment and vehicles will also control the incomplete combustion.
- Where dust emissions are high, katcha tracks will be overlain with shingle or surface treated. Where necessary, dust emissions will be reduced by a regular sprinkling of water for keeping the dust settled, at least twice a day.
- Haul-trucks carrying sand, aggregate and other materials will be kept covered with tarpaulin to help contain construction materials being transported within the body of each carrier between the sites.
- NTDC will set up a system to monitor the air quality in the project area of the sub-station site in accordance with the applicable NEQS and IFC air quality guidelines. The system will cover protocols for sampling and analysis, assessment of air

quality at sensitive locations, reporting, and information sharing.

- Ensure proper tuning of the construction vehicles.
- Preparation and implementation of plantation plan using indigenous trees & plants. The maintenance and care of plants should be ensured in the operation phase by NTDC.
- The construction material will be stored in the boundary wall and no disturbance to surrounding areas is expected. The contractor will be, however, required to provide a traffic management plan before commencement of work at site.
- The need for large stockpiles should be minimized by careful planning of the supply of materials from controlled sources. Stockpiles (if required) should not be located within 50 meters of schools, hospitals or other public amenities such as wells and pumps and should be covered with tarpaulins when not in use and at the end of the working day to enclose dust.

5.4.2 Noise

Impact analysis

191. There will be no requirement for blasting for this sub-project activity. It is anticipated that powered mechanical equipment and some local labor with hand tool methods will be used to construct the subproject works. Powered mechanical equipment can generate significant noise and vibration. The cumulative effects from several machines can be significant. Noise and vibration from the construction of the towers would not be a major consideration as there are very few residences near the construction site.

Mitigation measures

192. The following mitigation measures are proposed:

- To minimize such impacts, the Contractor for this subproject should be requested by the construction supervision consultants (engineer) to provide evidence and certification that all equipment to be used for construction is fitted with the necessary air pollution and noise dampening devices to meet EPA requirements.
- Noise will be controlled by monitoring at a distance of 3m from the boundary wall of any residential unit at a height of 1.5 m and while following the NEQS of 45 dB(A), which is consistent with WB/IFC guidelines.
- Construction should not be allowed during nighttime (9 PM to 6 AM).
- All noisy equipment should be located far away from Sensitive receptors as possible to prevent nuisances to dwellings and other structures from operation. However, if the noise still exceeds NEQS, then noise barriers will be installed

around the equipment to reduce the effects of the noise. Mitigation measures such as barriers installation should be discussed with the local population.

- Noise barriers should be installed for workers working more than eight hours a day during construction activities. Noise levels from construction activity can be reduced by regular maintenance of machinery. Noise can be controlled through engineering controls e.g. hammering actions can be substituted by hydraulic. Ensure that the workers are wearing PPEs (ear plugs, ear muffs etc.) where engineering control is not applicable to reduce the impact of noise.

5.4.3 Hydrology and drainage aspects

Impact analysis

193. To ensure the proper implementation of best practices to ensure the hydrology of the area is not adversely impacted.

Mitigation measures

194. The following measures shall be implemented:

- Consideration of weather conditions when particular construction activities are undertaken.
- Limitations on excavation depths in use of recharge areas for material exploitation or spoil disposal.
- Use of landscaping as an integrated component of construction activity as an erosion control measure.
- Minimizing the removal of vegetative cover as much as possible and providing for its restoration where construction sites have been cleared of such areas.

5.4.4 Water Quality

Impact analysis

195. To prevent adverse water quality impacts due to negligence and ensure unavoidable impacts are managed effectively. Ensure adverse impacts on water quality caused by construction activities are minimized.

Mitigation measures

196. The following measures shall be implemented:

- Storage of lubricants, fuels and other hydrocarbons in self-contained dedicated enclosures >50m away from water bodies.
- Proper disposal of solid waste from construction activities and labor camps.
- Cover the construction material and spoil stockpiles with a suitable material to

reduce material loss and sedimentation and avoid stockpiling near to water bodies.

- Topsoil stripped material shall not be stored where natural drainage will be disrupted.
- Borrow sites (if required) should not be close to sources of drinking water.

5.4.5 Soil Contamination

Impact analysis

197. Lands may get contaminated from the spillage of chemicals like fuels, solvents, oils, paints and other construction chemicals and concrete. This normally happens when these materials are transported in open or loosely capped containers. Unmanaged sewage can also contribute to contamination of soil.

198. The possible contamination of soil by oils and chemicals at campsites, workshop areas, and equipment washing-yards may limit the future use of land for vegetation purposes.

Mitigation measures

199. The measures provided below shall be implemented:

- It will be ensured that spill prevention trays are provided and used during refueling. Also, on-site maintenance of construction vehicles and equipment will be avoided as far as possible. In case on-site maintenance is unavoidable, tarpaulin or other impermeable material will be spread on the ground to prevent contamination of soil.
- Regular inspections will be carried out to detect leakages in construction vehicles and equipment and all vehicles will be washed in external commercial facilities.
- Fuels, lubricants and chemicals will be stored in covered bounded areas, underlain with impervious lining. Appropriate arrangements, including shovels, plastic bags and absorbent materials will be available near fuel and oil storage areas.
- Solid waste generated at the campsites will be properly segregated, treated and safely disposed of only in the demarcated waste disposal sites.
- Proper drainage system shall be constructed to ensure proper disposal of sewage and wastewater, which will offset any impact on soil. Sewage will be connected to sewage network for offsite treatment or will be connected to septic tank.

5.4.6 Construction waste disposal

Impact analysis

200. The waste generated during the construction works at site must be properly disposed in accordance with local applicable NEQS guidelines and environmental best practices.

Mitigation measures

201. The following measures shall be implemented:

- Waste management plan to be submitted to the CSC and approved by MC one month prior to starting works.
- Estimating the amounts and types of construction waste to be generated by the project.
- Investigating whether the waste can be reused in the project or by other interested parties.
- Identifying potential safe disposal sites close to the project or those designated sites in the contract.
- Investigating the environmental conditions of the disposal sites and recommendation of most suitable and safest sites.
- Piling up of loose material should be done in segregated areas to arrest washing out of soil. Debris shall not be left where it may be carried by water to downstream flood plains, dams, lagoons etc.
- Used oil and lubricants shall be recovered and reused or removed from the site in full compliance with the national and local regulations.
- Oily wastes must not be burned. Disposal location to be agreed with local authorities/EPA.
- Machinery should be properly maintained to minimize oil spill during the construction.
- Solid waste should be disposed at an approved solid waste facility, open burning is illegal and contrary to good environmental practice.

5.4.7 Impact on Water Resources

Use of Local Water Supplies/Spring Water

Impact analysis

202. Project lies in an agriculturally rich area, where there is no scarcity of water. Still use of local water supplies for construction purpose can create a big issue. As acknowledged during the public consultations, locals may not want to share their water supplies as they were concerned that sharing will disturb their agricultural activities and water will get contaminated.

Mitigation measures

203. The following measures will be carried out to mitigate the impacts of tapping local community water resources, where required:

- Approval from the local administration and representatives of the concerned departments will be obtained before using local water resources.
- Camps will be located within the project boundary to prevent the contamination of community-owned water resources.
- The contractors will be required to maintain close liaison with local communities to ensure that any potential conflicts relating to the common resource utilization for the project purposes are resolved quickly.
- Guidelines will be established to minimize the wastage of water during the construction activities and at campsites.

Contamination of Surface and Ground Water

Impact analysis

204. Subsurface water resources may be contaminated by fuel and chemical spills, or by unmanaged solid waste and effluents generated by the kitchens and toilets at construction campsites.

Mitigation measures

205. Good management practices will be adopted to ensure that fuels and chemicals, raw sewage and wastewater effluent are disposed of in a controlled manner to reduce the risk of contamination. These measures are as described below:

- Best engineered drainage channels will be established in the construction camps in order to facilitate the flow of the treated effluents.
- Soakage pits and septic tanks will be established for the treatment of sewage effluents.
- Wastewater effluent from the contractors' workshops and equipment washing-yards will be passed through gravel/sand beds to remove oil/grease contaminants before discharging into the natural streams. According to the local laws, the BOD5 concentration in sewage must be brought down to less than 80 mg/l before being discharged into a natural stream with a capacity to dilute the effluent further by 10 times. Furthermore, since the national regulation of 80 mg/l is quite lenient, thus in spirit all efforts shall be made to minimize the pollution load to meet the standard of 30 mg/l.

- Any oil contaminated gravel/sand left after the construction activity will be handed over to a pre-approved third party that shall be responsible for incineration and/or disposal of this material in accordance with NEQS and international best practices.

5.4.8 Soil Erosion

Impact analysis

206. Soil erosion may occur as a result of improper runoff drawn from the equipment washing-yards and improper management of construction activities.

Mitigation measures

207. The following measures shall be implemented:

- Good engineering practices will help control soil erosion both at the construction sites and in peripheral areas, particularly along the haul tracks. Controlled and well-managed vehicular movement, excavation, vegetation and regular water sprinkling will reduce the chances of soil erosion.
- Schedule works in sensitive areas (e.g. rivers) for dry season.
- Back-fill should be compacted properly in accordance with design standards and graded to original contours where possible.
- Cut areas should be treated against flow acceleration while filled areas should be carefully designed to avoid improper drainage.
- Stockpiles should not be formed within such distances behind excavated or natural slopes that would reduce the stability of the slopes.
- In the short-term, either temporary or permanent drainage works shall protect all areas susceptible to erosion.
- Measures shall be taken to prevent pounding of surface water and scouring of slopes. Newly eroded channels shall be backfilled and restored to natural contours.
- Contractor shall arrange to adopt suitable measures to minimize soil erosion during the construction period. Contractor should consult concerned authorities in the area before deciding mitigation measures.
- Clearing of green surface cover to be minimized during site preparation.

5.4.9 Handling, transportation and storage of Construction materials

Impact analysis

208. To minimize contamination of the surroundings (due to Implementation of works, concrete and crushing plants).

Mitigation measures

209. The following measures shall be implemented:

In order to minimize and or avoid adverse environmental impacts arising out of construction material exploitation, handling, transportation and storage measures to be taken in line with any EPA conditions/recommendations in approval:

- Conditions that apply for selecting sites for material exploitation.
- Conditions that apply to timing and use of roads for material transport.
- Conditions that apply for maintenance of vehicles used in material transport or construction.
- Conditions that apply for selection of sites for material storage.
- Conditions that apply for aggregate production.
- Conditions that apply for handling hazardous or dangerous materials such as oil, lubricants and toxic chemicals.

5.4.10 Work camp operation and location

Impact analysis

210. The operation of work camps can adversely affect the surrounding environment and residents in the area if local regulations and internationally accepted best practices are not implemented.

Mitigation measures

211. The following measures shall be implemented:

- Identify location of work camps in consultation with local authorities. The location shall be subject to approval by the NTDC. If possible, camps shall not be located near settlements or near drinking water supply intakes.
- Cutting of trees shall be avoided and removal of vegetation shall be minimized.
- Water and sanitary facilities (at least pit latrines) shall be provided for employees. Worker camp and latrine sites to be backfilled and marked upon vacation of the sites.
- Solid waste and sewage shall be managed according to the national and local regulations. As a rule, solid waste must not be dumped, buried or burned at or near the project site, but shall be disposed off to the nearest sanitary landfill or site having complied with the necessary permission of local authority permission.
- The Contractor shall organize and maintain a waste separation, collection and transport system.

- Toilets will be self contained or shall be disposed off to a septic tank and no toilets will be located within 100 meters of any surface water body or any groundwater well.
- The Contractor shall document that all liquid and solid hazardous and non-hazardous waste are separated, collected and disposed of according to the given requirements and regulations.
- At the conclusion of the project, all debris and waste shall be removed. All temporary structures, including office buildings, shelters and toilets shall be removed.
- Exposed areas shall be planted with suitable vegetation.
- NTDC and Supervising Engineer shall inspect and report that the camp has been vacated and restored to pre-project conditions.

5.4.11 Vehicle and Equipment Exhaust

Impact analysis

212. The emissions from vehicles and combustion processes in generators and other construction equipment result in exhaust gases that can affect the ambient air quality locally and pose a health hazard particularly for communities resident in proximity to the project site.

Mitigation measures

213. The following measures shall be implemented:

- It shall be ensured that all vehicles, generators and other equipment used during the construction will be properly tuned and maintained in good working condition in order to minimize emission of pollutants.
- The stack height of generators will be at least 3 meters above the ground.

Ecological Resources

5.4.12 Trees, Ecology and Protected Areas

Impact analysis

214. There is no protected area, as per identification of National Conservation Strategy, within or anywhere near the project area. Dust during the construction phase will also cause an adverse impact on surrounding crops.

215. Trees will be enumerated species wise and compensatory plantation will be arranged along roads and paths through forestryTo replace the removed trees,

sufficient areas will be identified to allow plantation of trees at a rate of 5:1. Moreover, owners of the affected trees will be paid compensation for their loss.

Mitigation measures

216. The following measures shall be implemented:

- To replace the removed trees, sufficient areas will be identified to allow plantation of trees at a rate of 5:1. Moreover, owners of the affected trees will be paid compensation for their loss.
- A requirement shall be inserted in the contracts that no trees are to be cut on the proposed project site or outside, without the written permission from the supervising consultant.
- In addition to this, the contractor will be required to spray water twice or thrice a day (as per need) to avoid dispersal of dust on the adjacent flora.
- The contractor's staff and labor will be strictly directed not to damage any vegetation such as trees or bushes.
- Clearing of green surface cover for construction, for borrow of for development, cutting trees and other important vegetation during construction should be minimized.

5.4.13 Wildlife and Fauna

Impact analysis

217. Mammals, Amphibians, birds and reptiles could be disturbed with the clearance of flora. Birds can easily fly away to any trees outside the project corridor. Moreover grazing activity of animals could also be disturbed.

218. During construction stage, noise and movement of heavy machinery for road construction, shall disturb the fauna of the area as the reptiles like lizard and snakes may get killed or move to the adjoining areas. Similarly, avifauna shall be disturbed and scared away due to disturbance of habitat. Trees provide resting and nesting places to the birds. Their removal shall have a negative effect on the fauna. Movement of vehicles near corridors of grazing cattle/slow moving animals may cause danger to their lives and require special attention by provision of sign boards and educating the drivers of construction vehicles. As there are no endangered species present near the project area, so there is no potential impact on the endangered species by the execution of the project.

Mitigation measures

219. The following mitigation measures should be implemented:

- Vehicle speed will be controlled to avoid incidental mortality of small mammals and reptiles.
- Staff working on the project will be given clear orders, not to shoot or trap any bird or animal.
- Lights used in the camps will be kept to the minimum requirement. Upward scattering lights will preferably be used.
- There will be adjacent areas available for grazing; hence the grazing activity of animals will not be affected.

Socio-economic Environment

5.4.14 Impact on local communities/Workforce

Impact analysis

220. The communities in the project area will be affected during the construction phase as follows:

- During the construction phase, the general mobility of the local residents and their livestock in and around the project area is likely to be hindered.
- Unmonitored construction activities, e.g. excavation, equipment movement etc. may create accident risks.
- Usage of community's common resources like potable water, fuel wood etc. by contractor's workforce may create conflicts between the community and the contractor.
- Induction of outside workers in the contractor's labor force may cause cultural issues with the local communities.
- Increase in crime as a result of contractor's workers trying to rob the local communities.

221. The presence of migrant construction workers inevitably causes some degree of social unease and even active disputes with the local community as a result of cultural differences.

Mitigation measures

222. The following measures must be implemented to ensure Community safety:

- Awareness workshops must be conducted prior to commencement of works in the project area of the sub-station
- Work sites must be cordoned off to villagers, particularly children.
- Construction vehicles must ensure controlling of speed limits to prevent accidents with village communities, particularly children.

223. Potential social conflict will be contained by implementing the measures listed below:

- Temporarily and for short duration, the contractor has to select specific timings for construction activities so as to cause least botheration to the local population considering their peak movement hours.
- Approval from the local administration will be obtained before using the local resources such as wood and water.
- The contractors will be required to maintain close liaison with the local communities to ensure that any potential conflicts related to common resource utilization for the project purposes are resolved quickly.
- Contractor will take care of the local community and sensitivity towards the local customs and traditions will be encouraged.
- Effective construction controls by the contractor to avoid inconvenience to the locals due to noise, smoke and fugitive dust.
- Good relations with the local communities will be promoted by encouraging contractors to provide opportunities for skilled and unskilled employment to the locals, as well as on-the-job training in construction for young people. Contractor will restrict his permanent staff to mix with the locals to avoid any social problems.
- Local vendors will be provided with regular business by purchasing campsite goods and services from them.
- The Contractor will warn the workers not to involve in any theft activities and if anyone found guilty of such activities, he will have to pay heavy penalty and would be handed over to police. Similarly, at the time of hiring, Contractor has to take care that the workers should be of good repute. The Contractor camp will be properly fenced and main gate will be locked at night with a security guard to check the theft issues from community side.
- Providing adequate warning signs.
- Providing workers with skull guard or hard hat.
- Contractor shall instruct his workers in health and safety matters, and require the workers to use the provided safety equipment.
- Establish all relevant safety measures as required by law and good engineering practices.

5.4.15 Traffic condition

Impact analysis

224. Minimize disturbance of vehicular traffic and pedestrians during haulage of construction materials, spoil and equipment and machinery, blocking access roads during works damage / maintenance problems for roads and bridges used by the haulage trucks, dust nuisance to school and hospitals.

Mitigation measures

225. The following measures shall be implemented:

- Submit temporary haul and access routes plan, one month prior to start of works.
- Formulate and implementation of a plan of alternate routes for heavy vehicles.
- Vicinity of schools and hospitals to be considered.
- Installation of traffic warning signs, and enforcing traffic regulations during transportation of materials and equipment and machinery. Conditions of roads and bridges to be considered.
- Provision of culverts on water channels and drains.
- Widening/upgrading of access paths/roads

5.4.16 Indigenous, Vulnerable and Women headed Households

Impact analysis

226. During the field survey for the sub-project, no indigenous group of people was identified, which comes under the definition of 'Indigenous people'. Also, no vulnerable or women headed households were identified. Thus, no such impact is envisaged during the implementation of the sub-project.

Mitigation measures

No measures required.

5.4.17 Public Health and Safety Hazards

Impact analysis

227. Construction of sub-station will require large number of workers who will obviously be accommodated in congested temporary camps. This scenario may lead to spreading of diseases like Malaria, Cholera, Typhoid, Hepatitis A, B and C etc.

228. Occurrence of accidents/incidents during the construction stage is a common phenomenon as evident from previous experience of NTDC.

Mitigation measures

229. The following mitigation measures are proposed:

- In construction camps, amenities of life including clean food, water and sanitation

facilities must be provided. Contractor will arrange first aid boxes in the temporary camps. Routine medical check-ups of all the field staff including unskilled labor needs to be conducted by an MBBS doctor.

- The other source of pollution from the camps will be from garbage and waste. Apparently, there are no solid waste disposals facilities in the villages located in the vicinity of the road and solid waste will have to be disposed of at a safe site.
- Compliance with the safety precautions for construction workers as per International Labor Organization (ILO) Convention No. 62, as far as applicable to the project contract, should be ensured.
  - Workers should be trained in construction safety procedures and environmental awareness. Proper handling of combustibles, flammable material and good housekeeping practices will be required to avoid fire hazard. Smoking will be prohibited at or around work areas where fire hazards are present. Signs will be put up, saying 'NO SMOKING' or 'NO OPEN FLAMES'.
- Equipping all construction workers with PPEs such as safety boots, helmets, gloves, and protective masks, and monitoring their proper and sustained usage.
- Contractor will ensure the provision of medicines, first aid kits, vehicle, etc. at the camp site.
- Safety lookouts will be built to prevent people and vehicles from passing at the time of excavation and other activities of such sort.
- Cordon off the work areas where necessary.
- It is recommended that NTDC at the planning stage of the project shall plan necessary arrangements in the form of earthing system to avoid accidents.
- Adequate facilities shall be provided in terms of drinking water that meets standards, number of toilets per worker with running water, stocked first aid kit and trained first aider at each tower location etc.
- Solid and hazardous waste generated shall be disposed to a suitably licensed landfill, potentially transporting it outside the project area, if felt necessary.

5.4.18 Sanitation, Solid Waste Disposal, Communicable Diseases

Impact analysis

230. The main issues of concern are uncontrolled or unmanaged disposal of solid and liquid wastes into watercourses and natural drains, improper disposal of storm water and black water and open defecation by construction workers.

Mitigation measures

231. The proposed mitigation measures are as follows:

- In order to maintain proper sanitation around the construction site, access to the nearby lavatories will be allowed or provision of temporary toilets will be made. Construction worker camps will be necessary, based on the scale of the works needed. The construction camp will be provided with toilets with soakage pits or portable lavatories or at least pit latrines.
- Disposal of surplus materials must also be negotiated through local authority approvals prior to the commencement of construction.
- If surplus materials arise from the removal of the existing surfaces from specific areas, it will be used elsewhere on the subproject before additional soil, rock, gravel or sand is brought in. The use of immediately available material will generally minimize the need for additional rock based materials extraction from outside.
- Contractual clauses will require the contractor to produce a materials management plan (one month before construction commences) to identify all sources of cement and aggregates and to balance cut and fill. The plan should clearly state the methods to be employed prior to and during the extraction of materials and all the mitigation measures to be employed to mitigate nuisances to local residents. Financial compensation shall not be allowed as mitigation for environmental impacts or environmental nuisance.
- Contractual clauses will require the contractor to produce a solid waste management plan so that proper disposal of waste can be ensured.

5.4.19 Disease Vectors

Impact analysis

232. Wherever water is allowed to accumulate, in temporary drainage facilities, due to improper storm water management, or improper disposal of wastewater generated from the site, it can offer a breeding site for mosquitoes and other insects. Vectors such as mosquitoes may be encountered if open water is allowed to accumulate at the construction campsite.

Mitigation measures

233. The following mitigation measure can be implemented:

- Temporary and permanent drainage facilities should therefore be designed to facilitate the rapid removal of surface water from all areas and prevent the accumulation of surface water ponds.

5.5 Potential Environmental Impacts during Operation

5.5.1 Impacts on Ecological Resources

Impact analysis

234. No tree cutting is to take place during the operation stage. On the other hand, tree plantation, on the ratio of 5:1 will improve the ecological habitat and environmental conditions of the project area and thus enable the scared away avifauna to return to this area. New plantations will not only compensate for the loss of trees, but will also add to the aesthetics of the area. There will be healthy and positive impacts on flora and fauna during the operation stage.

235. It shall be ensured that vegetation is also maintained within the project area of the sub-station and the aesthetic value resulting from the presence of vegetation is not lost.

Mitigation measures

No measures required.

5.5.2 Enhancement

Impact analysis

236. Environmental enhancements are not a major consideration for this sub-station development. However, it is noted that it is common practice at many such sites to create some local hard and soft landscaping and successful planting of fruit trees and shrubs has been accomplished in many sites. This practice should be encouraged as far as practicable.

Mitigation measures

No measures required.

5.6 Cumulative impacts

237. There are no other infrastructure projects being planned in the project area. Thus, no cumulative impacts are expected.

Development of Transmission Line (12 km)

5.7 Potential Environmental Impacts during Pre-Construction Stage

5.7.1 Loss of Crops

Impact analysis

238. The transmission line route will encounter some cultivated lands. In order to construct the transmission line and tower stringing, the land acquisition specialists will assess the specific amount of cropped land to be compensated.

239. In order to install the towers and transmission lines, temporary land would be needed and the exact acrage of the land will be determined once the transmission line alignment has been finalized and the LARP has been prepared.

Mitigation measures

240. Compensation of crops will be paid to the owners as per the LARP to be developed. Accordingly, the necessary amount will be allocated for compensation of crops.

5.7.2 Cultural Heritage & Religious Sites

Impact analysis

241. The location of cultural and other heritage sites with respect to the sub-project has been reviewed in Chapter 4. No temples or religious sites are in close proximity to the RoW of the transmission line as to cause a nuisance. However, in case the need arises, the 'Chance find' procedures are provided as **Annexure VI.**

Mitigation measures

No measures required.

5.7.3 Impact due to Land Acquisition

Impact analysis

242. The proposed project will involve the acquisition of land on permanent basis for construction of the sub-station and transmission line as per NTDC practice.

Mitigation measures

243. Fair compensation in accordance with SPS 2009 shall be disbursed to the personnel from whom their land shall be purchased for development of the required infrastructure for this sub-project.

5.7.4 Encroachment, Landscape and Physical Disfiguration

Impact analysis

244. The extent of the proposed power expansion is moderate and will not extend beyond the power corridor created by the sub-project. No significant landscape impacts are expected from construction of transmission line.

245. Disposal of surplus materials will be negotiated through local authority approvals prior to the commencement of construction, so that no toxic/hazardous material is produced in the scrap.

Mitigation measures

No measures required.

5.7.5 Waste Disposal

Impact analysis

246. To ensure adequate disposal options for all waste including unsuitable soils, scrap metal etc.

Mitigation measures

247. The following measures shall be implemented:

- Identify sufficient locations for disposal of transformer oils, unsuitable soils, and scrap metal “cradle to grave”.
- Include in contracts for unit rates for re-measurement for disposal.
- Designate disposal sites in the contract and cost unit disposal rates accordingly.

5.7.6 Temporary drainage and erosion control

Impact analysis

248. Include mitigation in preliminary and detailed designs for erosion control and temporary drainage.

Mitigation measures

249. The following measures shall be implemented:

- Identify locations where drainage or irrigation crossing RoW may be affected by works.
- Include in protection works Contract as a payment milestone(s).

5.7.7 Avoidance of Sensitive and High Value areas

Impact analysis

250. The siting of transmission facilities must seek to avoid to the maximum extent possible areas of high ecological, cultural, economic, and aesthetic value and sensitivity.

Mitigation measures

251. When siting in such areas that cannot be avoided altogether, the area of disruption shall be minimized and the impacts mitigated.

5.7.8 EMF Reduction

Impact analysis

252. Although the health effects of chronic exposure to EMFs from AC transmission lines remain scientifically uncertain, many utilities and regulatory authorities employ EMF reduction practices as a precautionary measure, usually within the limit of a few percent of overall project cost. Utilities seek to keep annual average magnetic field intensities at the edge of the right-of-way below about 10 mG (milli-Gauss).

Mitigation measures

253. The following measures shall be implemented:

- Raising conductor height above the ground, typically by increasing tower height.
- Reducing conductor spacing.
- Arranging phases so that fields tend to cancel.
- Increasing transmission voltage (since magnetic field intensities are a function of current, and increased voltage, all things being equal, will result in reduced current).
- Reducing loads (and therefore, currents).
- Increasing right-of-way widths or buffer zone widths, to move people further from transmission lines.

5.7.9 Site Specific EMP

Impact analysis

254. The absence of a site specific EMP will make it difficult for the project Contractor(s) to effectively mitigate possible impacts resulting from the project development.

Mitigation measures

255. The following measures shall be taken:

- Define boundaries.

- Identify sensitive receptors & environmental values.
- Specify construction activities.
- Conduct risk assessment.
- Assign environmental management measures.
- Prepare monitoring plan.
- Prepare site plans.
- Prepare environmental work plan.

5.8 Potential Environmental Impacts during Construction Stage

256. The summary of the key potential impacts during the Construction phase is provided in **Table 5.2** below.

Table 5.2: Summary of key potential Impacts during Construction Phase

S/No.	Environmental Aspect	Potential Issue from Environmental Aspect	Potential of Impact	Mitigation Measures
1	Ambient Air Quality	Dust emissions from site preparation, excavation, material handling & other construction activities at site.	Dust emissions expected at work site and at closest key receptors. However, minor and short-term impact expected which will be temporary in nature.	Regular water sprinkling on the exposed surfaces to reduce dust emissions and proper maintenance of all equipment at regular intervals to minimize impact of exhaust emissions
2	Noise	Noise generated from construction activities, operation of construction machinery, equipment and their movement.	Noise levels expected to vary during activity based upon the nature of work being conducted. Higher noise levels expected at site but minor impact expected at key receptors. Impact expected to be short term in nature.	Necessary control equipment and techniques to be applied to control noise levels and limit their nuisance effects
3	Community Safety	The village communities, particularly children, might not exercise due care during movement of heavy machinery and	Kids might have accidents either through accidents with construction vehicles or	(i) Awareness workshops must be conducted prior to commencement of

		during the civil works, resulting in a high potential of accidents taking place.	by getting hurt/electrocuted during the electrical works on the towers.	works in any project area (ii) Work sites must be cordoned off to villagers, particularly children. (iii) Construction vehicles must ensure controlling of speed limits to prevent accidents with village communities, particularly children.
4	Water Quality	Surface runoff from project site of Oil/fuel and waste spills as well as improper disposal of debris and discharge of sewage from labor camp.	Minor negative impact expected.	Construction methods and techniques and mechanism for disposal of effluent to be designed for proper drainage and control of discharge
5	Solid Waste	Disposal of excavated soil, construction debris and other waste including domestic waste, which can cause soil contamination and other health and safety issues.	Minor negative impact expected.	Proper solid waste management programme to be designed and implemented
6	Land Use	Soil excavation of agricultural land along line alignment requiring rehabilitation	Minor negative impact expected	Excavation and rehabilitation to be conducted as per EMP.
7	Soils	Excavation activity leading to topsoil removal and erosion.	Minor negative impact expected	Necessary measures to be taken to replace removed soil as per EMP.
8	Ecology Flora & Fauna	Habitat disturbance during construction activity.	Project is being developed in a rural environment with scarce flora and fauna present in project area. Minor and short term impact expected	Necessary steps to be taken to minimize ecological disturbance wherever applicable, particularly the prohibition of hunting and killing of animals.
9	Socio-economy	Increase in job opportunities expected for residents of neighboring areas.	Overall positive impact expected	Fair and transparent hiring policy must be maintained for the

		.		project. Project sustainability must be ensured through regular and proper maintenance of infrastructure.
10	Traffic condition	Vehicle movement and possibility of traffic congestion on the road.	Minor negative impact	Traffic management plan to be prepared and implemented one month before commencement of construction work

Physical Resources

5.8.1 Air Quality

Impact analysis

257. Air quality will be affected by the fugitive dust and emissions from the construction machinery, and vehicular traffic during the construction phase. Emissions may be carried over long distances, depending on wind speed and direction, the temperature of the surrounding air, and atmospheric stability.

258. The critical sources of air pollution during the construction phase are as follows:

- Earth haulage trucks that generate dust, particularly during transportation, loading and unloading processes.
- Noxious gases emission by Construction equipment and vehicles including batching plants that will be set up at each work site to lay the foundation for the towers.

Mitigation measures

259. The following mitigation measures are proposed:

- Concrete batching plants will be located at a minimum distance of 500 meters from any residences and will be equipped with dust control equipment such as fabric filters or wet scrubbers to reduce the level of dust emissions.
- The applicable NEQS/international regulations for gaseous emissions generated by the construction vehicles, equipment and machinery will be enforced during the construction works. Contractor should make sure that all equipment and vehicles are tested for emissions. Regular maintenance of equipment and vehicles will also

control the incomplete combustion.

- Where dust emissions are high, katcha tracks will be overlain with shingle or surface treated. Where necessary, dust emissions will be reduced by a regular sprinkling of water for keeping the dust settled, at least twice a day.
- Haul-trucks carrying sand, aggregate and other materials will be kept covered with tarpaulin to help contain construction materials being transported within the body of each carrier between the sites.
- NTDC will set up a system to monitor the air quality along the project corridor in accordance with the applicable NEQS and IFC air quality guidelines. The system will cover protocols for sampling and analysis, assessment of air quality at sensitive locations, reporting, and information sharing.
- Ensure proper tuning of the construction vehicles.
- Preparation and implementation of plantation plan using indigenous trees & plants. The maintenance and care of plants should be ensured in the operation phase by NTDC.
- The construction material will be stored in the boundary wall and no disturbance to surrounding areas is expected. The contractor will be, however, required to provide a traffic management plan before commencement of work at site.
- The need for large stockpiles should be minimized by careful planning of the supply of materials from controlled sources. Stockpiles (if required) should not be located within 50 meters of schools, hospitals or other public amenities such as wells and pumps and should be covered with tarpaulins when not in use and at the end of the working day to enclose dust.

5.8.2 Noise and Vibration

Impact analysis

260. There will be no requirement for blasting for this sub-project activity. It is anticipated that powered mechanical equipment and some local labor with hand tool methods will be used to construct the subproject works. Powered mechanical equipment can generate significant noise and vibration. The cumulative effects from several machines can be significant. Noise and vibration from the construction of the towers would not be a major consideration as there are no residences, schools or hospitals present near the construction site.

Mitigation measures

261. The following mitigation measures are proposed:

- To minimize such impacts, the contractor for this subproject should be requested

by the construction supervision consultants (engineer) to provide evidence and certification that all equipment to be used for construction is fitted with the necessary air pollution and noise dampening devices to meet EPA requirements.

- Noise will be controlled by monitoring at a distance of 3m from the boundary wall of any residential unit at a height of 1.5 m and while following the NEQS of 45 dB(A), which is consistent with WB/IFC guidelines.
- Construction should not be allowed during nighttime (9 PM to 6 AM).
- All noisy equipment should be located far away from Sensitive receptors as possible to prevent nuisances to dwellings and other structures from operation. However, if the noise still exceeds NEQS, then noise barriers will be installed around the equipment to reduce the effects of the noise. Mitigation measures such as barriers installation should be discussed with the local population.
- Vibration from construction of piles to support pads may be required for some tower construction and may be a significant impact but this should be for a short duration. Where vibration could become a major consideration (within say 100m of schools, religious premises, hospitals or residences) a building condition survey should take place prior to construction.

  The physical effect of piling should be assessed prior to construction and measures should be discussed with the local population as well as timing of the works to serve as a vehicle for further public consultation at the implementation stage and to assist in public relations. At nearby schools, the contractor shall discuss with the school principals the agreed time for operating these machines and completely avoid machine use near schools during examination times, if such a need arises.
- Noise barriers should be installed for workers working more than eight hours a day during construction activities. Noise levels from construction activity can be reduced by regular maintenance of machinery. Noise can be controlled through engineering controls e.g. hammering actions can be substituted by hydraulic. Ensure that the workers are wearing PPEs (ear plugs, ear muffs etc.) where engineering control is not applicable to reduce the impact of noise.

5.8.3 Hydrology and drainage aspects

Impact analysis

262. To ensure the proper implementation of best practices to ensure the hydrology of the area is not adversely impacted.

Mitigation measures

263. The following measures shall be implemented:

- Consideration of weather conditions when particular construction activities are undertaken.
- Limitations on excavation depths in use of recharge areas for material exploitation or spoil disposal.
- Use of landscaping as an integrated component of construction activity as an erosion control measure.
- Minimizing the removal of vegetative cover as much as possible and providing for its restoration where construction sites have been cleared of such areas.

5.8.4 Water Quality

Impact analysis

264. To prevent adverse water quality impacts due to negligence and ensure unavoidable impacts are managed effectively. Ensure adverse impacts on water quality caused by construction activities are minimized.

Mitigation measures

265. The following measures shall be implemented:

- Storage of lubricants, fuels and other hydrocarbons in self-contained dedicated enclosures >50m away from water bodies.
- Proper disposal of solid waste from construction activities and labor camps.
- Cover the construction material and spoil stockpiles with a suitable material to reduce material loss and sedimentation and avoid stockpiling near to water bodies.
- Topsoil stripped material shall not be stored where natural drainage will be disrupted.
- Borrow sites (if required) should not be close to sources of drinking water.

5.8.5 Soil Contamination

Impact analysis

266. Lands may get contaminated from the spillage of chemicals like fuels, solvents, oils, paints and other construction chemicals and concrete. This normally happens when these materials are transported in open or loosely capped containers. Unmanaged sewage can also contribute to contamination of soil.

267. The possible contamination of soil by oils and chemicals at campsites, workshop areas, and equipment washing-yards may limit the future use of land for vegetation purposes.

Mitigation measures

268. The measures provided below shall be implemented:

- It will be ensured that spill prevention trays are provided and used during refueling. Also, on-site maintenance of construction vehicles and equipment will be avoided as far as possible. In case on-site maintenance is unavoidable, tarpaulin or other impermeable material will be spread on the ground to prevent contamination of soil.
- Regular inspections will be carried out to detect leakages in construction vehicles and equipment and all vehicles will be washed in external commercial facilities.
- Fuels, lubricants and chemicals will be stored in covered bounded areas, underlain with impervious lining. Appropriate arrangements, including shovels, plastic bags and absorbent materials will be available near fuel and oil storage areas.
- Solid waste generated at the campsites will be properly segregated, treated and safely disposed of only in the demarcated waste disposal sites.
- Proper drainage system shall be constructed to ensure proper disposal of sewage and wastewater, which will offset any impact on soil. Sewage will be connected to sewage network for offsite treatment or will be connected to septic tank.

5.8.6 Construction waste disposal

Impact analysis

269. The waste generated during the construction works at site must be properly disposed in accordance with local applicable NEQS guidelines and environmental best practices.

Mitigation measures

270. The following measures shall be implemented:

- Waste management plan to be submitted to the CSC and approved by MC one month prior to starting works.
- Estimating the amounts and types of construction waste to be generated by the project.

- Investigating whether the waste can be reused in the project or by other interested parties.
- Identifying potential safe disposal sites close to the project or those designated sites in the contract.
- Investigating the environmental conditions of the disposal sites and recommendation of most suitable and safest sites.
- Piling up of loose material should be done in segregated areas to arrest washing out of soil. Debris shall not be left where it may be carried by water to downstream flood plains, dams, lagoons etc.
- Used oil and lubricants shall be recovered and reused or removed from the site in full compliance with the national and local regulations.
- Oily wastes must not be burned. Disposal location to be agreed with local authorities/EPA.
- Machinery should be properly maintained to minimize oil spill during the construction.
- Solid waste should be disposed at an approved solid waste facility, open burning is illegal and contrary to good environmental practice.

5.8.7 Impact on Water Resources

Use of Local Water Supplies/Spring Water

Impact analysis

271. Project lies in an agriculturally rich area, where there is no scarcity of water. Still use of local water supplies for construction purpose can create a big issue. As acknowledged during the public consultations, locals may not want to share their water supplies as they were concerned that sharing will disturb their agricultural activities and water will get contaminated.

Mitigation measures

272. The following measures will be carried out to mitigate the impacts of tapping local community water resources, where required:

- Approval from the local administration and representatives of the concerned departments will be obtained before using local water resources.
- Camps will be located within the project boundary to prevent the contamination of community-owned water resources.
- The contractors will be required to maintain close liaison with local communities to ensure that any potential conflicts relating to the common resource utilization for

the project purposes are resolved quickly.

- Guidelines will be established to minimize the wastage of water during the construction activities and at campsites.

Contamination of Surface and Ground Water

Impact analysis

273. Subsurface water resources may be contaminated by fuel and chemical spills, or by unmanaged solid waste and effluents generated by the kitchens and toilets at construction campsites.

Mitigation measures

274. Good management practices will be adopted to ensure that fuels and chemicals, raw sewage and wastewater effluent are disposed of in a controlled manner to reduce the risk of contamination. These measures are as described below:

- Best engineered drainage channels will be established in the construction camps in order to facilitate the flow of the treated effluents.
- Soakage pits and septic tanks will be established for the treatment of sewage effluents.
- Wastewater effluent from the contractors' workshops and equipment washing-yards will be passed through gravel/sand beds to remove oil/grease contaminants before discharging into the natural streams. According to the local laws, the BOD5 concentration in sewage must be brought down to less than 80 mg/l before being discharged into a natural stream with a capacity to dilute the effluent further by 10 times. Furthermore, since the national regulation of 80 mg/l is quite lenient, thus in spirit all efforts shall be made to minimize the pollution load to meet the standard of 30 mg/l.
- Any oil contaminated gravel/sand left after the construction activity will be handed over to a pre-approved third party that shall be responsible for incineration and/or disposal of this material in accordance with NEQS and international best practices.

5.8.8 Soil Erosion

Impact analysis

275. Soil erosion may occur as a result of improper runoff drawn from the equipment washing-yards and improper management of construction activities.

Mitigation measures

276. The following measures shall be implemented:

- Good engineering practices will help control soil erosion both at the construction sites and in peripheral areas, particularly at tower foundations and along the haul tracks. Controlled and well-managed vehicular movement, excavation, vegetation and regular water sprinkling will reduce the chances of soil erosion.
- Schedule works in sensitive areas (e.g. rivers) for dry season.
- Meaningful water quality monitoring up and downstream at any tower site within a river or stream during construction. Rapid reporting and feedback to CSC.
- Back-fill should be compacted properly in accordance with design standards and graded to original contours where possible.
- Cut areas should be treated against flow acceleration while filled areas should be carefully designed to avoid improper drainage.
- Stockpiles should not be formed within such distances behind excavated or natural slopes that would reduce the stability of the slopes.
- In the short-term, either temporary or permanent drainage works shall protect all areas susceptible to erosion.
- Measures shall be taken to prevent pounding of surface water and scouring of slopes. Newly eroded channels shall be backfilled and restored to natural contours.
- Contractor shall arrange to adopt suitable measures to minimize soil erosion during the construction period. Contractor should consult concerned authorities in the area before deciding mitigation measures.
- Clearing of green surface cover to be minimized during site preparation.
- Replanting trees to be done before the site is vacated and handed back to NTDC with appropriate trees (other vegetation cover as appropriate) to ensure interception of rainwater and the deceleration of surface run-off.

5.8.9 Handling, transportation and storage of Construction materials

Impact analysis

277. To minimize contamination of the surroundings (due to Implementation of works, concrete and crushing plants).

Mitigation measures

278. The following measures shall be implemented:

In order to minimize and or avoid adverse environmental impacts arising out of construction material exploitation, handling, transportation and storage measures to be taken in line with any EPA conditions/recommendations in approval:

- Conditions that apply for selecting sites for material exploitation.

- Conditions that apply to timing and use of roads for material transport.
- Conditions that apply for maintenance of vehicles used in material transport or construction.
- Conditions that apply for selection of sites for material storage.
- Conditions that apply for aggregate production.
- Conditions that apply for handling hazardous or dangerous materials such as oil, lubricants and toxic chemicals.

5.8.10 Work camp operation and location

Impact analysis

279. The operation of work camps can adversely affect the surrounding environment and residents in the area if local regulations and internationally accepted best practices are not implemented.

Mitigation measures

280. The following measures shall be implemented:

- Identify location of work camps in consultation with local authorities. The location shall be subject to approval by the NTDC. If possible, camps shall not be located near settlements or near drinking water supply intakes.
- Cutting of trees shall be avoided and removal of vegetation shall be minimized.
- Water and sanitary facilities (at least pit latrines) shall be provided for employees. Worker camp and latrine sites to be backfilled and marked upon vacation of the sites.
- Solid waste and sewage shall be managed according to the national and local regulations. As a rule, solid waste must not be dumped, buried or burned at or near the project site, but shall be disposed off to the nearest sanitary landfill or site having complied with the necessary permission of local authority permission.
- The Contractor shall organize and maintain a waste separation, collection and transport system.
- Toilets will be self contained or shall be disposed off to a septic tank and no toilets will be located within 100 meters of any surface water body or any groundwater well.
- The Contractor shall document that all liquid and solid hazardous and non-hazardous waste are separated, collected and disposed of according to the given requirements and regulations.

- At the conclusion of the project, all debris and waste shall be removed. All temporary structures, including office buildings, shelters and toilets shall be removed.
- Exposed areas shall be planted with suitable vegetation.
- NTDC and Supervising Engineer shall inspect and report that the camp has been vacated and restored to pre-project conditions.

5.8.11 Vehicle and Equipment Exhaust

Impact analysis

281. The emissions from vehicles and combustion processes in generators and other construction equipment result in exhaust gases that can affect the ambient air quality locally and pose a health hazard particularly for communities resident in proximity to the project site.

Mitigation measures

282. The following measures shall be implemented:

- It shall be ensured that all vehicles, generators and other equipment used during the construction will be properly tuned and maintained in good working condition in order to minimize emission of pollutants.
- The stack height of generators will be at least 3 meters above the ground.

Ecological Resources

5.8.12 Trees, Ecology and Protected Areas

Impact analysis

283. There is no protected area, as per identification of National Conservation Strategy, within or anywhere near the project area. Dust during the construction phase will also cause an adverse impact on surrounding crops.

284. The trees that will need to be cut down have yet to be determined. Trees will be enumerated species wise and compensatory plantation will be arranged along roads and paths through forestry.

Mitigation measures

285. The following measures shall be implemented:

- To replace the removed trees, sufficient areas will be identified to allow plantation of trees at a rate of 5:1. Moreover, owners of the affected trees will be paid compensation for their loss.

- A requirement shall be inserted in the contracts that no trees are to be cut on the proposed project site or outside, without the written permission from the supervising consultant.
- In addition to this, the contractor will be required to spray water twice or thrice a day (as per need) to avoid dispersal of dust on the adjacent flora.
- Land holders will be paid compensation for their standing trees in accordance with prevailing market rates (LARP). The land holders will be allowed to salvage the wood of the affected trees. They will also be encouraged to plant suitable new trees outside the 30 meter corridor of the transmission line in lieu of trees removed.
- The contractor's staff and labor will be strictly directed not to damage any vegetation such as trees or bushes.
- Clearing of green surface cover for construction, for borrow of for development, cutting trees and other important vegetation during construction should be minimized.
- Landscaping and road verges to be re-installed on completion.

5.8.13 Wildlife and Fauna

Impact analysis

286. Mammals, Amphibians, birds and reptiles could be disturbed with the clearance of flora. Birds can easily fly away to any trees outside the project corridor. Moreover, grazing activity of animals could also be disturbed.

287. During construction stage, noise and movement of heavy machinery for road construction, shall disturb the fauna of the area as the reptiles like lizard and snakes may get killed or move to the adjoining areas. Similarly, avifauna shall be disturbed and scared away due to disturbance of habitat. Trees provide resting and nesting places to the birds. Their removal shall have a negative effect on the fauna. Movement of vehicles near corridors of grazing cattle/slow moving animals may cause danger to their lives and require special attention by provision of sign boards and educating the drivers of construction vehicles. As there are no endangered species present near the project area, so there is no potential impact on the endangered species by the execution of the project.

Mitigation measures

288. The following mitigation measures should be implemented:

- Vehicle speed will be controlled to avoid incidental mortality of small mammals and reptiles.
- Staff working on the project will be given clear orders, not to shoot or trap any bird

or animal.

- Lights used in the camps, during construction of towers will be kept to the minimum requirement. Upward scattering lights will preferably be used.
- There will be adjacent areas available for grazing; hence the grazing activity of animals will not be affected.

Socio-economic Environment

5.8.14 Impact on local communities/Workforce

Impact analysis

289. The communities in the project area will be affected during the construction phase as follows:

- During the construction phase, the general mobility of the local residents and their livestock in and around the project area is likely to be hindered.
- Unmonitored construction activities, e.g. excavation, equipment movement etc. may create accident risks.
- Usage of community's common resources like potable water, fuel wood etc. by contractor's workforce may create conflicts between the community and the contractor.
- Induction of outside workers in the contractor's labor force may cause cultural issues with the local communities.
- Increase in crime as a result of contractor's workers trying to rob the local communities.

290. The presence of migrant construction workers inevitably causes some degree of social unease and even active disputes with the local community as a result of cultural differences.

Mitigation measures

291. The following measures must be implemented to ensure Community safety:

- Awareness workshops must be conducted prior to commencement of works in any project area
- Work sites must be cordoned off to villagers, particularly children.
- Construction vehicles must ensure controlling of speed limits to prevent accidents with village communities, particularly children.

292. Potential social conflict will be contained by implementing the measures listed below:

- Temporarily and for short duration, the contractor has to select specific timings for stringing so as to cause least botheration to the local population considering their peak movement hours.
- Approval from the local administration will be obtained before using the local resources such as wood and water.
- The contractors will be required to maintain close liaison with the local communities to ensure that any potential conflicts related to common resource utilization for the project purposes are resolved quickly.
- Contractor will take care of the local community and sensitivity towards the local customs and traditions will be encouraged.
- Effective construction controls by the contractor to avoid inconvenience to the locals due to noise, smoke and fugitive dust.
- Good relations with the local communities will be promoted by encouraging contractors to provide opportunities for skilled and unskilled employment to the locals, as well as on-the-job training in construction for young people. Contractor will restrict his permanent staff to mix with the locals to avoid any social problems.
- Local vendors will be provided with regular business by purchasing campsite goods and services from them.
- The Contractor will warn the workers not to involve in any theft activities and if anyone found guilty of such activities, he will have to pay heavy penalty and would be handed over to police. Similarly, at the time of hiring, Contractor has to take care that the workers should be of good repute. The Contractor camp will be properly fenced and main gate will be locked at night with a security guard to check the theft issues from community side.
- Providing adequate warning signs.
- Providing workers with skull guard or hard hat.
- Contractor shall instruct his workers in health and safety matters, and require the workers to use the provided safety equipment.
- Establish all relevant safety measures as required by law and good engineering practices.

5.8.15 Traffic condition

Impact analysis

293. Minimize disturbance of vehicular traffic and pedestrians during haulage of construction materials, spoil and equipment and machinery, blocking access roads during works Damage / maintenance problems for roads and bridges used by the haulage trucks, dust nuisance to school and hospitals.

Mitigation measures

294. The following measures shall be implemented:

- Submit temporary haul and access routes plan, one month prior to start of works.
- Formulate and implementation of a plan of alternate routes for heavy vehicles.
- Vicinity of schools and hospitals to be considered.
- Installation of traffic warning signs, and enforcing traffic regulations during transportation of materials and equipment and machinery. Conditions of roads and bridges to be considered.
- Provision of culverts on water channels and drains.
- Widening/upgrading of access paths/roads

5.8.16 Indigenous, Vulnerable and Women headed Households

Impact analysis

295. During the field survey for the sub-project, no indigenous group of people was identified, which comes under the definition of 'Indigenous people'. Also, no vulnerable or women headed households were identified. Thus, no such impact is envisaged during the implementation of the project.

Mitigation measures

No measures required.

5.8.17 Public Health and Safety Hazards

Impact analysis

296. Construction of transmission line will require large number of workers who will obviously be accommodated in congested temporary camps. This scenario may lead to spreading of diseases like Malaria, Cholera, Typhoid, Hepatitis A, B and C etc.

297. Occurrence of accidents/incidents during the construction stage is a common phenomenon as evident from previous experience of NTDC.

Mitigation measures

298. The following mitigation measures are proposed:

- In construction camps, amenities of life including clean food, water and sanitation facilities must be provided. Contractor will arrange first aid boxes in the temporary camps. Routine medical check-ups of all the field staff including unskilled labor needs to be conducted by an MBBS doctor.

- The other source of pollution from the camps will be from garbage and waste. Apparently, there are no solid waste disposals facilities in the villages located in the vicinity of the road and solid waste will have to be disposed of at a safe site.
- Compliance with the safety precautions for construction workers as per International Labor Organization (ILO) Convention No. 62, as far as applicable to the project contract, should be ensured.
  - Workers should be trained in construction safety procedures and environmental awareness. Proper handling of combustibles, flammable material and good housekeeping practices will be required to avoid fire hazard. Smoking will be prohibited at or around work areas where fire hazards are present. Signs will be put up, saying 'NO SMOKING' or 'NO OPEN FLAMES'.
- Equipping all construction workers with PPEs such as safety boots, helmets, gloves, and protective masks, and monitoring their proper and sustained usage.
- Contractor will ensure the provision of medicines, first aid kits, vehicle, etc. at the camp site.
- Safety lookouts will be built to prevent people and vehicles from passing at the time of excavation and other activities of such sort.
- Cordon off the work areas where necessary.
- It is recommended that NTDC at the planning stage of the project shall plan necessary arrangements in the form of earthing system to avoid accidents.
- Adequate facilities shall be provided in terms of drinking water that meets standards, number of toilets per worker with running water, stocked first aid kit and trained first aider at each tower location etc.
- Solid and hazardous waste generated shall be disposed to a suitably licensed landfill, potentially transporting it outside the project area, if felt necessary.

5.8.18 Sanitation, Solid Waste Disposal, Communicable Diseases

Impact analysis

299. The main issues of concern are uncontrolled or unmanaged disposal of solid and liquid wastes into watercourses and natural drains, improper disposal of storm water and black water and open defecation by construction workers.

Mitigation measures

300. The proposed mitigation measures are as follows:

- In order to maintain proper sanitation around construction sites, access to the nearby lavatories will be allowed or provision of temporary toilets will be made. Construction worker camps will be necessary, based on the scale of the works

needed. The construction camp will be provided with toilets with soakage pits or portable lavatories or at least pit latrines.

- Disposal of surplus materials must also be negotiated through local authority approvals prior to the commencement of construction. The Subproject work will not involve any significant cutting and filling but minor excavations (down to 4m) and piling may be required to create the foundations for some towers (if required). It is envisaged (depending on the mode of contract) that the surface under the towers will need to be scrabbled to remove unstable materials, or to stockpile topsoil.
- If surplus materials arise from the removal of the existing surfaces from specific areas, it will be used elsewhere on the subproject before additional soil, rock, gravel or sand is brought in. The use of immediately available material will generally minimize the need for additional rock based materials extraction from outside.
- Contractual clauses will require the contractor to produce a materials management plan (one month before construction commences) to identify all sources of cement and aggregates and to balance cut and fill. The plan should clearly state the methods to be employed prior to and during the extraction of materials and all the mitigation measures to be employed to mitigate nuisances to local residents. Financial compensation shall not be allowed as mitigation for environmental impacts or environmental nuisance.
- Contractual clauses will require the contractor to produce a solid waste management plan so that proper disposal of waste can be ensured.

5.8.19 Disease Vectors

Impact analysis

301. Wherever water is allowed to accumulate, in temporary drainage facilities, due to improper storm water management, or improper disposal of wastewater generated from the site, it can offer a breeding site for mosquitoes and other insects. Vectors such as mosquitoes may be encountered if open water is allowed to accumulate at the construction campsite.

Mitigation measures

302. The following mitigation measure can be implemented:

- Temporary and permanent drainage facilities should therefore be designed to facilitate the rapid removal of surface water from all areas and prevent the

accumulation of surface water ponds.

5.9 Potential Environmental Impacts during Operation

5.9.1 Aircraft safety and radar interference

Impact analysis

303. The proposed transmission lines can pose a potential threat to low flying aircraft and also cause radar interference to the communication systems of the aircraft.

304. However, the closest airport is at Lahore and is located at an approximate distance of 40 kilometers. In addition, no smaller air fields are located near the transmission line routes and considering the height of the proposed TL in comparison to the minimum altitude of aircraft, no threat is posed to aircraft from the proposed sub-project.

305. Keeping in view the minimal height of the transmission towers in comparison to the minimal altitude of aircraft along with the fact that there are no airports or small airfields in close proximity to the TL route, no significant impact is expected on aircraft safety and the possibility of radar interference is also highly remote.

Mitigation measures

No measures required.

5.9.2 Impacts on Ecological Resources

Impact analysis

306. No tree cutting is to take place during the operation stage. On the other hand, tree plantation, on the ratio of 5:1 will improve the ecological habitat and environmental conditions of the project area and thus enable the scared away avifauna to return to this area. New plantations will not only compensate for the loss of trees, but will also add to the aesthetics of the area. There will be healthy and positive impacts on flora and fauna during the operation stage.

307. It shall be ensured that vegetation is also maintained along the right of way of the proposed transmission line and the aesthetic value resulting from the presence of vegetation is not lost.

Mitigation measures

No measures required.

5.9.3 Crops and vegetation

Impact analysis

308. To ensure tree clearance under transmission lines is controlled to prevent damage to TLs from tree growth.

Mitigation measures

309. Track growth of large trees under the conductors.

5.9.4 Social safety impacts

Impact analysis

310. To ensure no encroachments/construction under the transmission line and prevent violation of clearance spaces.

Mitigation measures

311. The following measures shall be implemented:

- Necessary signboards with limits of height clearances to be placed properly.
- Identify and prevent any illegal encroachments under the transmission line.

5.9.5 Enhancement

Impact analysis

312. Environmental enhancements are not a major consideration for this sub-project corridor. However, it is noted that it is common practice at many such sites to create some local hard and soft landscaping and successful planting of fruit trees and shrubs has been accomplished in many sites. This practice should be encouraged as far as practicable.

Mitigation measures

No measures required.

5.10 Environmental and Social Risk Assessment

313. The common environmental risks as assessed on the basis of consultations with the stakeholders are as follows:

- Some of the local people believe that their movement will be restricted in the project area due to Electro Magnetic Field (EMF), and it may have adverse impacts on their health. EMF due to EHV can cause the risk of leukemia, which is a disease in which white blood cells mutate and become cancerous before maturity. These cells are important in fighting against infection in the body. Leukemia also slows down the production of red blood cells that are needed to carry oxygen in the second leading cause of death for children ages 2-15 years.
- People have to bear an excessive noise due to the current flow in the conductors especially in rainy season.

- The electronic devices/equipment may fail to work when passing under the EHV transmission lines.
- The allied transmission line may become a danger to the movement of birds

Mitigation Measures

314. The proposed mitigation measures for the above environmental risks are as follows:

5.10.1 Occupational Health and Safety

Impact analysis

315. The high voltage transmission lines in the project area and at times in close proximity to certain communities pose a real threat if any kids or community members do not realize the danger and choose to climb the towers.

316. The staff of NTDC that will be required to climb the towers for maintenance of the lines are at considerable threat of falling from the towers or being electrocuted if they are not wearing the proper equipment or following the established protocol.

Mitigation measures

317. It shall be ensured that a public awareness campaign is developed and implemented to educate the local communities regarding the dangers posed by exposure to the high voltage contained in live transmission lines.

318. All NTDC staff conducting maintenance of the transmission lines shall ensure that they wear protective equipment such as goggles, rubber boots, protective jacket and also carefully follow all standard protocols to ensure their safety while working on the towers.

319. All NTDC staff shall also use protective harnesses to ensure they are protected from falling from the towers.

320. All NTDC staff shall avoid working on the towers in bad weather conditions, particularly during rain and high winds.

5.10.2 Danger to Bird Movements

Impact Analysis

321. There is a possibility of birds either being electrocuted by sitting on transmission lines or by colliding with the towers. The necessary mitigation measures for minimizing the possibility of either of these two scenarios are presented below.

Mitigation Measures

(i) Mitigating for Electrocution:

322. Electrocution mitigation can be more easily achieved than collision mitigation. The problem is at a smaller physical scale, whereby a bird bridges energised wires or wires and grounded hardware on a pole structure. The solution is relatively straightforward and involves ensuring that a bird cannot touch the relevant components using appropriate design. It is cost effective to carry out electrocution mitigation in the building phase of new medium voltage power lines as retrospective fitting (i.e. mitigate for electrocution on an already operational network) of dangerous poles is very expensive.

323. Also the impact upon migratory soaring birds (MSBs) in the interim period could be highly significant, especially in terms of cumulative impact if occurring at multiple locations across the flyway. Furthermore, retrofitting normally requires an outage (line switched off) with subsequent customer issues, and is principally changing a previously approved engineering design, with additional materials and complications.

- **Pole and line design or configuration**

324. This is relatively easily achieved through the technical design of the pole top. The design can take one or a combination of two approaches:

- Ensuring that the likely preferred perching space for a bird on the pole top is well clear of dangerous components;
- Ensuring that the dangerous components are sufficiently separated by space to ensure that the bird cannot touch them.
- The second option, whilst more foolproof, can result in significantly larger pole tops with consequent significantly increased costs, which is why a combination of the two approaches is often employed.
- Line design modifications for mitigating bird casualties should include sufficient spacing between different conductors and between conductors and grounded wires or hardware. Short distances between conductors often occur at switch towers, at junctions and dead ends of distribution systems.

- **Insulation**
  - Where poles or pylons or substation hardware pose a risk of electrocution to birds by virtue of the insufficient clearances between critical hardware, it is possible to adjust the situation with add-on mitigation. This usually takes the form of insulating materials that are fitted onto critical components of the structure, in order to render those components neutral.

    In some cases this insulation takes the form of custom designed products for insulating certain components, and in other cases more universal, generic material is used, which can be adapted on site to insulate varying components. A feature of most of these products is that they often do not provide full insulation, and should not be considered safe for humans. In fact, these materials often only cover the

dangerous components, reducing the likelihood of electrocution but not fully eliminating it.

(ii) Mitigating for Collisions:

325. Employing mitigation measures already during the development of new lines is more cost-effective and may ensure a substantially reduced number of casualties from the onset of the operation of the power line. Once infrastructure exists, line modification in various forms is the most widely used approach. Modification of existing lines can be broadly divided into measures that:

- Make power lines less of an 'obstacle' for birds to collide with;
- Keep birds away from the power line
- Make the power lines more visible.

- **Line design or configuration**

326. Although different bird species fly at different heights above the ground, there is general consensus that:

- Power line cables lower to the ground are better for preventing bird collision;
- Less vertical separation of cables is preferred, as it poses less of an 'obstacle' for birds to collide with. Horizontal separation of conductors is therefore preferred;
- Construction of self-supporting towers, which do not require stay wires, is preferred, as bird collisions have been recorded with the guy or stay wires of towers;
- moving or designing power lines without earth or shield wire (the thinnest wire at the top of the power line structure) can take away the obstacle birds most often collide with.

- **Line marking**
  - Since the assumption is that birds collide with overhead cables because they cannot see them, fitting the cables with devices in order to make them more visible to birds in flight is the preferred mitigation option.
  - Besides thickening, coating or coloring the often least visible thin ground wires, a wide range of potential 'line marking' devices has evolved over the years, including: spheres, swinging plates, spiral vibration dampers, strips, swan flight diverters, Firefly Bird Flight Diverters, bird flappers, aerial marker spheres, ribbons, tapes, flags, fishing floats, aviation balls and crossed bands

- Devices should be installed on the earth wire (also-called ground or shield wire), wherever possible. On lines without an earth wire, devices should be installed on the conductors. Although installation of these devices on higher voltage conductors is problematic, lines of higher voltage would typically have an earth wire anyway. Guidance is available on spacing between line markers.

5.10.3 Effect of Electro Magnetic Field (EMF)

Impact Analysis

327. Different studies are carried out in Britain to find out the effects of EHV on children particularly with reference to leukemia. British study suggested that children who live close to high voltage overhead power lines may be at an increased risk of leukemia. Although the researchers have made efforts to identify the effects of EHV related to leukemia, the researchers have so far been unable to prove that the power lines are the cause of leukemia.

Mitigation Measures

328. The following measures shall be implemented:

- Since the project has been planned in the least populated area, even if some effects due to EMF are envisaged, these will be minimal due to safe distance since no residences are generally located within a distance of 100 meters along the transmission line alignment.
- Similarly, a vertical clearance required as per international standards will also be maintained, especially near any populated areas.
- During the operation stage, check will be kept by the NTDC that no construction will be allowed within 100 m of the transmission line.

5.10.4 Excessive Noise Problem

Impact Analysis

329. Due to the EMF along the transmission lines, noise is generated during the ionization of the ambient air. Such a situation occurs with more severity in the rainy season when moisture in the air is relatively high. It may generate discomfort due to the noise generated during the ionization process.

Mitigation Measures

330. To overcome this problem, the route has been selected passing through the least populated area.

331. Construction of houses within the project corridor will be prohibited and NTDC will make sure to check such type of construction during the operation stage. NTDC is providing vertical and horizontal clearances in accordance with the national and international standards. This will also reduce the noise intensity.

5.11 Cumulative impacts

332. Cumulative impacts would mainly be from other projects, particularly other transmission line projects being constructed concurrently with the construction stage of this sub-project.

333. There is no other transmission line project or any other infrastructure projects being planned in the project area along the transmission line alignments. Thus, no cumulative impacts are expected.

5.12 Environmental and Social Benefits of The Project

334. Although there will be some insignificant and temporary negative effects of the sub-project during implementation and operation stage, but a large number of positive effects on environment and social settings of the area are also expected. Load shedding is a serious issue these days due to huge difference in production and demand of electricity. The major positive impacts of the proposed sub-project on environment and social settings of the project area include:

- Availability of the electricity will be ensured as per demand of the area.
- Expansion of industries expected due to availability of electricity.
- Better quality of life will be available to the citizens.

6 Institutional Requirements & Environmental Management Plan

6.1 Introduction

335. The Environmental Management Plan (EMP) is developed to eliminate and/or mitigate the impacts envisaged at the design, construction and operation stages.

336. The detailed EMPs provided in this section are as follows:

- **Table 6.1** is the EMP for the Jauharabad sub-station development
- **Table 6.2** is the EMP for the 12 km Transmission Line

337. These EMPs shall ensure that the proposed sub-project has no detrimental effect on the surrounding environment. The Plan shall act as a guideline for incorporating environmental measures to be carried out by the contractors engaged by NTDC, as well as for other parties concerned for mitigating possible impacts associated with the sub-project and will form part of the Contract documents to be considered alongside the specifications. This Plan shall act as the Environmental Monitoring Plan during construction and operational phases of the Project, and will allow for prompt implementation of effective corrective measures.

6.2 Environmental Management Plan (EMP)

338. The EMP attached with this report ensures the following:

- Delivery of the prescribed environmental outcomes during all phases of the Project;
- Formulating a system for compliance with applicable legislative and non-legislative requirements and obligations and commitments for the Project;
- Ensure that project design process incorporates best practice environmental design and sustainability principles to minimize potential impacts of construction and operation on the environment and community.
- Ensure that the construction work procedures minimize potential impacts on the environment and community.
- Develop, implement and monitor measures that minimize pollution and optimize resource use.

6.3 Objectives of EMP

339. The EMP provides a delivery mechanism to address potential impacts of the project activities, to enhance project benefits and to outline standardized good

practice to be adopted for all project works. The EMP has been prepared with the objectives of:

- Defining the roles and responsibilities of the project proponent for the implementation of EMP and identifying areas where these roles and responsibilities can be shared with other parties involved in the execution and monitoring of the project;
- Outlining mitigation measures required for avoiding or minimizing potential negative impacts assessed by environmental study;
- Developing a monitoring mechanism and identifying requisite monitoring parameters to confirm effectiveness of the mitigation measures recommended in the study;
- Defining the requirements for communication, documentation, training, monitoring, management and implementation of the mitigation measures.

6.4 Environmental Management/Monitoring and Reporting

340. The proposed Project will be administrated by NTDC during the implementation stage as described in detail below, and the existing institutional setup of NTDC for implementation of the project is illustrated in **Fig. 6.1**. The existing organizational setup of NTDC for all the stages of the project (design, construction and operation) is fully integrated with handling of environment and social issues.

341. The NTDC federal headquarter is based in Lahore, and is responsible for managing the project at the policy level. At the highest level, the Chief Engineer (EHV-I) will be responsible for day-to-day project management at project implementation stage. He will report directly to the General Manager (GSC), who will have ultimate responsibility for planning and managing implementation of the projects.

342. The Chief Engineer (EHV-I) will be assisted by Project Director, who will have overall responsibility for ensuring the project compliance with the EMP. The Project Director (PD) will be supported by two Executive Engineers i.e. Survey and Soil Investigations (SI) and Transmission Line Construction (TLC) who, will further be assisted by the concerned Sub-Divisional Officers and their teams.

343. After completion of the Project, the Project will be handed over to the GSO Division of NTDC, which is working under the Chief Engineer (GSO). He reports to the General Manager (GSO) for operation and maintenance of grid stations and transmission lines.

344. The Chief Engineer GSO will be supported by the Superintending Engineer for the proposed Project, who will also be assisted by Executive Engineer, Sub-Divisional Officer and his field team.

345. To ensure the community participation and to provide the environmentally and socially viable conditions, the Environment and Social Impact Cell of NTDC will extend its services and support the field teams. The Organogram of ESIC for the implementation of EMP is depicted in **Fig. 6.2**.

346. The specific roles and responsibilities for environmental management are provided in **Tables 6.1** and **6.2** below.

Figure 6.1: NTDC's Institutional Setup for Project Implementation

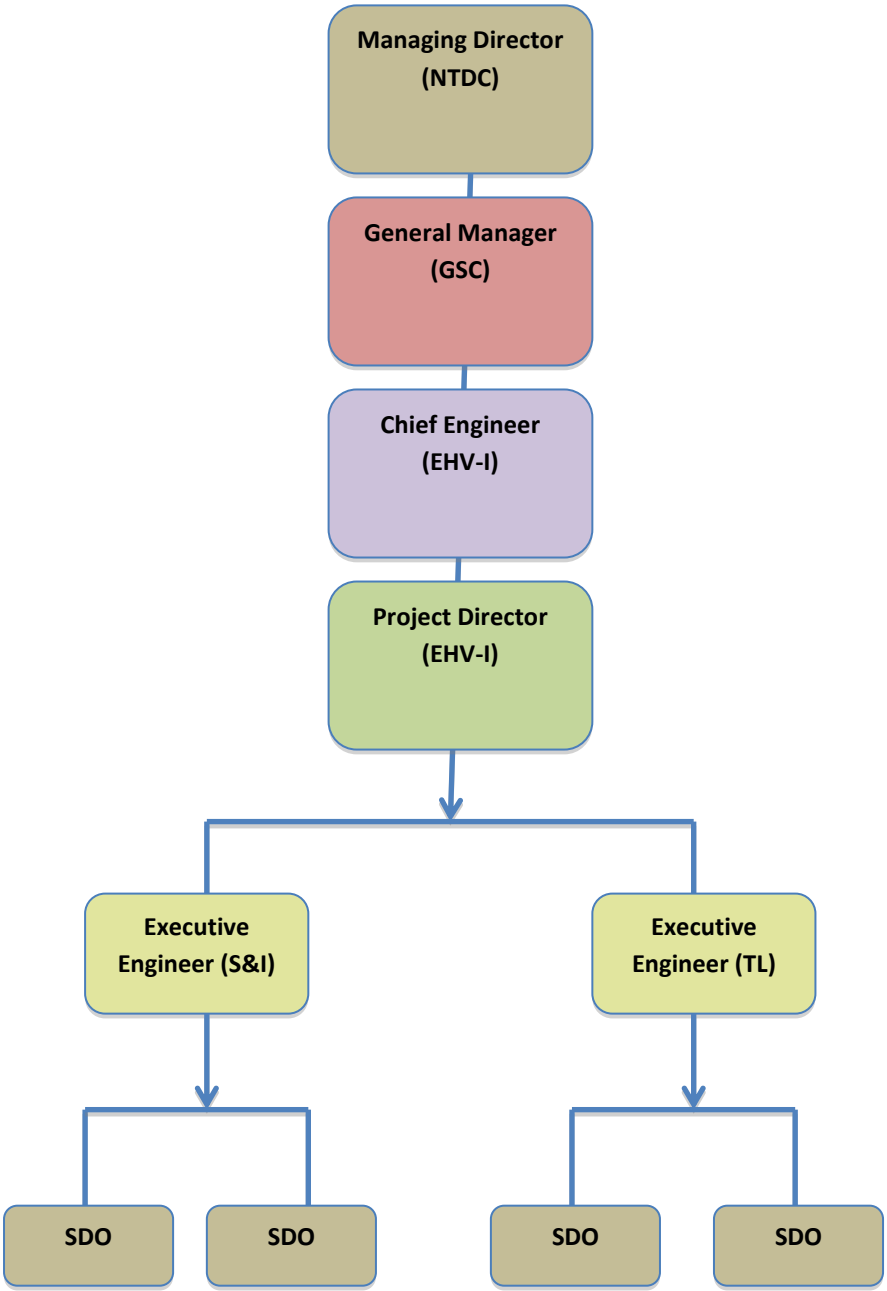
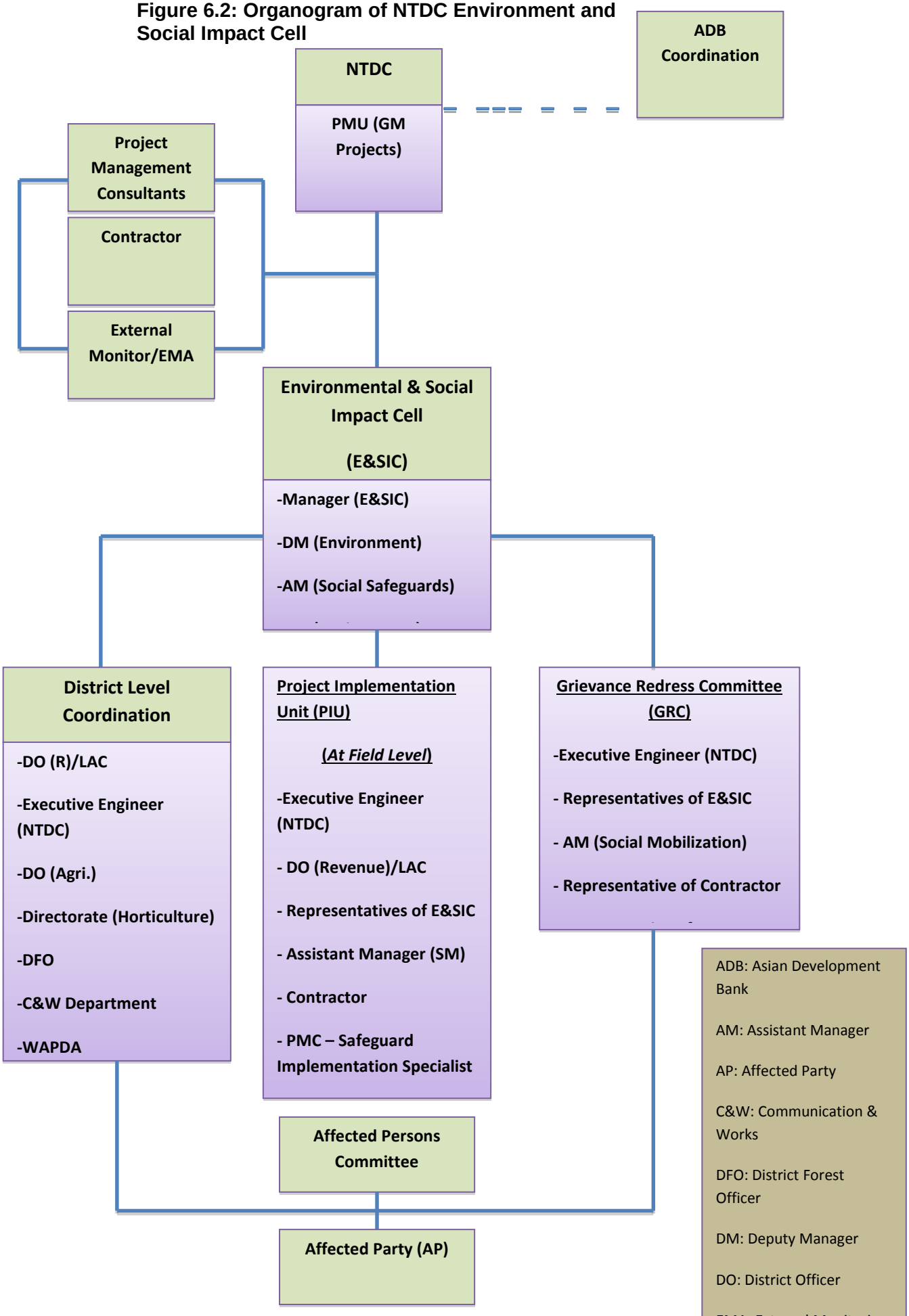


Figure 6.2: Organogram of NTDC Environment and Social Impact Cell



347. The EMP was prepared taking into account the capacity of the NTDC to conduct environmental assessments of the subproject. But it is envisaged that the NTDC's Environmental and Social Impact Cell (ESIC) will conduct monitoring of the subproject to check the compliance of EMP provisions and will obtain environmental approval from EPA Punjab.

348. The ESIC is composed of one Manager, one Deputy Manager, and two Assistant Managers (refer to **Fig 6.2**). Most of the environmental work is delegated to consultants. Specific areas for immediate attention are in EMP auditing, environmentally responsible procurement, air, water and noise pollution management, Social and ecological impact mitigation. It is recommended that an environmental specialist should be made part of team of supervisory consultants for effective monitoring of EMP provisions.

349. The duties of the ESIC include but are not limited to the following:

- Provide review and technical support to PMU, including review of papers, feasibility studies, appraisal reports and other relevant documents from the perspective of environment and land acquisition and resettlement management, on assignment basis.
- Supervise and scrutinize the consultants hiring process for environmental and social documents preparation.
- Oversight of construction contractors for monitoring and implementing mitigation measures.
- Preparing and implementing environment policy guidelines and environmental good practices.
- Liaising with the PIUs and seeking their help to solve the environment related issues of project implementation.
- Providing awareness-training workshop on environmental and social issues related to power transmission to PIU staff.
- Preparation of bi-annual progress reports on environmental and social safeguards for submission to ADB.
- Conduct seminars / local training workshops on environment safeguards matters with the help of NGOs / PIU / IFIs, etc. and
- Prepare EIAs/IEEs of new projects.
- Seek environmental approvals (NOCs) from respective EPA

6.4.1 Environmental and Social Monitoring by ESIC

350. The general monitoring responsibilities of the NTDC Environment and Social Impact Cell will consist of:

- Assist in valuation of the trees, crops etc. and negotiation with the owners.
- Assist in checking genuine ownerships of the claimants, in consultation with the Revenue staff for prompt payment to the affectees.
- Assist the Contractor for the timely payments of negotiated price.
- Check that the Contractor backfills, compacts, and leaves the ground in the original condition after excavation of pits for subsurface investigations, and for the tower footings.
- Keep checks and controls so that the pollution of land and water resources due to the spills of lubricants, fuel, chemicals, and other wastes does not take place.
- Monitor, that pollution of wetlands is not excessive during the excavation for the tower footings.
- To see that the Contractor keeps the damages to the minimum during the substation construction especially while making tracks for accessibility and that the damage is rectified properly.
- All the existing tracks, roads, water courses are left in the original shape after completion of the construction activities.
- Monitor that the Contractor uses such working methodology so as not to cause disturbance to the communities by fugitive dust, noise, fumes, etc.
- Monitor that the Contractor adjusts his working hours during the stringing activities in such a manner that it causes least inconvenience to the local population.
- To ensure that the Contractor keeps first aid kits, medicines, safety gadgets at site for taking care of possible mishaps to the workers or other persons.
- To keep the working site/camps tidy so as to avoid unhealthy impacts on the work force.

The environmental monitoring plan is provided as **Table 6.3.**

Table 6.1: Environmental Management Plan for Jauharabad Sub-station

Environmental Concern	Objectives	Mitigation Measures (MM) recommended	Timing to implement MM	Location to implement MM	Responsibility	
					Implementation	Monitoring
Pre-Construction/Design Stage						
Impact due to Land Acquisition	To ensure the compensation for loss of any crops is paid to all stakeholders	Acquisition of this plot of land shall be conducted in accordance with the LARP, which has been developed in accordance with ADB SPS 2009 regulations, and it shall be ensured that the entire land acquisition process is completely fair and transparent.	Prior to commencement of construction activity	Any affected agricultural land lying within proposed sub-station site boundary	NTDC	NTDC and ADB
Soil Contamination	It must be ensured that proposed sub-station does not contaminate the soil in the project area.	▪ The containment and bunds under all newly installed transformers will be designed to retain all transformer oil contents. ▪ Contingency measures will be developed to recondition or dispose of any oil released during an emergency.	Prior to commencement of construction activity	Project site and surrounding areas within project area	NTDC	NTDC and ADB

Waste Disposal	Ensure adequate disposal options for all waste including unsuitable soils, scrap metal.	▪ Identify sufficient locations for disposal of transformer oils, unsuitable soils, scrap metal “cradle to grave”. ▪ Include in contracts for unit rates for re-measurement for disposal. ▪ Designate disposal sites in the contract and cost unit disposal rates accordingly.	1. During designing stage no later than pre-qualification or tender negotiations. 2. Include in the contract.	Locations approved by ADB and NTDC and waste disposal local authorities.	NTDC with the design consultant	NTDC and ADB
Temporary Drainage and Erosion Control	Include mitigation in Preliminary and detailed designs for erosion control and temporary drainage.	▪ Identify locations where drainage or irrigation in the project area may be affected by works. ▪ Include in protection works Contract as a payment milestone(s).	During designing stage, no later than pre-qualification or tender negotiations.	Locations based on drainage or irrigation crossing project area.	NTDC and Design Consultant	NTDC and ADB
Site-specific environmental management plan	To ensure any potential site specific impacts are appropriately mitigated through necessary measures.	▪ Define boundaries ▪ Identify sensitive receptors & environmental values ▪ Specify construction activities ▪ Conduct risk	Prior to construction	Prior to commencement of Construction	Contractor	NTDC

		assessment ▪ Assign environmental management measures ▪ Prepare monitoring plan ▪ Prepare site plans ▪ Prepare environmental work plan				
Construction Stage						
Air Quality	To minimize effectively and avoid complaints due to the airborne particulate matter released to the atmosphere.	▪ Concrete batching plants will be located at a minimum distance of 500 meters from any residences and will be equipped with dust control equipment such as fabric filters or wet scrubbers to reduce the level of dust emissions. ▪ The applicable NEQS/international regulations for gaseous emissions generated by the construction vehicles, equipment and machinery will be enforced during the construction works. Contractor should make sure that all equipment and vehicles are tested for emissions. Regular	All construction sites within 100 m of sensitive receivers.	A list of locations to be included in contract and other sensitive areas identified by the CSC within the project area during works.	Contractor	NTDC & CSC

		maintenance of equipment and vehicles will also control the incomplete combustion. ▪ Where dust emissions are high, katcha tracks will be overlain with shingle or surface treated. Where necessary, dust emissions will be reduced by a regular sprinkling of water for keeping the dust settled, at least twice a day. ▪ Haul-trucks carrying sand, aggregate and other materials will be kept covered with tarpaulin to help contain construction materials being transported within the body of each carrier between the sites. ▪ NTDC will set up a system to monitor the air quality along the project corridor in accordance with the applicable NEQS and IFC air quality guidelines. The system will cover protocols for sampling and analysis,				

		assessment of air quality at sensitive locations, reporting, and information sharing. ▪ Ensure proper tuning of the construction vehicles. ▪ Preparation and implementation of plantation plan using indigenous trees & plants. The maintenance and care of plants should be ensured in the operation phase by NTDC. ▪ The construction material will be stored in the boundary wall and no disturbance to surrounding areas is expected. The contractor will be, however, required to provide a traffic management plan before commencement of work at site. ▪ The need for large stockpiles should be minimized by careful planning of the supply of materials from				

		controlled sources. Stockpiles (if required) should not be located within 50 meters of schools, hospitals or other public amenities such as wells and pumps and should be covered with tarpaulins when not in use and at the end of the working day to enclose dust.				
Noise	To minimize noise level increases and ground vibrations during construction phase.	▪ All heavy equipment and machinery shall be fitted in full compliance with the national and local regulations and with effective silencing apparatus to minimize noise. ▪ As a rule, the operation of heavy equipment shall be conducted in daylight hours. ▪ Hammer- type percussive pile driving operations shall be not be allowed at night time. ▪ Construction equipment, which generates excessive noise, shall be enclosed	During Construction	The most sensitive locations within the project area	Contractor shall meet the acceptable standards	NTDC & CSC

		or fitted with effective silencing apparatus to minimize noise. ▪ Well-maintained haulage trucks will be used with speed controls. ▪ Contractor shall take adequate measures to minimize noise nuisance in the vicinity of construction sites by way of adopting available acoustic methods such that at the edge of the works nearest residential areas will be less than 45 dB(A) Leq during night time (10 p.m. to 7 a.m.) and 55 dB(A) Leq at other times during the day.				
Hydrology and Drainage Aspects	To ensure the proper implementation of best practices to ensure the hydrology of the area is not adversely	▪ Consideration of weather conditions when particular construction activities are undertaken. ▪ Limitations on excavation depths in use of recharge areas for material exploitation	1. Consideration of weather conditions when particular construction activities are undertaken. 2. Limitations on excavation depths in use of recharge areas	1. Locations of each construction activity to be listed by the engineer. 2. Special locations are identified within the project area by the contractor to minimize disturbance. 3. A list of locations of	Contractor	NTDC & CSC

	impacted.	or spoil disposal. ▪ Use of landscaping as an integrated component of construction activity as an erosion control measure. ▪ Minimizing the removal of vegetative cover as much as possible and providing for its restoration where construction sites have been cleared of such areas.	for material exploitation or spoil disposal. 3. Use of landscaping as an integrated component of construction activity as an erosion control measure. 4. Minimizing the removal of vegetative cover as much as possible and providing for its restoration where construction sites have been cleared of such areas.	irrigation channels/ drains to be compiled by the contractor.		
Water Quality	To prevent adverse water quality impacts due to negligence and ensure unavoidable impacts are managed effectively. Ensure adverse impacts on water quality caused by construction	▪ Storage of lubricants, fuels and other hydrocarbons in self-contained dedicated enclosures >50m away from water bodies. ▪ Proper disposal of solid waste from construction activities and labor camps. ▪ Cover the construction	During construction, 50 m from water bodies. Timing will depend on the construction timetable.	Relevant locations to be determined in the detailed project design	1.Contractor to enforce 2. Contractor has to check water quality and report to NTDC.	NTDC & CSC to review results

	activities are minimized.	material and spoil stockpiles with a suitable material to reduce material loss and sedimentation and avoid stockpiling near to water bodies. ▪ Topsoil stripped material shall not be stored where natural drainage will be disrupted. ▪ Borrow sites (if required) should not be close to sources of drinking water.				
Soil Contamination	To ensure no soil contamination takes place as a result of construction activities	▪ It will be ensured that spill prevention trays are provided and used during refueling. Also, on-site maintenance of construction vehicles and equipment will be avoided as far as possible. In case on-site maintenance is unavoidable, tarpaulin or other impermeable material will be spread on the ground to prevent contamination of soil. ▪ Regular inspections will be carried out to detect	During Construction	At all construction sites within project area	Contractor	NTDC and CSC

		leakages in construction vehicles and equipment and all vehicles will be washed in external commercial facilities. ▪ Fuels, lubricants and chemicals will be stored in covered bounded areas, underlain with impervious lining. Appropriate arrangements, including shovels, plastic bags and absorbent materials will be available near fuel and oil storage areas. ▪ Solid waste generated at the campsites will be properly segregated, treated and safely disposed of only in the demarcated waste disposal sites. ▪ Proper drainage system shall be constructed to ensure proper disposal of sewage and wastewater, which will offset any impact on soil. Sewage will be connected to sewage network for offsite treatment or will be connected to septic				

		tank.				
Water Resources	To prevent conservation of water resources in project area	▪ Approval from the local administration and representatives of the concerned departments will be obtained before using local water resources. ▪ Camps will be located away from community-owned water resources to prevent contamination. ▪ The contractors will be required to maintain close liaison with local communities to ensure that any potential conflicts relating to the common resource utilization for the project purposes are resolved quickly. ▪ Guidelines will be established to minimize the wastage of water during the construction activities and at campsites. ▪ Good management practices will be adopted to ensure that fuels and chemicals,	During Construction	At all construction sites within project area	Contractor	NTDC and CSC

		raw sewage and wastewater effluent are disposed of in a controlled manner to reduce the risk of contamination. ▪ Best engineered drainage channels will be established in the construction camps in order to facilitate the flow of the treated effluents. ▪ Soakage pits and septic tanks will be established for the treatment of sewage effluents. ▪ The national regulation of 80 mg/l is quite lenient, thus in spirit all efforts shall be made to minimize the pollution load to meet the standard of 30 mg/l. ▪ Any oil contaminated gravel/sand left after the construction activity will be handed over to a pre-approved third party				
Soil Erosion/ Surface Run-	To minimize soil erosion due to	▪ Schedule works in sensitive areas (e.g.	During Construction	1. Locations based on history of flooding	Contractor	NTDC/

off	the construction activities and creation of access tracks for project vehicles.	rivers) for dry season. ▪ Temporary erosion control plan one month before commencement of works. ▪ Back-fill should be compacted properly in accordance with design standards and graded to original contours where possible. ▪ Cut areas should be treated against flow acceleration while filled areas should be carefully designed to avoid improper drainage. ▪ Stockpiles should not be formed within such distances behind excavated or natural slopes that would reduce the stability of the slopes. ▪ In the short-term, either temporary or permanent drainage works shall protect all areas susceptible to erosion. ▪ Measures shall be		problems. 2. A list of sensitive areas during construction to be prepared by the detail design consultant in consideration with the cut and fill, land reclamation, borrow areas etc. 3. Locations of all culverts, irrigation channels, road and highway.		CSC

		taken to prevent pounding of surface water and scouring of slopes. Newly eroded channels shall be backfilled and restored to natural contours. ▪ Contractor should arrange to adopt suitable measures to minimize soil erosion during the construction period. Contractor should consult concerned authorities in the area before deciding mitigation measures. ▪ Clearing of green surface cover to be minimized during site preparation.				
Handling, Transportation and Storage of Construction Materials	To minimize contamination of the surroundings (Due to Implementation of works, concrete and crushing plants).	▪ In order to minimize and or avoid adverse environmental impacts arising out of construction material exploitation, handling, transportation and storage measures to be taken in line with any EPA conditions/recommenda	During Construction	1. List of borrow areas to be prepared one month prior to construction and to be approved by CSC. 2. List of routes of transport of construction material is to be prepared for the contract and agreed one month prior to construction. 3. Report of vehicle	Contractor	NTDC & CSC

		tions in approval. ▪ Conditions that apply for selecting sites for material exploitation. ▪ Conditions that apply to timing and use of roads for material transport. ▪ Conditions that apply for maintenance of vehicles used in material transport or construction. ▪ Conditions that apply for selection of sites for material storage. ▪ Conditions that apply for aggregate production. ▪ Conditions that apply for handling hazardous or dangerous materials such as oil, lubricants and toxic chemicals.		conditions is available. 4. Map of locations of storage is prepared by the contractor. 5. Environmental accident checklist and a list of banned substances are included in the contractor's manual.		
Construction Waste Disposal	Minimize the impacts from the disposal of construction waste.	▪ Waste management plan to be submitted to the CSC and approved by MC one month prior to starting works. ▪ Estimating the amounts	During Construction	A list of temporary stockpiling areas and more permanent dumping areas to be prepared at the contract stage for agreement.	Contractor	NTDC & CSC

		and types of construction waste to be generated by the project. ▪ Investigating whether the waste can be reused in the project or by other interested parties. ▪ Identifying potential safe disposal sites close to the project or those designated sites in the contract. ▪ Investigating the environmental conditions of the disposal sites and recommendation of most suitable and safest sites. ▪ Piling up of loose material should be done in segregated areas to arrest washing out of soil. Debris shall not be left where it may be carried by water to downstream flood plains, dams, lagoons etc. ▪ Used oil and lubricants shall be recovered and				

		reused or removed from the site in full compliance with the national and local regulations. ▪ Oily wastes must not be burned. Disposal location to be agreed with local authorities/EPA. ▪ Machinery should be properly maintained to minimize oil spill during the construction. ▪ Solid waste should be disposed at an approved solid waste facility, open burning is illegal and contrary to good environmental practice				
Work Camp Operation and Location	To ensure that the operation of work camps does not adversely affect the surrounding environment and residents in the area.	▪ Identify location of work camps in consultation with local authorities. The location shall be subject to approval by the NTDC. If possible, camps shall not be located near settlements or near drinking water supply intakes.	During Construction	Location Map is prepared by the Contractor.	Contractor	NTDC/ MC

		▪ Cutting of trees shall be avoided and removal of vegetation shall be minimized. ▪ Water and sanitary facilities (at least pit latrines) shall be provided for employees. Worker camp and latrine sites to be backfilled and marked upon vacation of the sites. ▪ Solid waste and sewage shall be managed according to the national and local regulations. As a rule, solid waste must not be dumped, buried or burned at or near the project site, but shall be disposed off to the nearest sanitary landfill or site having complied with the necessary permission of local authority permission. ▪ The Contractor shall organize and maintain a waste separation, collection and transport system. ▪ The Contractor shall				

		document that all liquid and solid hazardous and non-hazardous waste are separated, collected and disposed of according to the given requirements and regulations. ▪ At the conclusion of the project, all debris and waste shall be removed. All temporary structures, including office buildings, shelters and toilets shall be removed. ▪ Exposed areas shall be planted with suitable vegetation. ▪ NTDC and Supervising Engineer shall inspect and report that the camp has been vacated and restored to pre-project conditions.				
Vehicle and Equipment Exhaust	To ensure the emissions resulting from construction vehicles and equipment do not exceed applicable air	▪ It shall be ensured that all vehicles, generators and other equipment used during the construction will be properly tuned and maintained in good working condition in order to minimize	During Construction	At different work sites in the project area	Contractor	NTDC & CSC

	quality guidelines	emission of pollutants. ▪ The stack height of generators will be at least 3 meters above the ground.				
Trees, Ecology and Protected Areas	To avoid several negative impacts due to removing of landmark, sentinel and specimen trees as well as green vegetation and surface cover.	▪ To replace the removed trees, sufficient areas will be identified to allow plantation of trees at a rate of 5:1. Moreover, owners of the affected trees will be paid compensation for their loss. ▪ A requirement shall be inserted in the contracts that no trees are to be cut on the proposed project site or outside, without the written permission from the supervising consultant. ▪ In addition to this, the contractor will be required to spray water twice or thrice a day (as per need) to avoid dispersal of dust on the adjacent flora. ▪ The contractor's staff and labor will be strictly directed not to damage	Rerouting and site identification during design stage and other matters during construction of relevant activities	Map to be compiled by the design consultant during detailed design and CSC to update as necessary.	Design consultant, Contractor and CSC	NTDC/CSC

		any vegetation such as trees or bushes. ▪ Clearing of green surface cover for construction, for borrow of for development, cutting trees and other important vegetation during construction should be minimized.				
Wildlife and Fauna	To protect wildlife and fauna within project area	▪ Vehicle speed will be controlled to avoid incidental mortality of small mammals and reptiles. ▪ Staff working on the project will be given clear orders, not to shoot or trap any bird or animal. ▪ Lights used in the camps will be kept to a minimum. Upward scattering lights will preferably be used. ▪ There will be adjacent areas available for grazing; hence the grazing activity of animals will not be affected.	During Construction	Within project area and at work camps	Contractor	NTDC & CSC

Impact on Local Communities/ Workforce	To ensure local communities are not adversely impacted by the construction activity	▪ Awareness workshops must be conducted prior to commencement of works in the project area of the sub-station ▪ Work sites must be cordoned off to villagers, particularly children. ▪ Construction vehicles must ensure controlling of speed limits to prevent accidents with village communities, particularly children. ▪ Temporarily and for short duration, the contractor has to select specific timings for construction activities so as to cause least botheration to the local population considering their peak movement hours. ▪ Approval from the local administration will be obtained before using the local resources such as wood and water. ▪ The contractors will be required to maintain	During Construction	All along project corridor and at work camps	Contractor	NTDC & CSC

		close liaison with the local communities to ensure that any potential conflicts related to common resource utilization for the project purposes are resolved quickly. ▪ Contractor will take care of the local community and sensitivity towards the local customs and traditions will be encouraged. ▪ Effective construction controls by the contractor to avoid inconvenience to the locals due to noise, smoke and fugitive dust. ▪ Good relations with the local communities will be promoted by encouraging contractors to provide opportunities for skilled and unskilled employment to the locals, as well as on-the-job training in construction for young people. Contractor will restrict his permanent staff to mix with the				

		locals to avoid any social problems. ▪ Local vendors will be provided with regular business by purchasing campsite goods and services from them. ▪ The Contractor will warn the workers not to involve in any theft activities and if anyone found guilty of such activities, he will have to pay heavy penalty and would be handed over to police. Similarly, at the time of hiring, Contractor has to take care that the workers should be of good repute. The Contractor camp will be properly fenced and main gate will be locked at night with a security guard to check the theft issues from community side. ▪ Providing adequate warning signs. ▪ Providing workers with skull guard or hardhat. ▪ Contractor shall instruct his workers in health				

		and safety matters, and require the workers to use the provided safety equipment. ▪ Establish all relevant safety measures as required by law and good engineering practices.				
Safety Precautions for the Workers	To ensure safety of workers	▪ Providing adequate warning signs. ▪ Providing workers with skull guard or hard hat. ▪ Contractor shall instruct his workers in health and safety matters, and require the workers to use the provided safety equipment. ▪ Establish all relevant safety measures as required by law and good engineering practices.	Prior to commencement and during construction	Location to be identified by the CSC with Contractor.	Contractor	NTDC/ CSC
Traffic Condition	Minimize disturbance of vehicular traffic and pedestrians during haulage of construction	▪ Submit temporary haul and access routes plan, one month prior to start of works. ▪ Formulate and	Prior to and throughout construction.	The most important locations to be identified and listed.	Contractor and Engineer	NTDC & CSC

	materials, spoil and equipment and machinery, blocking access roads during works	implementation of a plan of alternate routes for heavy vehicles. ▪ Vicinity of schools and hospitals to be considered. ▪ Installation of traffic warning signs, and enforcing traffic regulations during transportation of materials and equipment and machinery. Conditions of roads and bridges to be considered. ▪ Provision of culverts on water channels and drains. ▪ Widening/upgrading of access paths/roads				
Public Health and Safety Hazards	To ensure safety of the public during the construction activity	▪ In construction camps, amenities of life including clean food, water and sanitation facilities must be provided. Contractor will arrange first aid boxes in the temporary camps. Routine medical check-ups of all the field staff including unskilled labor needs to	During Construction	All along project corridor and at work camps	Contractor	NTDC & CSC

		be conducted by an MBBS doctor. ▪ The other source of pollution from the camps will be from garbage and waste. Apparently, there are no solid waste disposals facilities in the villages located in the vicinity of the road and solid waste will have to be disposed of at a safe site. ▪ Compliance with the safety precautions for construction workers as per International Labor Organization (ILO) Convention No. 62, as far as applicable to the project contract, should be ensured. ▪ Workers should be trained in construction safety procedures and environmental awareness. ▪ Equipping all construction workers with PPEs such as safety boots, helmets, gloves, and protective masks, and monitoring				

		their proper and sustained usage. ▪ Contractor will ensure the provision of medicines, first aid kits, vehicle, etc. at the campsite. ▪ Safety lookouts will be built to prevent people and vehicles from passing at the time of excavation and other activities of such sort. ▪ Cordon off the work areas where necessary. ▪ It is recommended that NTDC at the planning stage of the project shall plan necessary arrangements in the form of earthing system to avoid accidents. ▪ Adequate facilities shall be provided in terms of drinking water that meets standards, number of toilets per worker with running water, stocked first aid kit and trained first aider at each tower location etc.				

		▪ Solid and hazardous waste generated shall be disposed to a suitably licensed landfill, potentially transporting it outside the project area, if felt necessary.				
Sanitation, Solid Waste Disposal & Communicable diseases	To ensure proper sanitation and solid waste disposal as per applicable national regulations and international best practices.	▪ Access to nearby lavatories will be allowed or provision of temporary toilets will be made. Construction worker camps will be necessary, based on the scale of the works needed. The construction camp will be provided with toilets with soakage pits or portable lavatories or at least pit latrines. ▪ Disposal of surplus materials must also be negotiated through local authority approvals prior to the commencement of construction. ▪ If surplus materials arise from the removal of the existing surfaces from specific areas, it will be used elsewhere on the subproject	During Construction	Within project area and at work camps	Contractor	NTDC & CSC

		before additional soil, rock, gravel or sand is brought in. The use of immediately available material will generally minimize the need for additional rock based materials extraction from outside. ▪ Contractual clauses will require the contractor to produce a materials management plan (one month before construction commences) to identify all sources of cement and aggregates and to balance cut and fill. The plan should clearly state the methods to be employed prior to and during the extraction of materials and all the mitigation measures to be employed to mitigate nuisances to local residents. Financial compensation shall not be allowed as mitigation for environmental impacts or environmental nuisance. ▪ Contractual clauses will require the contractor to produce a solid waste				

		management plan so that proper disposal of waste can be ensured.				
Disease Vectors	To ensure breeding grounds for different diseases are not developed.	Temporary and permanent drainage facilities should therefore be designed to facilitate the rapid removal of surface water from all areas and prevent the accumulation of surface water ponds.	During Construction	At different locations within project area and at work camps	Contractor	NTDC & CSC

CSC : Construction Supervision Consultant

NTDC : National Transmission and Despatch Company

ADB : Asian Development Bank

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Some other social impacts during construction phase, particularly from local socio-cultural perspective, if required will be reviewed at the implementation stage according to the existing Land Acquisition criteria.

Table 6.2: Environmental Management Plan for Transmission Line (12 km)

Environmental Concern	Objectives	Mitigation Measures (MM) recommended	Timing to implement MM	Location to implement MM	Responsibility	
					Implementation	Monitoring
Pre-Construction/Design Stage						
Loss of Crops	To ensure the compensation for loss of any crops is paid to all stakeholders	Compensation of crops will be paid to the owners as per the LARP. Accordingly, the necessary amount will be allocated for compensation of crops.	Prior to commencement of construction activity	Any affected agricultural land lying within RoW	NTDC	NTDC and ADB
Orientation for Contractors and Workers	To ensure all project related staff are aware and well versed with required mitigation measures	▪ NTDC to engage environmental specialist in the PMC to monitor and progress all environmental statutory and recommended obligations. ▪ Conduct special briefing for managers and / or on-site training for the contractors and workers on the environmental requirement of the project. Record attendance and achievement test. ▪ Agreement on critical areas to be considered and necessary mitigation measures, among all parties who are involved in project	Prior to commencement of construction activity	-	NTDC	NTDC

		activities. ▪ Continuous progress review and refresher sessions to be followed.				
Waste Disposal	Ensure adequate disposal options for all waste including unsuitable soils, scrap metal.	▪ Identify sufficient locations for disposal of transformer oils, unsuitable soils, scrap metal “cradle to grave”. ▪ Include in contracts for unit rates for re-measurement for disposal. ▪ Designate disposal sites in the contract and cost unit disposal rates accordingly.	1. During designing stage no later than pre-qualification or tender negotiations. 2. Include in the contract.	Locations approved by ADB and NTDC and waste disposal local authorities.	NTDC with the design consultant	NTDC and ADB
Temporary Drainage and Erosion Control	Include mitigation in Preliminary and detailed designs for erosion control and temporary drainage.	▪ Identify locations where drainage or irrigation crossing RoW may be affected by works. ▪ Include in protection works Contract as a payment milestone(s).	During designing stage, no later than pre-qualification or tender negotiations.	Locations based on drainage or irrigation crossing RoW.	NTDC and Design Consultant	NTDC and ADB

Avoidance of Sensitive and High Value Areas	The siting of transmission facilities must seek to avoid to the maximum extent possible areas of high ecological, cultural, economic, and aesthetic value and sensitivity.	When siting in such areas cannot be avoided altogether, the area of disruption should be minimized and the impacts mitigated.	During designing stage - no later than pre-qualification or tender negotiations.	Locations based on crossing RoW	NTDC and Design Consultant	NTDC and ADB
EMF Reduction	Although EMF effects are uncertain, as per international precautions, it should be ensured to minimize any potential EMF impacts as far as possible.	▪ Raising conductor height above the ground, typically by increasing tower height. ▪ Reducing conductor spacing. ▪ Arranging phases so that fields tend to cancel. ▪ Increasing transmission voltage (since magnetic field intensities are a function of current, and increased voltage, all things being equal, will result in reduced current). ▪ Reducing loads (and therefore, currents).	Design Stage	Design Stage	NTDC	NTDC

		▪ Increasing right-of-way widths or buffer zone widths, to move people further from transmission lines.				
Site-specific environmental management plan	To ensure any potential site specific impacts are appropriately mitigated through necessary measures.	▪ Define boundaries ▪ Identify sensitive receptors & environmental values ▪ Specify construction activities ▪ Conduct risk assessment ▪ Assign environmental management measures ▪ Prepare monitoring plan ▪ Prepare site plans ▪ Prepare environmental work plan	Prior to construction	Prior to commencement of Construction	Contractor	NTDC
Construction Stage						
Air Quality	To minimize effectively and avoid complaints due to the airborne particulate matter released to the atmosphere.	▪ Concrete batching plants will be located at a minimum distance of 500 meters from any residences and will be equipped with dust control equipment such as fabric filters or wet	All construction sites within 100 m of sensitive receivers.	A list of locations to be included in contract and other sensitive areas identified by the CSC along the ROW during works.	Contractor	NTDC & CSC

		scrubbers to reduce the level of dust emissions. ▪ The applicable NEQS/international regulations for gaseous emissions generated by the construction vehicles, equipment and machinery will be enforced during the construction works. Contractor should make sure that all equipment and vehicles are tested for emissions. Regular maintenance of equipment and vehicles will also control the incomplete combustion. ▪ Where dust emissions are high, katcha tracks will be overlain with shingle or surface treated. Where necessary, dust emissions will be reduced by a regular sprinkling of water for keeping the dust settled, at least twice a day. ▪ Haul-trucks carrying sand, aggregate and other materials will be kept covered with				

		tarpaulin to help contain construction materials being transported within the body of each carrier between the sites. ▪ NTDC will set up a system to monitor the air quality along the project corridor in accordance with the applicable NEQS and IFC air quality guidelines. The system will cover protocols for sampling and analysis, assessment of air quality at sensitive locations, reporting, and information sharing. ▪ Ensure proper tuning of the construction vehicles. ▪ Preparation and implementation of plantation plan using indigenous trees & plants. The maintenance and care of plants should be ensured in the operation phase by NTDC. ▪ The construction material will be stored				

		in the boundary wall and no disturbance to surrounding areas is expected. The contractor will be, however, required to provide a traffic management plan before commencement of work at site. ▪ The need for large stockpiles should be minimized by careful planning of the supply of materials from controlled sources. Stockpiles (if required) should not be located within 50 meters of schools, hospitals or other public amenities such as wells and pumps and should be covered with tarpaulins when not in use and at the end of the working day to enclose dust.				
Noise / Ground Vibration	To minimize noise level increases and ground vibrations during construction phase.	▪ All heavy equipment and machinery shall be fitted in full compliance with the national and local regulations and with effective silencing apparatus to minimize	During Construction	The most sensitive locations along the project corridor	Contractor shall meet the acceptable standards	NTDC & CSC

		noise. ▪ As a rule, the operation of heavy equipment shall be conducted in daylight hours. ▪ Hammer- type percussive pile driving operations shall be not be allowed at night time. ▪ Construction equipment, which generates excessive noise, shall be enclosed or fitted with effective silencing apparatus to minimize noise. ▪ Well-maintained haulage trucks will be used with speed controls. ▪ Contractor shall take adequate measures to minimize noise nuisance in the vicinity of construction sites by way of adopting available acoustic methods such that at the edge of the works nearest residential areas will be less than 45 dB(A) Leq during				

		night time (10 p.m. to 7 a.m.) and 55 dB(A) Leq at other times during the day.				
Hydrology and Drainage Aspects	To ensure the proper implementation of any requirements mentioned in EPA conditions of approval letter in relation to Hydrology of the project.	▪ Consideration of weather conditions when particular construction activities are undertaken. ▪ Limitations on excavation depths in use of recharge areas for material exploitation or spoil disposal. ▪ Use of landscaping as an integrated component of construction activity as an erosion control measure. ▪ Minimizing the removal of vegetative cover as much as possible and providing for its restoration where construction sites have been cleared of such areas.	5. Consideration of weather conditions when particular construction activities are undertaken. 6. Limitations on excavation depths in use of recharge areas for material exploitation or spoil disposal. 7. Use of landscaping as an integrated component of construction activity as an erosion control measure. 8. Minimizing the removal of vegetative cover as much as possible and providing for its restoration where construction sites have been	1. Locations of each construction activity to be listed by the engineer. 2. Special locations are identified along the RoW by the contractor to minimize disturbance. 3. A list of locations of irrigation channels/ drains to be compiled by the contractor.	Contractor	NTDC & CSC

			cleared of such areas.			
Water Quality	To prevent adverse water quality impacts due to negligence and ensure unavoidable impacts are managed effectively. Ensure adverse impacts on water quality caused by construction activities are minimized.	▪ Storage of lubricants, fuels and other hydrocarbons in self-contained dedicated enclosures >50m away from water bodies. ▪ Proper disposal of solid waste from construction activities and labor camps. ▪ Cover the construction material and spoil stockpiles with a suitable material to reduce material loss and sedimentation and avoid stockpiling near to water bodies. ▪ Topsoil stripped material shall not be stored where natural drainage will be disrupted. ▪ Borrow sites (if required) should not be close to sources of drinking water.	During construction, 50 m from water bodies. Timing will depend on the construction timetable.	Relevant locations to be determined in the detailed project design	1.Contractor to enforce 2. Contractor has to check water quality and report to NTDC.	NTDC & CSC to review results

Soil Contamination	To ensure no soil contamination takes place as a result of construction activities	▪ It will be ensured that spill prevention trays are provided and used during refueling. Also, on-site maintenance of construction vehicles and equipment will be avoided as far as possible. In case on-site maintenance is unavoidable, tarpaulin or other impermeable material will be spread on the ground to prevent contamination of soil. ▪ Regular inspections will be carried out to detect leakages in construction vehicles and equipment and all vehicles will be washed in external commercial facilities. ▪ Fuels, lubricants and chemicals will be stored in covered bounded areas, underlain with impervious lining. Appropriate arrangements, including shovels, plastic bags and absorbent materials will be available near fuel and oil storage areas.	During Construction	At all construction sites along corridor	Contractor	NTDC and CSC

		▪ Solid waste generated at the campsites will be properly segregated, treated and safely disposed of only in the demarcated waste disposal sites. ▪ Proper drainage system shall be constructed to ensure proper disposal of sewage and wastewater, which will offset any impact on soil. Sewage will be connected to sewage network for offsite treatment or will be connected to septic tank.				
Water Resources	To ensure conservaton of water resources	▪ Approval from the local administration and representatives of the concerned departments will be obtained before using local water resources. ▪ Camps will be located away from community-owned water resources to prevent contamination. ▪ The contractors will be required to maintain	During Construction	At all construction sites along corridor	Contractor	NTDC and CSC

		close liaison with local communities to ensure that any potential conflicts relating to the common resource utilization for the project purposes are resolved quickly. ▪ Guidelines will be established to minimize the wastage of water during the construction activities and at campsites. ▪ Good management practices will be adopted to ensure that fuels and chemicals, raw sewage and wastewater effluent are disposed of in a controlled manner to reduce the risk of contamination. ▪ Best engineered drainage channels will be established in the construction camps in order to facilitate the flow of the treated effluents. ▪ Soakage pits and septic tanks will be established for the				

		treatment of sewage effluents. ▪ The national regulation of 80 mg/l is quite lenient, thus in spirit all efforts shall be made to minimize the pollution load to meet the standard of 30 mg/l. ▪ Any oil contaminated gravel/sand left after the construction activity will be handed over to a pre-approved third party				
Soil Erosion/ Surface Run-off	To minimize soil erosion due to the construction activities of towers, stringing of conductors and creation of access tracks for project vehicles.	▪ Schedule works in sensitive areas (e.g. rivers) for dry season. ▪ Meaningful water quality monitoring up and downstream at any tower site within a river or stream during construction. Rapid reporting and feedback to CSC. ▪ Back-fill should be compacted properly in accordance with design standards and graded to original contours where possible.	During Construction	1. Locations based on history of flooding problems. 2. A list of sensitive areas during construction to be prepared by the detail design consultant in consideration with the cut and fill, land reclamation, borrow areas etc. 3. Locations of all culverts, irrigation channels, road and highway.	Contractor	NTDC/ CSC

		▪ Cut areas should be treated against flow acceleration while filled areas should be carefully designed to avoid improper drainage. ▪ Stockpiles should not be formed within such distances behind excavated or natural slopes that would reduce the stability of the slopes. ▪ In the short-term, either temporary or permanent drainage works shall protect all areas susceptible to erosion. ▪ Measures shall be taken to prevent pounding of surface water and scouring of slopes. Newly eroded channels shall be backfilled and restored to natural contours. ▪ Contractor should arrange to adopt suitable measures to minimize soil erosion during the construction				

		period. Contractor should consult concerned authorities in the area before deciding mitigation measures. ▪ Clearing of green surface cover to be minimized during site preparation. ▪ Replanting of trees to be done before the site is vacated and handed back to NTDC with appropriate trees (other vegetation cover as appropriate) to ensure interception of rainwater and the deceleration of surface run-off.				
Exploitation Handling, Transportation and Storage of Construction Materials	To minimize contamination of the surroundings (Due to Implementation of works, concrete and crushing plants).	▪ In order to minimize and or avoid adverse environmental impacts arising out of construction material exploitation, handling, transportation and storage measures to be taken in line with any EPA conditions/recommendations in approval.	During Construction	1. List of borrow areas to be prepared one month prior to construction and to be approved by CSC. 2. List of routes of transport of construction material is to be prepared for the contract and agreed one month prior to construction. 3. Report of vehicle conditions is available.	Contractor	NTDC & CSC

		▪ Conditions that apply for selecting sites for material exploitation. ▪ Conditions that apply to timing and use of roads for material transport. ▪ Conditions that apply for maintenance of vehicles used in material transport or construction. ▪ Conditions that apply for selection of sites for material storage. ▪ Conditions that apply for aggregate production. ▪ Conditions that apply for handling hazardous or dangerous materials such as oil, lubricants and toxic chemicals.		4. Map of locations of storage is prepared by the contractor. 5. Environmental accident checklist and a list of banned substances are included in the contractor's manual.		
Construction Waste Disposal	Minimize the impacts from the disposal of construction waste.	▪ Waste management plan to be submitted to the CSC and approved by MC one month prior to starting works. ▪ Estimating the amounts and types of construction waste to	During Construction	A list of temporary stockpiling areas and more permanent dumping areas to be prepared at the contract stage for agreement.	Contractor	NTDC & CSC

		be generated by the project. ▪ Investigating whether the waste can be reused in the project or by other interested parties. ▪ Identifying potential safe disposal sites close to the project or those designated sites in the contract. ▪ Investigating the environmental conditions of the disposal sites and recommendation of most suitable and safest sites. ▪ Piling up of loose material should be done in segregated areas to arrest washing out of soil. Debris shall not be left where it may be carried by water to downstream flood plains, dams, lagoons etc. ▪ Used oil and lubricants shall be recovered and reused or removed from the site in full				

		compliance with the national and local regulations. ▪ Oily wastes must not be burned. Disposal location to be agreed with local authorities/EPA. ▪ Machinery should be properly maintained to minimize oil spill during the construction. ▪ Solid waste should be disposed at an approved solid waste facility, open burning is illegal and contrary to good environmental practice				
Work Camp Operation and Location	To ensure that the operation of work camps does not adversely affect the surrounding environment and residents in the area.	▪ Identify location of work camps in consultation with local authorities. The location shall be subject to approval by the NTDC. If possible, camps shall not be located near settlements or near drinking water supply intakes. ▪ Cutting of trees shall be avoided and removal of	During Construction	Location Map is prepared by the Contractor.	Contractor	NTDC/ MC

		vegetation shall be minimized. ▪ Water and sanitary facilities (at least pit latrines) shall be provided for employees. Worker camp and latrine sites to be backfilled and marked upon vacation of the sites. ▪ Solid waste and sewage shall be managed according to the national and local regulations. As a rule, solid waste must not be dumped, buried or burned at or near the project site, but shall be disposed off to the nearest sanitary landfill or site having complied with the necessary permission of local authority permission. ▪ The Contractor shall organize and maintain a waste separation, collection and transport system. ▪ The Contractor shall document that all liquid and solid hazardous				

		and non-hazardous waste are separated, collected and disposed of according to the given requirements and regulations. ▪ At the conclusion of the project, all debris and waste shall be removed. All temporary structures, including office buildings, shelters and toilets shall be removed. ▪ Exposed areas shall be planted with suitable vegetation. ▪ NTDC and Supervising Engineer shall inspect and report that the camp has been vacated and restored to pre-project conditions.				
Vehicle and Equipment Exhaust	To ensure the emissions resulting from construction vehicles and equipment do not exceed applicable air quality guidelines	▪ It shall be ensured that all vehicles, generators and other equipment used during the construction will be properly tuned and maintained in good working condition in order to minimize emission of pollutants.	During Construction	At different work sites along the corridor	Contractor	NTDC & CSC

		▪ The stack height of generators will be at least 3 meters above the ground.				
Loss of Trees and Vegetation Cover of the Areas for Towers and Temporary Work-space	To avoid several negative impacts due to removing of landmark, sentinel and specimen trees as well as green vegetation and surface cover.	▪ Land holders will be paid compensation for their standing trees in accordance with prevailing market rates (LARP). The land holders will be allowed to salvage the wood of the affected trees. They will also be encouraged to plant suitable new trees outside the 30 meter corridor of the transmission line in lieu of tree removed. ▪ The contractor's staff and labor will be strictly directed not to damage any vegetation such as trees or bushes. ▪ In order to save the affected orchards (if any), Transmission Line route will need to be changed. However, if unavoidable, use of towers with maximum height will be resorted	Rerouting and site identification during design stage and other matters during construction of relevant activities	A list of Locations with a Map to be compiled by the design consultant during detailed design and CSC to update as necessary.	Design consultant, Contractor and CSC	NTDC/CSC

		to. ▪ Clearing of green surface cover for construction, for borrow of for development, cutting trees and other important vegetation during construction should be minimized. ▪ Landscaping and road verges to be re-installed on completion. ▪ Compensatory planting of trees/shrubs/ornamental plants (at a rate of 5:1) to contribute to the aesthetic value of the area. ▪ At completion all debris and waste shall be removed. ▪ All temporary structures, including office buildings, shelters and toilets shall be removed.				
Wildlife and Fauna	To protect wildlife and fauna along the project corridor	▪ Vehicle speed will be controlled to avoid incidental mortality of small mammals and	During Construction	All along project corridor and at work camps	Contractor	NTDC & CSC

		reptiles. ▪ Staff working on the project will be given clear orders, not to shoot or trap any bird or animal. ▪ Lights used in the camps, during construction of towers will be kept to the minimum requirement. Upward scattering lights will preferably be used. ▪ There will be adjacent areas available for grazing; hence the grazing activity of animals will not be affected.				
Impact on Local Communities/ Workforce	To ensure local communities are not adversely impacted by the construction activity	▪ Temporarily and for short duration, the contractor has to select specific timings for stringing so as to cause least botheration to the local population considering their peak movement hours. ▪ Approval from the local administration will be obtained before using the local resources such as wood and	During Construction	All along project corridor and at work camps	Contractor	NTDC & CSC

		water. ▪ The contractors will be required to maintain close liaison with the local communities to ensure that any potential conflicts related to common resource utilization for the project purposes are resolved quickly. ▪ Contractor will take care of the local community and sensitivity towards the local customs and traditions will be encouraged. ▪ Effective construction controls by the contractor to avoid inconvenience to the locals due to noise, smoke and fugitive dust. ▪ Good relations with the local communities will be promoted by encouraging contractors to provide opportunities for skilled and unskilled employment to the locals, as well as on-				

		the-job training in construction for young people. Contractor will restrict his permanent staff to mix with the locals to avoid any social problems. ▪ Local vendors will be provided with regular business by purchasing campsite goods and services from them. ▪ The Contractor will warn the workers not to involve in any theft activities and if anyone found guilty of such activities, he will have to pay heavy penalty and would be handed over to police. Similarly, at the time of hiring, Contractor has to take care that the workers should be of good repute. The Contractor camp will be properly fenced and main gate will be locked at night with a security guard to check the theft issues from community side. ▪ Providing adequate warning signs.				

		▪ Providing workers with skull guard or hardhat. ▪ Contractor shall instruct his workers in health and safety matters, and require the workers to use the provided safety equipment. ▪ Establish all relevant safety measures as required by law and good engineering practices.				
Safety Precautions for the Workers	To ensure safety of workers	▪ Providing adequate warning signs. ▪ Providing workers with skull guard or hard hat. ▪ Contractor shall instruct his workers in health and safety matters, and require the workers to use the provided safety equipment. ▪ Establish all relevant safety measures as required by law and good engineering practices.	Prior to commencement and during construction	Location to be identified by the CSC with Contractor.	Contractor	NTDC/ CSC

Traffic Condition	Minimize disturbance of vehicular traffic and pedestrians during haulage of construction materials, spoil and equipment and machinery, blocking access roads during works	▪ Submit temporary haul and access routes plan, one month prior to start of works. ▪ Formulate and implementation of a plan of alternate routes for heavy vehicles. ▪ Vicinity of schools and hospitals to be considered. ▪ Installation of traffic warning signs, and enforcing traffic regulations during transportation of materials and equipment and machinery. Conditions of roads and bridges to be considered. ▪ Provision of culverts on water channels and drains. ▪ Widening/upgrading of access paths/roads	Prior to and throughout construction.	The most important locations to be identified and listed.	Contractor and Engineer	NTDC & CSC
Public Health and Safety Hazards	To ensure safety of the public during the construction activity	▪ In construction camps, amenities of life including clean food, water and sanitation facilities must be	During Construction	All along project corridor and at work camps	Contractor	NTDC & CSC

		provided. Contractor will arrange first aid boxes in the temporary camps. Routine medical check-ups of all the field staff including unskilled labor needs to be conducted by an MBBS doctor. ▪ The other source of pollution from the camps will be from garbage and waste. Apparently, there are no solid waste disposals facilities in the villages located in the vicinity of the road and solid waste will have to be disposed of at a safe site. ▪ Compliance with the safety precautions for construction workers as per International Labor Organization (ILO) Convention No. 62, as far as applicable to the project contract, should be ensured. ▪ Workers should be trained in construction safety procedures and environmental				

		awareness. ▪ Equipping all construction workers with PPEs such as safety boots, helmets, gloves, and protective masks, and monitoring their proper and sustained usage. ▪ Contractor will ensure the provision of medicines, first aid kits, vehicle, etc. at the campsite. ▪ Safety lookouts will be built to prevent people and vehicles from passing at the time of excavation and other activities of such sort. ▪ Cordon off the work areas where necessary. ▪ It is recommended that NTDC at the planning stage of the project shall plan necessary arrangements in the form of earthing system to avoid accidents. ▪ Adequate facilities shall be provided in terms of drinking water that				

		meets standards, number of toilets per worker with running water, stocked first aid kit and trained first aider at each tower location etc. ▪ Solid and hazardous waste generated shall be disposed to a suitably licensed landfill, potentially transporting it outside the project area, if felt necessary.				
Sanitation, Solid Waste Disposal & Communicable diseases	To ensure proper sanitation and solid waste disposal as per applicable national regulations and international best practices.	▪ Access to nearby lavatories will be allowed or provision of temporary toilets will be made. Construction worker camps will be necessary, based on the scale of the works needed. The construction camp will be provided with toilets with soakage pits or portable lavatories or at least pit latrines. ▪ Disposal of surplus materials must also be negotiated through local authority approvals prior to the commencement of	During Construction	All along project corridor and at work camps	Contractor	NTDC & CSC

		construction. ▪ The sub-project work will not involve any significant cutting and filling but minor excavations (down to 4m) and piling may be required to create the foundations for some towers (if required). It is envisaged (depending on the mode of contract) that the surface under the towers will need to be scrabbled to remove unstable materials, or to stockpile topsoil. ▪ If surplus materials arise from the removal of the existing surfaces from specific areas, it will be used elsewhere on the subproject before additional soil, rock, gravel or sand is brought in. The use of immediately available material will generally minimize the need for additional rock based materials extraction from outside. ▪ Contractual clauses will require the contractor to produce a materials				

		management plan (one month before construction commences) to identify all sources of cement and aggregates and to balance cut and fill. The plan should clearly state the methods to be employed prior to and during the extraction of materials and all the mitigation measures to be employed to mitigate nuisances to local residents. Financial compensation shall not be allowed as mitigation for environmental impacts or environmental nuisance. ▪ Contractual clauses will require the contractor to produce a solid waste management plan so that proper disposal of waste can be ensured.				
Disease Vectors	To ensure breeding grounds for different diseases are not developed.	▪ Temporary and permanent drainage facilities should therefore be designed to facilitate the rapid removal of surface water from all areas and prevent the accumulation of surface	During Construction	All along project corridor and at work camps	Contractor	NTDC & CSC

		water ponds.				
Operational Stage						
Compensatory Tree Planting	Maintain survival of trees planted	▪ Employ landscaping contractor to monitor, water, feed and replace dead specimens as necessary.	During Operation	All Project sites	NTDC	NTDC
Crops and Vegetation	Monitor impacts from maintaining tree clearance under transmission lines	▪ Track growth of large trees under the conductors and ensure trimming of tree branches if reaching near the lines.	During Operation	All Project sites	NTDC	NTDC
Social safety Impacts	Ensure no encroachments/ construction under the transmission line. No violation of clearances spaces.	▪ Necessary signboards with limits of height clearances to be placed properly. ▪ Identify and prevent any illegal encroachments under the transmission line.	During Operation	All Project sites	NTDC	NTDC
Occupational Health and Safety	To ensure health and safety of the communities along the TL alignment.	▪ It shall be ensured that a public awareness campaign is developed and implemented to educate the local communities regarding the dangers posed by exposure to the high	During Operation	All Project sites	NTDC	NTDC

		voltage contained in live transmission lines. ▪ All NTDC staff conducting maintenance of the transmission lines shall ensure that they wear protective equipment such as goggles, rubber boots, protective jacket and also carefully follow all standard protocols to ensure their safety while working on the towers. ▪ All NTDC staff shall also use protective harnesses to ensure they are protected from falling from the towers. ▪ All NTDC staff shall avoid working on the towers in bad weather conditions, particularly during rain and high winds.				
Danger to Bird Movements	The potential risk to bird movements from the TL need to be mitigated.	▪ Since the assumption is that birds collide with overhead cables because they cannot see them, fitting the cables with devices in order to make them more visible to birds in	During Operation	All Project sites	NTDC	NTDC

		flight is the preferred mitigation option. ▪ Besides thickening, coating or coloring the often least visible thin ground wires, a wide range of potential 'line marking' devices has evolved over the years, including: spheres, swinging plates, spiral vibration dampers, strips, swan flight diverters, Firefly Bird Flight Diverters, bird flappers, aerial marker spheres, ribbons, tapes, flags, fishing floats, aviation balls and crossed bands ▪ Devices should be installed on the earth wire (also-called ground or shield wire), wherever possible. On lines without an earth wire, devices should be installed on the conductors. Although installation of these devices on higher voltage conductors is problematic, lines of higher voltage would typically have an earth wire anyway. Guidance is available on spacing				

		between line markers. ▪ Ensuring that the likely preferred perching space for a bird on the pole top is well clear of dangerous components; ▪ Ensuring that the dangerous components are sufficiently separated by space to ensure that the bird cannot touch them. ▪ The second option, whilst more foolproof, can result in significantly larger pole tops with consequent significantly increased costs, which is why a combination of the two approaches is often employed. ▪ Line design modifications for mitigating bird casualties should include sufficient spacing between different conductors and between conductors and grounded wires or hardware. Short				

		distances between conductors often occur at switch towers, at junctions and dead ends of distribution systems. ▪ Power line cables lower to the ground are better for preventing bird collision; ▪ Less vertical separation of cables is preferred, as it poses less of an 'obstacle' for birds to collide with. Horizontal separation of conductors is therefore preferred; ▪ Construction of self-supporting towers, which do not require stay wires, is preferred, as bird collisions have been recorded with the guy or stay wires of towers; ▪ □□moving or designing power lines without earth or shield wire (the thinnest wire at the top of the power line structure) can take away the obstacle birds				

		most often collide with.				
Effect of EMF	To ensure any possible effects from EMF are effectively mitigated.	▪ A vertical clearance required as per international standards will also be maintained, especially near any populated areas. ▪ During the operation stage, check will be kept by the NTDC that no construction will be allowed within 100 m of the transmission line.	During Operation	All Project sites	NTDC	NTDC
Excessive Noise Problem	To ensure high noise levels from the TL do not create a nuisance to the receptors along the TL route.	▪ Construction of houses within the project corridor will be prohibited and NTDC will make sure to check such type of construction during the operation stage. ▪ NTDC is providing vertical and horizontal clearances in accordance with the national and international standards. This will also reduce the noise intensity.	During Operation	All Project sites	NTDC	NTDC

CSC : Construction Supervision Consultant

NTDC : National Transmission and Despatch Company

ADB : Asian Development Bank

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Some other social impacts during construction phase, particularly from local socio-cultural perspective, if required will be reviewed at the implementation stage according to the existing Land Acquisition criteria.

1. During the construction phase, the general mobility of the local residents and their livestock in and around the project area is likely to be hindered.
2. Usage of Community's common resources like potable water, fuel wood etc. by Contractor workforce may create conflicts between the community and the Contractor.
3. Community will have to face the noise and dust problems during the construction activities.
4. Induction of outside workers in the Contractor labor may cause cultural issues with the local community.
5. Theft problems to the community by the Contractor workers and vice versa.
6. During the construction activities of tower foundations, erection, and conductor stringing people will lose their annual income due to the loss of crops, trees, etc.
7. The land under the towers during the operation stage may restrict its current use for agriculture purpose.
8. The restriction of plantation of trees above 2.5 m height during the operation stage may also cause the reduction of income of the farmers.
9. Due to the erection of towers and passing of the transmission line, the value of land may depreciate in the long term.
10. As the project route is passing through the rural areas and rural community, women activities in the field may become affected due to the construction activities.
11. The rural women normally use the open field latrines and their privacy may suffer due to the project activities.
12. The induction of outside labor may create social and gender issues due to the unawareness by them of local customs and norms. It will also cause hindrance to the mobility of local women.

13 Disturbance to the privacy of the local women when workers will work on the erection of towers

Table 6.3: Environmental Monitoring Plan for Sub-Project 3

Environmental Concern	Performance Indicator (PI)	Frequency to Monitor	Timing to Check PI	Locations to implement PI	Responsible to implement PI	Cost of Implementation	Responsible PI Supervision	Cost of Supervision
Pre-Construction/Design Phase								
Review of EMP	EMP is reviewed	During detailed design (later monthly by Contractor to cover any unidentified impacts)	By completion of detailed design	NTDC proposed project locations.	Contractor	Initially NTDC Cell / later Contractor cost	NTDC, ESIC cell / Environment al Specialist	ESIC cell staff cost
Project disclosure	Design changes notified	During detailed design by Contractor.	Complete on of detailed design.	NTDC proposed project locations.	Contractor	Contractor cost	NTDC, ESIC cell / Environment al Specialist	ESIC cell staff cost
Environmentally Responsible procurement (ERP)	Contract follows ADB Guidelines on ERP Performance bond. Deposited Contractual clauses include implementation of environmental mitigation measures tied to a performance bond.	Once, before Contract is signed	Once, before Contract is signed	Method Statements	NTDC Project Cell	Contractor cost	NTDC, ESIC cell / Environment al Specialist	ESIC cell staff cost

Environmental Concern	Performance Indicator (PI)	Frequency to Monitor	Timing to Check PI	Locations to implement PI	Responsible to implement PI	Cost of Implementation	Responsible PI Supervision	Cost of Supervision
Waste disposal	Disposal options for all waste, residually contaminated soils, scrap metal agreed with NTDC and local authority.	1. Monthly or as required in waste management plan to identify sufficient locations for, storage and reuse of transformers and recycling of breaker oils and disposal of transformer oil, residually contaminated soils and scrap metal 2. Include in contracts for unit rates for re-measurement for disposal. 3. After agreement with local authority, designate disposal sites in the contract and cost unit disposal rates accordingly.	1.Prior to detailed design stage no later than prequalification on or tender negotiate ones 2. Include in contract	Locations approved by local waste disposal authorities	NTDC cell with the design/supervision consultant.	ESIC cell	ESIC cell	NTDC

Environmental Concern	Performance Indicator (PI)	Frequency to Monitor	Timing to Check PI	Locations to implement PI	Responsible to implement PI	Cost of Implementation	Responsible PI Supervision	Cost of Supervision
Noise and air quality mitigation in design.	Design changes included in IEE (supplementary) & EMP approved by provincial EPAs	During detailed design by Contractor	Complete on of detailed design	As defined in IEE (supplementary) & EMP	NTDC Cell / Contractor	Contractor cost	NTDC / /Environment specialist	NTDC Cell staff cost
Hydrological Impacts	Temporary Drainage	During detailed design by Contractor and monthly to cover any unidentified impacts	One month before commencement of construction	Considered locations to be as identified in the Detailed Drainage Report	Contractor	Contractor cost	NTDC / and NTDC Project Cell	NTDC Cell Staff Cost
Planning construction camps	Use of land agreed with surrounding residents & villages.	During detailed design updated by Contractor monthly to cover any unidentified impacts.	One month before construction commences.	Locations agreed NTDC cell in consultation with community and the Contractor	Contractor NTDC Cell facilitates.	Contractor cost	NTDC / and NTDC Project Cell.	NTDC Cell staff cost
Traffic Condition	Temporary Pedestrian and Traffic Management Plan agreed.	During detailed design updated by Contractor monthly to cover any unidentified impacts.	One month before construction commences.	Locations agreed with NTDC cell in consultation with community and the Contractor.	Contractor	Contractor cost	NTDC / and NTDC Project Cell.	NTDC Cell staff cost
Institutional strengthening and capacity building	Strengthening plan agreed for NTDC cell.	Once	As soon as practicable	Throughout the project	NTDC Project Cell	NTDC Cell staff cost	NTDC / and / Environment al Specialist.	NTDC Cell staff cost
Construction Phase								

Environmental Concern	Performance Indicator (PI)	Frequency to Monitor	Timing to Check PI	Locations to implement PI	Responsible to implement PI	Cost of Implementation	Responsible PI Supervision	Cost of Supervision
Orientation for Contractor, and Workers	1. Contractor agreed to provide training to professional staff and workers. 2. Special briefing and training for Contractor completed. 3. Periodic progress review sessions.	1. Once 2. Ongoing 3. Ongoing	1. Before contract is signed 2. Before construction areas are opened up 3. Every six months	All staff members in all categories. monthly induction and six month refresher course	Contractor with ESIC-NTDC assistance and record details.	Contractor cost	NTDC and NTDC to observe and record success	NTDC Cell staff cost

Environmental Concern	Performance Indicator (PI)	Frequency to Monitor	Timing to Check PI	Locations to implement PI	Responsible to implement PI	Cost of Implementation	Responsible PI Supervision	Cost of Supervision
Plans to control environmental impacts	1. Drainage Management plan 2. Temp. Pedestrian & Traffic Management plan, 3. Erosion Control & Temp. Drainage plan 4. Materials Management plan, 5. Waste Management plan; 6. Noise and Dust Control plan, 7. Safety Plan 8. Agreed schedule of costs for environmental mitigation.{N.B. Forest Clearance and Compensatory Planting plan is prepared by NTDC cell} 9. A tree management plan will be implemented.	Deliverable in final form to NTDC cell one month before construction commences for any given stretch.	One month before construction commencement	All of NTDC Project sites	Contractor	Contractor cost	NTDC Project Cell	NTDC Cell staff cost
Spoil disposal and construction waste disposal	1. Use of land agreed with surrounding residents & villages. 2. Waste Management Plan implemented. 3 No open burning of waste.	Monthly (line item when commencing construction).	Prior to construction. Update monthly.	NTDC proposed project site	Contractor	Contractor cost	NTDC and NTDC Cell	NTDC Cell staff cost

Environmental Concern	Performance Indicator (PI)	Frequency to Monitor	Timing to Check PI	Locations to implement PI	Responsible to implement PI	Cost of Implementation	Responsible PI Supervision	Cost of Supervision
Noise	Noise mitigation measures implemented in line with guidelines for noise reduction from ISO/TR116881:1995(E)	Monthly (line item when opening up construction).	Follow WB/IFC standards for residential areas -55 dB(A) day time	At and around NTDC proposed sites	Contractor should maintain the accepted standards	Contractor cost	NTDC / NTDC Project Cell will monitor sample activities	NTDC Cell staff cost
Air quality	Noise and dust control plan implemented	Monthly (line item when opening up construction).	Prior to construction. Update monthly.	At and around NTDC proposed sites	Contractor	Contractor cost	NTDC and NTDC Cell	NTDC Cell staff cost
Soil Contamination	Contractors workforce instructed and trained in handling of chemicals	Monthly (line item when opening up construction).	Prior to construction. Update monthly.	At and around NTDC proposed sites	Contractor	Contractor cost	NTDC and NTDC Cell	NTDC Cell staff cost
Work Camp Location and Operation	1. Use of land agreed with surrounding residents & villages. 2. Waste Management Plan implemented. 3 No open burning	Monthly (line item when opening up construction).	Prior to construction. Update monthly.	At and around NTDC proposed sites	Contractor	Contractor cost	NTDC and NTDC Cell	NTDC Cell staff cost
Safety Precautions for Workers	Safety Plan submitted	Once (update monthly as necessary)	One month before construction and update quarterly.	At and around NTDC proposed sites	Contractor	Contractor cost	NTDC and NTDC Cell	NTDC Cell staff cost
Operation Phase								

Environmental Concern	Performance Indicator (PI)	Frequency to Monitor	Timing to Check PI	Locations to implement PI	Responsible to implement PI	Cost of Implementation	Responsible PI Supervision	Cost of Supervision
Vegetation within ROW	Number of plants and trees planted along ROW	Quarterly	During operation	At and around NTDC proposed sites	Contractor	Contractor cost	NTDC and NTDC Cell	NTDC Cell staff cost
Occupational Health and Safety	(i) Number of public awareness sessions implemented and number of community members made aware. (ii) Number of accidents in a month from local communities or NTDC staff working on TL.	Quarterly	During operation	At and around NTDC proposed sites	Contractor	Contractor cost	NTDC and NTDC Cell	NTDC Cell staff cost

6.5 Institutional Arrangements

351. The proposed project environmental management plan will require involvement of the following stakeholders in their specific roles.

6.5.1 Role and Responsibilities of Project Management Consultant (PMC)

352. A Supervisory Consultant appointed by NTDC will be designated as the "Engineer/Project Manager". The Consultant will be responsible for:

- Supervising the Project's Contractors and ensuring that all the contractual obligations related to the design and construction, as well as environmental and social compliance are met;
- Ensuring that the day-to-day construction activities are carried out in an environmentally and socially sound and sustainable manner and developing 'good practices' construction guidelines to assist the Contractors and NTDC staff in implementing the EMP; and
- Assisting the Chief Engineer (EHV-II) in coordinating with the EPAs, provincial agriculture, forest and Wildlife departments, NGOs/CBOs and other public/private sector organizations.

6.5.2 Role and Responsibilities of Project Contractor

353. For the proposed Project, NTDC will appoint Contractor(s) for construction and other project activities. The Contractor(s) will be responsible for the physical execution / implementation of EMP, or adherence to all the provisions of the IEE and EMP and any environmental or other code of conduct required by PEPA. Overall responsibility for the Contractor's environmental performance will rest with the NTDC.

354. The project contractor will also responsible for following items:

- Implementation of, or adherence to, all provisions of the IEE and EMP;
- Contractor will prepare and submit the SSEMPs required according to the EMP, which will be approved at least ten days before the start construction activity.
- Contractor's environmental performance will rest with the person holding the highest management position within the contractor's organization. Reporting to their management, the contractor's site managers will be responsible for the effective implementation of the EMP.

6.6 Estimated Environmental and Social Management Costs

355. The **Tables 6.4** and **6.5** provide the estimated costs for the implementation of EMP. The compensation costs include the costs for cutting of trees due to construction of the subproject 3. It should be noted that as referred earlier that the project is at a preliminary stage and detailed surveys including tower spotting is to be carried out for the project showing the actual position of the towers, so at this stage

only tentative and lump sum amount has been allocated for the expected losses and is based on the environmental and social field surveys.

Table 6.4: Estimated Costs for EMP Implementation for Jauharabad sub-station

Item	Sub-Item	Estimated Total Cost (PKR)
Staffing, audit and monitoring	For entire project construction phase[1]	600,000
Monitoring Activities	As detailed under EMP[2]	240,000
Mitigation Measures	As prescribed under EMP and IEE[3]	500,000
	(i) Water Sprinkling	200,000
	(ii) Tree replanting	150,000
	(iii) Waste Management	150,000
Contingency	5% Contingency	67,000
Total		**1,407,000**

Note:

1 @ rate of PKR 60,000/month

2 Laboratory charges for: testing of construction materials; water quality tests; ambient air tests; emissions measurements; and noise measurements. (Please refer to Table 6.3 above for monitoring plan).

3 Includes; Compensatory tree plantation under supervision of forest department and training on counterpart staff

Table 6.5: Estimated Costs for EMP Implementation for Jauharabad to Ludewala-Chashnupp TL (12 km)

Item	Sub-Item	Estimated Total Cost (PKR)
Staffing, audit and monitoring	For entire project duration[1]	720,000
Monitoring Activities	As detailed under EMP[2]	580,000
Mitigation Measures	As prescribed under EMP and IEE[3]	600,000
	(i) Water Sprinkling	200,000
	(ii) Tree replanting	200,000
	(iii) Waste Management	200,000
Contingency	5% Contingency	95,000
Total		**1,995,000**

Note:

1 @ rate of PKR 60,000/month

2 Laboratory charges for: testing of construction materials; water quality tests; ambient air tests; emissions measurements; and noise measurements. (Please refer to Table 6.3 above for monitoring plan).

3 Includes; Compensatory tree plantation under supervision of forest department and training on counterpart staff

7 Public Consultation and Information Disclosure

356. Public consultation sessions in detail are discussed in this section, which were held with the stakeholders/ groups likely to be affected by the project. The consultation process was carried out in accordance with the Asian Development Bank's Safe Guard Policy Statement (ADB SPS 2009). Interactive sessions were held by NTDC staff with communities located near and around the project area for the sub-station development and along the proposed transmission line route.

357. A series of 5 consultations (consisting of 18 participants) were carried out with the Affected Person (APs) and other local community to share the information about the sub-project and record their concerns/feedback associated with this sub-project. In this context, the AF shared their point of view regarding payment on the loss of their land, crops and trees, as he had concerns regarding the true assessment of compensation.

358. This process has been undertaken to involve the stakeholders from the initial stages of the project. All applicable concerns and suggestions of the stakeholders have been included during the planning and design phases of this project. Much of the PC process to date has revolved around concerns for the mitigation of construction impacts and the possible side effects from the proposed scope of work of this sub-project.

359. The process of consultation is expected to continue through all stages of the project in order to accommodate stakeholders' desires and to orient the stakeholders positively towards the project implementation and where possible to harness cooperation over access issues in order to facilitate timely completion.

360. This process has been initiated during the feasibility stage in order to disclose the project information to the stakeholders and record feedback regarding the proposed project and preferences.

7.1 Consultation Process

361. The process of public consultation is likely to continue throughout the project cycle.

362. The focus of these consultations have been the receptors living in the project area of the proposed scope of work for the sub-station development i.e. an area of up to 4 km^2 around the project boundary.

363. The disclosure of information to the stakeholders beforehand has advantages in the environmental assessment and mitigation of impacts. Public consultation can also provide a conduit for the improvement of the project implementation to better serve the stakeholders.

364. The environmental assessment process under the Pakistan Environmental Protection Act only requires the disclosure to the public after the statutory IEE/EIA has been accepted by the relevant EPA to be in strict adherence to the rules. In this IEE the consultation process was performed to satisfy the ADB requirements.

365. Different relevant Government departments were consulted in order to gather information regarding the land and people, public-sector infrastructure, possible impact, if any, of project activities on the surrounding environment and any other private or public concerns about the project under review.

7.2 Identification of Stakeholders

366. Field work and public consultation phase was used to identify the stakeholders. On the basis of the findings of the field team, the primary stakeholders are:

- Landowners of the sub-station proposed site and the corridor of the transmission lines.
- Landowners whose properties may be hired or acquired for access purposes.
- People that might be indirectly affected by the project.
- People who shall benefit from project activities in the form of employment or business opportunities.
- Government departments directly or indirectly involved with the project.
- Knowledgeable residents of the area keen to contribute to the consultation process.
- Pressure groups demanding table power supply on urgent basis.

367. A number of stakeholders were identified during the field surveys. These included villagers, local residents, Government officials, shop owners, public representatives and general public. All those stakeholders had different types of stakes according to their professions.

368. During the Environmental and Social Assessment of the project area, two types of stakeholders were identified; the primary stakeholders, who would be directly affected by the project; and the secondary stakeholders, who would be indirectly affected by the project (or who could indirectly affect the project).

369. Subsequent to the stakeholder identification, guidelines and questionnaires (**Annexure IV**) were prepared for conducting the focus group discussions/meetings, which were arranged through contacting the key persons from the community, such as village heads and patwaris.

370. After completing the preparatory steps described above, the consultations were carried out in the communities. The consultations with the secondary stakeholders were carried out in parallel to the community meetings. The details of the stakeholders consulted are provided as **Annex-II**.

7.3 Consultation Findings

371. The detailed comments from the different stakeholders as a result of the consultation process are provided as **Table 7.1** below. In general, no objection was raised to the proposed sub-station and transmission line project with all stakeholders expressing positive sentiments regarding the project with the hope being repeatedly expressed that this project and similar projects will result in a reduction in load shedding and energy crisis.

Consultations with AF

372. Consultation is a continuous process that started at the project preparatory stage and will continue till project completion. Based on the consultations with the displaced person and general public, a number of concerns were highlighted and accordingly some feedback was also provided. The main concerns include the compensation of land for the AF of grid station; he was demanding the compensation as per current market value of the land. Along with the crops & trees at current market rates and disbursement should be made prior to the start of civil works and employment to the local peoples should be provided. RoW clearance for undertaking the project activities should be minimized at the best possible extent.

Redressal of Farmers' Issues

373. Compensation for the loss of land, crops and trees will be estimated by the concerned department keeping in view the current market rates and payment will be made prior to start of civil works and one-third of unskilled labor will be engaged from local community especially AF.

Table 7.1: AFs/ Community Concerns and their Redressal

Concerns	Redress	Responsibility
An employment in the project should be provided to increase the livelihood.	Preference will be given to engage local people especially AF in the project related jobs.	, NTDC, PMU & Contractor
The impact of electromagnetic induction increases during the rainy days.	It is required to avoid any field activity by the local people during rainy days to prevent accidents.	NTDC, PMU, ESIC, Consultant & Local Representatives
Installation should be done after harvest of crops	Preference will be given to installation after harvest, but in case of any crop/ tree losses, compensation at current market rate will be given to owner of crops/ trees.	PMU, NTDC & ESIC
Compensation should be made before the start of civil work.	As per ADB policy no civil work will be started before the disbursement of compensation to all AFs.	PMU, NTDC & ESIC -
NTDC should shift the Grid station	The option is seriously considered	NTDC, PMU &

to the less productive agricultural land	but the technical requirement is also essential	design consultant
The land to be acquired for the Grid Station is prime agricultural land, hence the compensation should be worked out as per the future potential of the land use especially in context with the commercialization owing to located near the motorway where the induatrial parks is established	Efforts will be made to acquire the land through the private negotiation.	NTDC, PMU & ESIC
Irrigation water channel should not be disturbed	The restorartion of all channels will be ensured by the project office	NTDC, PMU & Construction supervision consultant

7.4 Gender Component

374. The consultations identified some potential environmental and social impacts and perceptions of the affected communities. The public consultations were held in March 2018. Overall, the community supported the construction of the proposed sub-station and transmission line.

375. All the concerns and issues mentioned by the stakeholders shall be reflected in the Social Framework Agreement (SFA) between the local community and the NTDC and when the project is commissioned for construction.

7.5 Social Framework Agreement

376. The project proponent has committed that they will work hand-in-hand with the community for the successful completion of the sub-project.

377. SFA shall be considered as a “follow up” of the public consultation and indicates that NTDC and the communities are mutually facilitating the construction process of the scope of works for sub-project 3.

7.5.1 Parties to Agreement

378. The local villagers/representatives and the project proponent will sign the SFA through mutual consent. At least two leaders/elders will be chosen from each of the villages situated adjacent to the area where construction activity will be based. These leaders/elders will constitute a villagers committee, which will choose a Chairman among themselves.

379. SFA shall be signed by NTDC Resident Engineer (RE) representing the project proponent and by the Chairman of villagers’ committee representing the local community, two months prior to commencement of the construction work.

7.5.2 Agreement Contents

380. SFA shall be prepared in the form of a legal agreement in Urdu language on a stamp paper to be provided by RE at the project cost. Three copies of the agreement shall be signed by both parties. All the mitigation measures described in EMP which are relevant to SFA shall be included in the agreement. The obligations of the NTDC and those of the community shall be listed clearly. Signed copies of SFA shall be kept by both parties and the Executive Engineer in charge of this sub-station and TL development project.

8 Grievance Redress Mechanism

8.1 General

381. In order to receive and facilitate the resolution of affected peoples' (AP) concerns, complaints and grievances about the Project's environmental performance, a Grievance Redress Mechanism (GRM) will be established at the sub-project. The GRM will address the APs' concerns and complaints proactively and promptly, using an understandable and transparent process that is gender responsive, culturally appropriate, and readily accessible to all segments of the APs at no costs and without retribution. The mechanism will not impede access to the country's judicial or administrative remedies.

8.2 Redress Committee, Focal Points, Complaints Reporting, Recording and Monitoring

382. The Executing Agency will establish a mechanism to receive and facilitate the resolution of affected peoples' concerns, complaints, and grievances about the project's environmental performance. The Executing Agency at site will be the Project Implementation Unit (PIU). The PIU will overall be responsible for executing the work at site. The Executive Engineer/Resident engineer will be in charge of the project. The Executive Engineer will be supported with Sub Divisional Officers and other supporting staff. The GRM will be established at each project location as described below.

383. Prior to the contractor's mobilization to the project site NTDC's Environment and Social Impact Cell (E&SIC) will assist the affected communities to establish a Grievance Redress Committee (GRC) and identify local representatives to act as Grievance Focal Points (GFP) for that community. The Grievance Redress Committee (GRC) will comprise of:

- Executive Engineer (NTDC) for the project;
- Representative of E&SIC (Assistant Manager (Environment));
- Environment Specialist CSC;
- Representative of Contractor; and
- GFP of relevant community.

384. The function of the GRC is to address the project related grievances of the affected parties that are unable to be resolved satisfactorily through the initial stages of the GRM procedure.

385. The Grievance Focal Points (GFPs) are designated personnel from within the community who will be responsible for: i) acting as community representatives in formal meetings between the project team (contractor, CSC, Assistant Manager (Environment), E&SIC and the local community he/she represents and ii) communicating community members' grievances and concerns to the contractor during project implementation. The number of GFPs to be identified for each project will depend on the number and distribution of affected communities.

386. A pre-mobilization public consultation meeting will be convened by E&SIC and attended by GFPs, contractor, CSC, E&SIC representatives and other interested parties (e.g. District level representatives, NGOs). The objectives of the meeting will be as follows:

- Introduction of key personnel of each stakeholder including roles and responsibilities,
- Presentation of project information of immediate concern to the communities by the contractor (timing and location of specific construction activities, design issues, access constraints etc.) This will include a brief summary of the EMP - its purpose and implementation arrangements;
- Establishment and clarification of the GRM to be implemented during project implementation including routine (proactive) public relations activities proposed by the project team (contractor, CSC, E&SIC) to ensure communities are continually advised of project progress and associated constraints throughout project implementation;
- Identification of members of the Grievance Redress Committee (GRC); and
- Elicit and address the immediate concerns of the community based on information provided above.

387. Following the pre-mobilization public consultation meeting, environmental complaints associated with the construction activity will be routinely handled through the GRM as explained below and shown schematically in **Figure 8.1**:

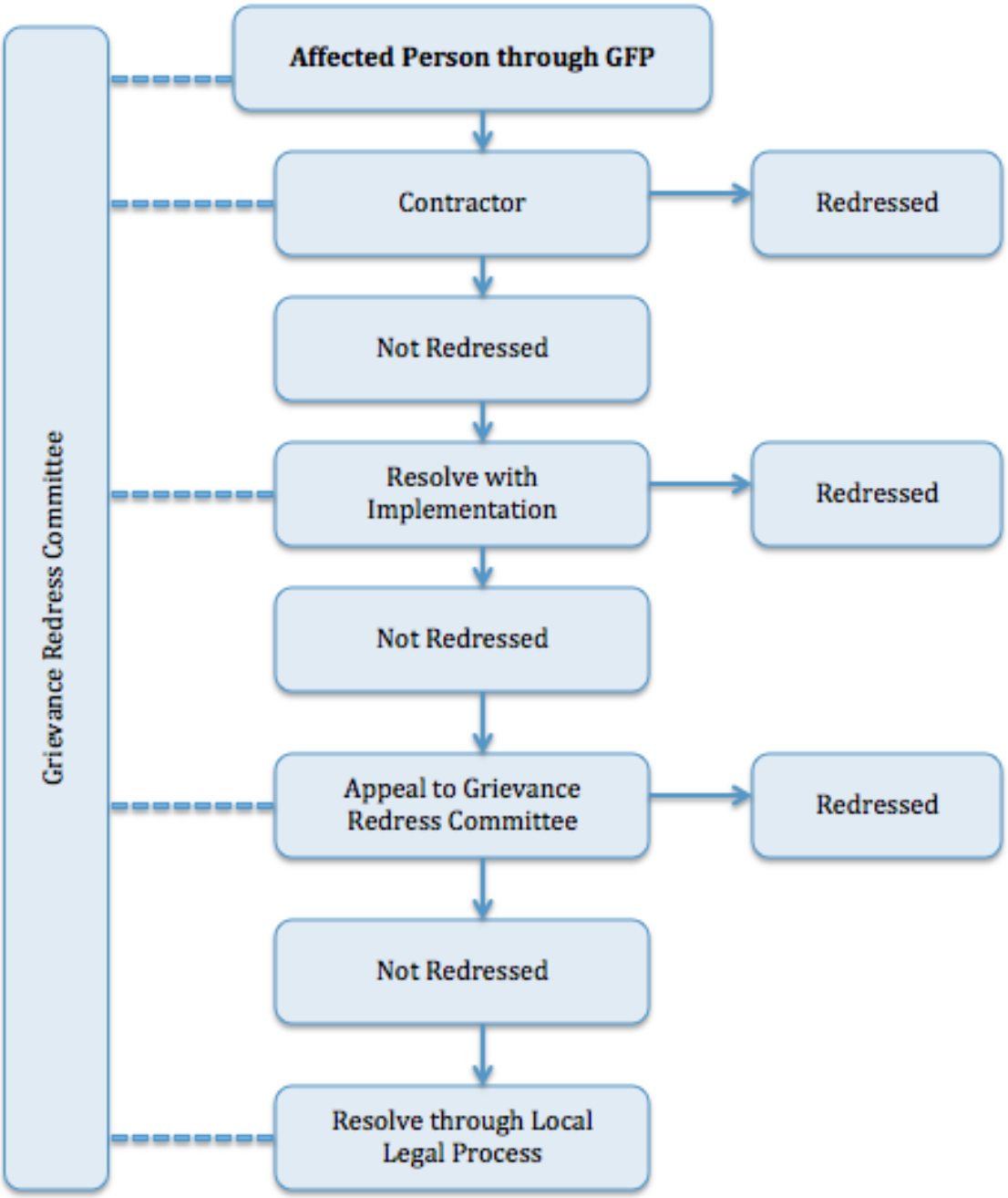
- Individuals will lodge their environmental complaint/grievance with their respective community's nominated GFP.
- The GFP will bring the individual's complaint to the attention of the Contractor.
- The Contractor will record the complaint in the onsite Environmental Complaints Register (ECR) in the presence of the GFP.
- The GFP will discuss the complaint with the Contractor and have it resolved;
- If the Contractor does not resolve the complaint within one week, then the GFP will bring the complaint to the attention of the CSC's Environmental Specialist. The SC's Environment Specialist will then be responsible for coordinating with the Contractor in solving the issue.
- If the Complaint is not resolved within 2 weeks, the GFP will present the complaint to the Grievance Redress Committee (GRC).
- The GRC will have to resolve the complaint within a period of 2 weeks and the resolved complaint will have to be communicated back to the community. The Contractor will then record the complaint as resolved and closed in the

Environmental Complaints Register.

- Should the complaint not be resolved through the GRC, the issue will be adjudicated through local legal processes.

388. In parallel to the ECR placed with the Contractor, each GFP will maintain a record of the complaints received and will follow up on their rapid resolution. E&SIC will also keep track of the status of all complaints through the Monthly Environmental Monitoring Report submitted by the Contractor to the SC and will ensure that they are resolved in a timely manner.

Figure 8.1: Grievance Redress Mechanism



9 Conclusions and Recommendations

9.1 Conclusion

389. The development of the proposed scope of work for sub-project 3 is of national significance and is of critical importance considering the significant energy deficit being faced by the country since several years.

390. Primary and secondary data has been used to assess the environmental impacts of the activities to be conducted for this sub-project. This IEE report highlights any potential environmental impacts associated with the development of the Jauharabad sub-station and associated transmission lines and recommends mitigation measures, wherever felt necessary. All environmental impacts associated with the sub-project development need to be properly mitigated, wherever required, through the existing institutional arrangements described in this report.

391. The majority of the environmental impacts, however minimal and temporary in nature, are associated with the construction phase of the sub-project. The implementation of mitigation measures during this period will be the responsibility of the Contractor. Therefore, the required environmental mitigation measures will have to be clearly defined in the bidding and Contract documents, and appropriately qualified environmental staff retained by the Consultant to supervise the implementation process.

392. This IEE concludes that no significant negative environmental impacts are likely to occur due to construction and normal operations of the proposed sub-project, provided mitigation measures are implemented and the proposed monitoring program is adequately carried out. The EMP includes measures to minimize project impacts due to noise and air pollution, waste generation etc.

393. The sub-project has been assigned environmental category 'B' in accordance with the ADB's Safeguard Policy Statement (SPS) 2009 and Schedule II as per PEPA, IEE and EIA Gazette Notification, 2000. Thus, this IEE report with the associated EMP is regarded as sufficient environmental assessment of this sub-project and a full EIA is not required.

9.2 Recommendations

394. Although comprehensive mitigation measures have been proposed in the report to minimize the negative impacts and to enhance the positive impacts of the sub-project, however, major recommended mitigation measures are summarized as under:

- Soil erosion and contamination, water contamination, air pollution and high noise levels should be controlled with the use of good engineering practices.

- Contractor should develop plan such as traffic management, solid waste management and material management etc. before commencing the construction activities.
- Fair and negotiated compensation in accordance with the prevailing market prices should be made for loss of crops and trees during the construction activities of the sub-project.
- Contractor should warn the workers not to hunt the water birds, fish resources, etc.
- The Contractor will have to adopt some suitable timing for the construction activities so as to cause the least disturbance to the local communities, particularly women, considering their peak movement hours.
- Contractor should take due care of the local community and its sensitivity towards local customs and traditions.
- EMP proposed in Chapter 6 shall be implemented in its true letter and spirit.

10 References

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ANNEXURE-I

Rapid Environmental Assessment Checklist

Rapid Environmental Assessment (REA) Checklist

Instructions:

(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to Environment and Safeguards Division (RSES) for endorsement by Director, RSES and for approval by the Chief Compliance Officer.

(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

(iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: **Sub-project 3: 220 kV Jauharabad Sub-station with associated transmission line**

Sector Division: CWRD/CWEN

Screening Questions	Yes	No	Remarks
A. Project Siting Is the Project area adjacent to or within any of the following environmentally sensitive areas?			All the project's sites and transmission lines are located well away from any environmentally sensitive areas.
▪ Cultural heritage site		X	Not Applicable
▪ Protected Area		X	Not Applicable
▪ Wetland		X	Not Applicable
▪ Mangrove		X	Not Applicable
▪ Estuarine		X	Not Applicable
▪ Buffer zone of protected area		X	Not Applicable
▪ Special area for protecting biodiversity		X	Not Applicable
B. Potential Environmental Impacts Will the Project cause…			
▪ Encroachment on historical/cultural areas, disfiguration of landscape and increased waste generation?	X		No historical site(s) located in project area. Landscape will be disrupted and waste will be generated, however, will be managed through implementation of EMP.

Screening Questions	Yes	No	Remarks
▪ Encroachment on precious ecosystem (e.g. sensitive or protected areas)?		X	No encroachment on sensitive ecosystems is expected
▪ Alteration of surface water hydrology of waterways crossed by roads and resulting in increased sediment in streams affected by increased soil erosion at the construction site?		X	Not expected
▪ Damage to sensitive coastal/marine habitats by construction of submarine cables?		X	The project is located far away from the sensitive coastal/marine habitats.
▪ Deterioration of surface water quality due to silt runoff, sanitary wastes from worker-based camps and chemicals used in construction?	X		There is a potential for water quality impacts from labor camps and construction sites. Based on EMP provisions, respective mitigation measures will be followed.
▪ Increased local air pollution due to rock crushing, cutting and filling?	X		There is a potential for local air pollution due to construction activities on sub-station and TL sites. EMP will contain mitigation measures such as water sprinkling will be adopted to minimize the impact.
▪ Risks and vulnerabilities related to occupational health and safety due to physical, chemical, biological, and radiological hazards during project construction and operation?	X		Project construction and operation phases can pose certain risks due to construction works and installation of high voltage electrical equipment. Specific measures such as using PPEs, safety trainings will be provided in the EMP to mitigate those possible impacts.
▪ Chemical pollution resulting from chemical clearing of vegetation for construction site?		X	No such risks are expected since as a general policy, NTDC does not use chemicals for clearing of vegetation.
▪ Noise and vibration due to blasting and other civil works?	X		No blasting is required in this sub-project. High noise levels can potentially be generated during construction phase by heavy machinery. Any possible impacts will be mitigated by implementing the Environmental Management Plan. Among those measures are using noise reduction equipment (mufflers), temporary acoustic barriers, etc.
▪ Dislocation or involuntary resettlement of people?		X	There is a potential for dislocation or resettlement of people. This will be minimized through selection of the TL routes and mitigated through preparing of LARP.

Screening Questions	Yes	No	Remarks
▪ Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?		X	Not expected. Vulnerable and other groups will benefit from supply of more reliable and quality energy.
▪ Social conflicts relating to inconveniences in living conditions where construction interferes with pre-existing roads?	X		EMP will contain measures to ensure that there are no interferences with the local community resources such as provision of own sources of drinking water.
▪ Hazardous driving conditions where construction interferes with pre-existing roads?	X		EMP will contain measures to ensure avoidance of hazardous driving conditions such as preparing and enforcement of traffic management plans.
▪ Creation of temporary breeding habitats for vectors of disease such as mosquitoes and rodents?	X		This impact will be minimized through proper wastewater management and other remedial measures.
▪ Dislocation and compulsory resettlement of people living in right-of-way of the power transmission lines?		X	There is a possibility of IR impacts at the substation site and associated TLs. Those impacts will be minimized by proper selection of the site, and preparation of LARP, if necessary.
▪ Environmental disturbances associated with the maintenance of lines (e.g. routine control of vegetative height under the lines)?	X		Although the sub-project scope of work consists of adding a twin bundle rail conductor to an existing 220 kV line, however it shall be ensured through the EMP that the heights of any trees under the lines are managed in the most efficient and effective manner.
▪ Facilitation of access to protected areas in case corridors traverse protected areas?		X	It is not expected that the associated TLs will cross any protected areas.
▪ Disturbances (e.g. noise and chemical pollutants) if herbicides are used to control vegetative height?		X	Not applicable since NTDC does not use any herbicide or vegetation control or removal.
▪ Large population influx during project construction and operation that cause increased burden on social infrastructure and services (such as water supply and sanitation systems)?		X	The sub-project construction will aim to engage local labor as far as possible apart from engaging technical NTDC staff. Thus, no large population influx is foreseen.
▪ Social conflicts if workers from other regions or countries are hired?		X	Local labor will mostly be engaged and thus no potential conflicts are expected.

Screening Questions	Yes	No	Remarks
▪ Poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases from workers to local populations?	X		The possibility of poor sanitation and resulting transmission of diseases from workers to the local populations is remote, yet does exist. Thus necessary provisions in the EMP shall be provided to ensure any waste generated is disposed off in accordance with applicable NEQS guidelines.
▪ Risks to community safety associated with maintenance of lines and related facilities?	X		As high voltage equipment will be installed and maintained within protected (fenced) sub-station there will be no risks to community safety. However, during maintenance of transmission lines, the community safety will need to be ensured through the measures provided in the EMP.
▪ Community health hazards due to electromagnetic fields, land subsidence, lowered groundwater table, and salinization?	X		Not Applicable
▪ Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during construction and operation?	X		No explosives will be involved in the proposed scope of works. Other materials such as fuel, oil etc. will be kept in the construction camps / storage places. Transport and disposal of such materials will be according to protective measures provided in EMP.
▪ Community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project (e.g., high voltage wires, and transmission towers and lines) are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning?	X		The risks to community safety do exist considering the high voltage transmission lines and towers that could potentially harm the communities. Necessary mitigation measures will be implemented to prevent any such impacts.

ANNEXURE-II

Record of Public Consultations

S/No.	Date of Consultation	Village Name	Type of Stakeholder	Name of Respondent
1	01-4-2018	Hadala	AF& Local Community	- Hamid Nawaz s/o Muhammad Nawaz - Muhammad Usman s/o Muhammad Aslam - Asad Ali s/o Asghar Ali
2	02-04-2018	Hadala (Angori)	AF	- Mr. M. Arif S/o Sher Din - Mr. M. Iftikhar S/o M. Yaqoob - Mr. M. Shabir S/o Major - Mr. Waris Ali S/o khair Din
3	03-04-2018	Hadala (Angori)	General Public	- Haji SaifUllah s/o NajeebUllah - Muhammad Abu Bakar s/o Muhammad Javed - Khan Muhammad s/o Muhammad Akram - Muhammad Aslam s/o Muhammad Rafiq
4	06-04-2018	Jahurabad	AF	- Hamid Nawaz s/o Muhammad Nawaz
5	06-04-2018	Hadala (Angori)	General Public	- Mr. M. Arif S/o Sher Din - Mr. M. Iftikhar S/o M. Yaqoob - Mr. M. Shabir S/o Major - Mr. Waris Ali S/o khair Din - Muhammad Usman s/o Muhammad Aslam - Asad Ali s/o Asghar Ali

ANNEXURE-III

Photographs of Project Area

Jauharabad Sub-station Project Area

Photograph 0-1: Consultations at site with local communities and NTDC and ADB personnel

Photograph 0-2: View of proposed site for sub-station development

Photograph 0-3: Another view of proposed site for sub-station

Photograph 0-4: Consultations at site with local communities and NTDC and ADB personnel

ANNEXURE-IV

Field Questionnaire

Serial No. _____

Interviewer's Name _____

Date _____

Name of the Respondent _____

Father's Name _____

Age (years) _____

Education _____

Q.1 Name of Tehsil: آپ کے علاقے کی تحصیل کا نام کیا ہے؟

_____

Q.2 Name of Union Council: آپ کی یونین کونسل کا نام کیا ہے؟

_____

Q.3 Name of Valley: آپ کی وادی کا نام کیا ہے؟

_____

Q.4 Name of the Village: آپ کے گاؤں کا نام کیا ہے؟

_____

Q.5 Names of Tribes in the Village: آپ کے گاؤں میں کون سے قبیلے ہیں؟ نام بتائیں

1	2.	3.	4.
5.	6.	7.	8.
9.	10.	11.	12.

Q.6 Languages Spoken in the Village: آپ کے گاؤں میں بولی جانے والی زبانیں کونسی ہیں؟

1		4	
2		5	
3		6	

Q.7 Accessibility from main road to Village:

Track	Un metalled Road	Metalled Road	Other (Specify)

Q.8 Distance from tarred road to Village: _____Km گاؤں سے سڑک تک فاصلہ؟

Q.9 Approximate area of the Village: _____(km^2) آپ کے گاؤں کا کل رقبہ تقریباً کتنے مربع کلومیٹر ہے؟

Q.10 Approximate population of the Village _____ آپ کے گاؤں کی کل آبادی تقریباً کتنی ہے؟

Q.11 Total Houses in the Village _____ آپ کے گاؤں میں تقریباً کتنے گھر ہیں؟

Q.12 Educational Facilities Available in the Village. آپ کے گاؤں میں کونسے تعلیمی ادارے ہیں؟

Sr. No	Facilities	Yes	No	Govt.	Private	Boys (M)	Girls (F)	Co-Education
(a)	Primary School							
(b)	Middle School							
(c)	High School							
(d)	College							
(e)	Vocational Training Centers							
(f)	Deeni Madrassa							
(g)	Others (Specify)							

Q.13 Institutional Facilities Available in the Village. آپ کے گاؤں میں درج ذیل میں سے کونسی سہولیات موجود ہیں؟

Sr. No	Facilities	Yes	No	Govt.	Private	Name
a.	Hospital					
b.	Dispensary					
c.	Basic Health Unit					
d.	Post Office					
e.	Mosque					
f.	Banks					

g.	Others					

Q.14 Means of Transport Available in the Village. آپ کے گاؤں میں کونسے ٹرانسپورٹ کے ذرائع موجود ہیں؟

LOCAL	INTERCITY
1. Public Transport	1. Public Transport
2. Private Transport	2. Private Transport
3. Pedestrian	3. Pedestrian
4. Others	4. Others

Q.15 Civic Facilities Available in the Village آپ کے گاؤں میں روزمرہ زندگی میں سے کونسی زندگی کی ضروریات موجود ہیں؟

Sr. No	Facilities	Yes	No	Remarks if Any
A	Lined Drainage System	1	2	
B	Street Lights	1	2	
C	Grocery Shops	1	2	
D	Recreational / Games Facilities	1	2	
E	Medical Stores	1	2	
F	Graveyards	1	2	
G	Electricity	1	2	
H	Telephone	1	2	
I	Public Water Supply	1	2	
J	Others	1	2	

Q. 16 Source of Water in the Village

آپ کے گاؤں میں کونسے پانی کے ذرائع ہیں؟

Storage Pit	Channel	Spring	Nullah	Other _____
A	B	C	D	E

Q.17 If Channel,

1 Katcha	2 Partly Lined	3 Completely Lined

Q.18 Nature of water supply آپ کے گاؤں کو پانی کس طرح مہیا کیا جاتا ہے؟

1. Public		Mode of supply of water:	(a) Self Carried (b) Tapped

2. Private			(c) By Channel (d) By Tanker

Q. 19 Common Diseases in the Village آپ کے گاؤں میں عموماً کونسی بیماریاں پائی جاتی ہیں؟

a. Common cold		b. Diarrhea		c. Typhoid	
d. Stomach Worms		e. TB		f. Malaria	
g. Goiter		h. Dysentery		i. Hepatitis	
j. Other (specify)					

Q.20 Does a Child Birth Attendant Available in the Village? کیا آپ کے گاؤں میں بچے کی پیدائش کے لیے دائی موجود ہے؟

1. Yes ☐ 2. No ☐

Q.21 If Yes: اگر ہے تو کیا وہ تربیت یافتہ ہے یا غیر تربیت یافتہ؟ 1 Trained ☐ 2 Untrained ☐

Q. 22 Does any NGO exist in the Village? کیا آپ کے گاؤں میں کوئی غیر سرکاری فلاحی تنظیمیں کام کر رہی ہیں؟

1. Yes ☐ 2. No ☐

Q.23 If Yes:

Sr.No	Name	Status
A		1. Local 2. National 3. International
B		1. Local 2. National 3. International
C		1. Local 2. National 3. International

Q.24 Major Development projects run by different organizations in the village?

کیا آپ کے گاؤں میں کوئی بڑے ترقیاتی پروگرام چل رہے ہیں؟ اگر ہاں تو براہ مہربانی ان کے نام بتائیں؟

1. _____
2. _____
3. _____

Q.25 Who has the ownership rights of the mountains, pastures, jungles and natural resources of the area? آپ کے علاقے میں پہاڑوں، چراگاہوں، جنگلات اور قدرتی وسائل کے ملکیتی حقوق کس کو حاصل ہیں؟

a. Owner Tribes ☐ b. Non Owner Tribes ☐ c. Individual ☐

d. Others (Specify) _____

Q.26 Who has the right to allow the people to get benefits from natural resources? (Forest trees, Mountains, Pastures, Herbs etc)?

ان قدرتی وسائل سے نفع حاصل کرنے کے لیے اجازت دینے کا حق کس کو حاصل ہے؟

a. Owner Tribes ☐ b. Non Owner Tribes ☐ c. Owner ☐

d. None ☐ e. Others (Specify) _____

Q.27 Who has the rights of selling and purchasing the agriculture land, residential and commercial property? آپ کے گاؤں میں زرعی زمین، رہائشی اور کمرشل جائیداد کی خرید و فروخت کا حق کس کو حاصل ہے؟

a. Owner Tribes ☐ Non Owner Tribes ☐ c. Individual ☐

d. Anyone ☐ e. Others (Specify) _____

Q.28 What are the preferences to sell the personal immoveable property like houses, agriculture land, shops etc. to:

ذاتی جائیداد مثلاً گھر، زرعی زمین اور دکانیں وغیرہ بیچنے کے لئے درج ذیل میں سے کس کو ترجیح دی جاتی ہے؟

a. Owner Tribes ☐ b. Non Owner Tribes ☐

c. Immediate Neighbor ☐ d. Anyone ☐

e. Others (Specify) _____

Q.29 What are the prevalent units of measurement of agricultural land in your village? آپ کے گاؤں میں زرعی زمین کی پیمائش کے لئے درج ذیل میں سے کونسے پیمانے استعمال کئے جاتے ہیں؟

a. Marlas ☐ b. Kanals ☐ c. Acres ☐

d. Jarib ☐ e. Sq Feet ☐ f. Sq. Haath ☐

g. Others (Specify) _____

Q.30 What are the prevalent units of measurement of agricultural produce in your village? آپ کے گاؤں میں زرعی اجناس کی پیداوار ناپنے تولنے کے لئے درج ذیل میں سے کونسے پیمانے استعمال کئے جاتے ہیں؟

a. Kilogram ☐ b. Maunds ☐ c. Haa ☐

d. Sinn ☐ e. Others (Specify)_____

Q.31 Who are the influential in your village?

آپ کے گاؤں میں درج ذیل میں سے کون سے لوگ معزز اصحاب ہوتے ہیں؟

a. Head of the Tribe	☐	b. Councilors	☐
c. Religious Scholars	☐	d. Heads of Families	☐
e. Government Servants	☐	f. Numberdar	☐

g. Others (Specify) _____

Q.32 How the matters related to property, dispute about the control and Consumption of the natural resources of the area are settled?

آپ کے گاؤں میں جائیداد، قدرتی وسائل کے استعمال سے متعلق معاملات اور تنازعات درج ذیل میں سے کن طریقوں سے حل کئے جاتے ہیں؟

1. Jirgah جرگہ	2. Head of the Tribes قبیلے کا سردار
3. Council of Ulamahs علماء کونسل	4. Heads of Families سربراہ خانہ
5. Government Officials سرکاری افسر	6. Others (Specify)

Q.33 What types of migration exists in your village?

آپ کے گاؤں میں لوگ درج ذیل میں سے کس نوعیت کی نقل مکانی کرتے ہیں؟

Patterns of local migration		
Nature of Migration	Duration	Radius of Migration
(a) Permanent	(a) Seasonal	(a) Within the same valley
(b) Temporary	(b) Yearly	(b) Within the local neighboring valleys
(c) Voluntary	(c) Monthly	(c) Within the neighboring districts
(d) Involuntary	(d) Others (Specify)	(d) In Province
(e) Individual		(e) Other parts of the country
(f) With family / sub-tribe		
(g) Other		

Q.34 What are the reasons of local migration in your village? مقامی نقل مکانی کی کوئی بڑی وجوہات ہیں؟

a. _____

b. _____

c. _____

Q.35 What are the major problems of your area? آپ کے گاؤں میں درپیش کوئی بڑے مسائل ہیں؟

Sr.No	Types of Problems	Proposed Solutions

A		
B		
C		
D		
E		
F		

Q.36 Do rock carvings / historical places exist in the village?

کیا آپ کے گاؤں میں اثار قدیمہ سے متعلق یادگاریں/مقامات/اشیا موجود ہیں؟

1. Yes ☐ 2. No ☐

Q.37 If yes: اگر ہاں تو مندرجہ ذیل کی تفصیل بتائیے؟

Sr.No	Name	Number	Location
A	Rock Carvings		
B	Historical Ruins		
C	Old Graveyard		
D	Others (Specify)		

Q.38 Are there markets for grains and livestock in the village?

کیا آپ کے گاؤں میں اجناس اور جانوروں کی خرید و فروخت کے لئے منڈیاں ہیں؟ ☐

Q.39 If No, where do people sell their agricultural produce and livestock?

اگر نہیں تو لوگ اپنی اجناس اور جانور کہاں فروخت کرتے ہیں؟

Grains	
Livestock	

Q.40 What types of trees are in your area?

آپ کے گاؤں میں درج ذیل میں سے عام طور پر کونسے درخت پائے جاتے ہیں؟

Fruit Trees	
Forest/wood Trees	

Q.41 What kinds of wild animals are found in your village area?

آپ کے گاؤں کے گرد و نواح میں کون کون سے جنگلی جانور پائے جاتے ہیں،ان کے نام بتائیے؟

Q.42 What type of cottage industry exists in your village?

آپ کے گاؤں میں کون کون سی گھریلو صنعتیں ہیں،ان کے نام بتائیے؟

ANNEXURE-V

NEQS Guidelines and WHO Standards

National Environmental Quality Standards for Gaseous Emission

Parameter	Source of Emission	Existing Standards	Revised Standards
Smoke	Smoke Opacity not to exceed	40% or 2 on Ringlemann scale	40% or 2 on Ringlemann scale or equivalent number
Particulate matter	a) Boilers and furnaces Oil fired Coal fired Cement Kilns b) Grinding crushing, clinker, coolers and related processes, metallurgical processes, converter, blast furnaces and cupolas	 300 500 200 500	 300 500 300 500
Hydrogen Chloride	Any	400	400
Chlorine	Any	150	150
Hydrogen Flouride	Any	150	150
Hydrogen Sulphide	Any	10	10
Sulphur oxides	Sulfuric acids/sulfuric acid plants Other plants	400 400	5000 1700
Lead	Any	50	50
Mercury	Any	10	10
Cadmium	Any	20	20
Arsenic	Any	20	20
Copper	Any	50	50
Antimony	20	20	20
Zinc	Any	200	200
Oxides of Nitrogen	Nitric Acid Manufacturing Unit Gas Fired Oil Fired Coal Fired	400 400	400 400 600 1200

WHO Guideline Values for Community Noise in Specific Environment

Specific Environment	LA eq (dB)	LAmax Fast (db)
Out door living area	55	
School class rooms and pre-schools (indoor)	35	
School Playground (outdoors)	35	
Hospitals Ward rooms (indoor	30 30	40
Hospital Treatment rooms (indoors)	#1	
Industrial, commercial, shopping and traffic areas (indoors and out doors)	70	110

#1– as low as Possible

WHO Drinking Water Quality Standards

Sr. No.	Constituent, mg/L	Recommended limit (1961 European)
1	Ammonia	0.5
2	Chlorides	350
3	Copper	0.05[a]
4	Flourides	1.5
5	Iron	0.1
6	Magnesium [b]	125[b]
7	Nitrates	50
8	Oxygen	5.0
9	Phenols	0.001
10	Sulphates	250
11	Zinc	5.0

a Maybe higher for new piping
b if 250mg/L SO_4 is present, Mg not to exceed 30mg/L

ANNEXURE-VI

Brochure

بجلی گھر / ترسیلاتی تاریں (گرڈسٹیشن / ٹرانسمشن لائن)

ماحولیاتی انتظامی منصوبہ

متوقع ماحولیاتی اثرات	طریقہ ہائے تدارک / انسدادی اقدامات	ذرائع تدارک	ذمہ دار محکمہ / ادارہ	سپرویژن
دوران تعمیر				
1 آمدورفت کی گزرگاہوں کی بہتری، تیز ڈھلوان کی وجہ سے زمینی کٹاؤ اور منصوبہ کے مختلف مراحل کا جائزہ۔	پہنچنے کے نئے راستوں کے ساتھ ڈھلوان و پن سٹاک وغیرہ کیلئے - زمینی کٹاؤ کو کم کرنے کیلئے پانی کے بہاؤ کے صحیح راستے بنانا - سمنٹ / پکی دیواریں، نیز دوسرے نئے دوسامان کا استعمال، کرخانی جگہیں پر ہو سکیں شہر کے ساتھ اور پن سٹاک کے ساتھ درخت لگانا وغیرہ	مناسب نگرانی کرنا	ٹھیکیدار اور ماحولیاتی انجینئر	این۔ٹی۔ڈی۔سی
2 ریت مٹی پتھر وغیرہ کی وجہ سے زمینی سطح کا نیچے ہونا، خراب ہو جانا۔	- مٹی، ریت، پتھر وغیرہ زرعی زمین سے نہیں لینا اور صرف پتھر، فالتو، اور دریا سے لینا ہے۔ - پیداواری زمین کو بچانا ضروری ہے۔ - جن جگہوں سے مٹی، ریت، پتھر لیا ہے اسکو ہموار کرنا اور اصلی حالت میں لانا ضروری ہے۔	کنٹریکٹ / ٹھیکہ میں شرائط لکھی ہوئی ہیں بمطابق نگرانی	ٹھیکیدار اور ماحولیاتی انجینئر	این۔ٹی۔ڈی۔سی
3 تعمیراتی سامان حاصل ہونیوالی جگہ کا جائزہ دلینا۔	- وہ جگہ جہاں سے پتھر وغیرہ کا حصول ہو پہلے سے اس کام کے لیے استعمال ہوتی ہو لائیسنس یافتہ ہو اور محکمہ ماحولیات سے اجازت شدہ ہو۔ اگر نئی جگہ سے ریت بجری اور مٹی حاصل ہوتی ہو تو محکمہ جاتی اجازت کے بعد شروع ہو	مناسب نگرانی	ٹھیکیدار اور ماحولیاتی انجینئر	این۔ٹی۔ڈی۔سی
4 تعمیراتی سامان کی حالت کا جائزہ، دوران تعمیر پانی کی ترسیل ورکاوٹ، پانی کی کوالٹی اور پانی میں آلودگی کا اندازہ کرنا۔	- پٹرول، موبل آئل وغیرہ کو پانی کے ذریعے سے دور رکھنا اور سامان کی مکمل حفاظت۔ پانی کے ذرائع کی مکمل حفاظت خاص کر سردی میں جب دریا میں پانی کی مقدار کم ہوتی ہے۔ جہاں جگہوں کی حفاظت جہاں فالتو سامان رکھا ہو۔ اس کے علاوہ فالتو پٹرولیم سامان کی صحیح طریقے سے انکاس اور مخصوص جگہوں میں جمع کرنا	مناسب نگرانی / معاہدے کی شرائط کے مطابق	کنسلٹنٹ	این۔ٹی۔ڈی۔سی
5 دوران تعمیر نکاسی آب سیلابی لائن اور نالیوں کے کام میں انتشار ہونا	- بارش کے پانی کی صحیح نکاسی آبپاشی اور پینے کے پانی کے ذرائع کو اگر نقصان ہو تو دوبارہ تعمیر یا بحال کرنا	مکمل منصوبہ بندی	ٹھیکیدار ، کنسلٹنٹ اور شیڈو	این۔ٹی۔ڈی۔سی
6 رہائشی کالونی / کیمپ کے سماجی اثرات اور ضائع شدہ پانی وغیرہ کے ماحولیاتی اثرات کا جائزہ۔	- تعمیراتی لوگوں کی رہائش دیہات / گاؤں سے دور ہونی چاہیے۔ - رہائشی جگہوں میں پانی کی نکاسی کا صحیح نظام ہو اور کوڑا کرکٹ کیلئے جگہیں مختص ہونی چاہئیں۔	مناسب نگرانی، ٹھیکیدار کے معاہدے کی شرائط کے مطابق	ٹھیکیدار ، کنسلٹنٹ	این۔ٹی۔ڈی۔سی
7 تعمیراتی کام میں استعمال ہونے والی گاڑیوں اور سامان سے نکلنے والے دھوئیں سے فضائی آلودگی پیدا ہونا۔	- مذکورہ گاڑیوں اور سامان سے آلودگی پاکستان آلودگی کے متعین شدہ معیار کے مطابق ہو۔ - آلودگی کی مکمل نگرانی کی جائے۔	مناسب نگرانی	ٹھیکیدار ، کنسلٹنٹ	محکمہ ماحولیات
8 گرد وغبار کے ذرات کی وجہ سے مزدور اور عوام کی صحت پر پڑنے والے اثرات کا جائزہ۔	- کرش اور کنکریٹ پلانٹ آبادی سے کافی دور ہو - مذکورہ اثرات سے تمام ممکنہ بچاؤ کے طریقے اپنانا، خاص کر کرش پلانٹ، ڈیم اور پن سٹاک سائیڈ اور بیچنگ پلانٹ وغیرہ۔ اسکے علاوہ وقتاً فوقتاً پانی کا چھڑکاؤ خاص کر سردیوں ، روڈ اور سٹوریج سائیڈ پر، سامان والی تمام گاڑیوں کو ڈھکنا شامل ہے	مناسب نگرانی	ٹھیکیدار ، کنسلٹنٹ	محکمہ ماحولیات
9 گاڑیوں، تعمیراتی سامان سے پیدا شدہ شور کے اثرات کا جائزہ دلینا۔	- تمام تعمیراتی مشینری اور گاڑیوں کا شور پاکستان انوائرمنٹل کوالٹی سٹینڈرڈ کے مطابق ہو جبکہ عام گاڑیوں میں شور کنٹرول کرنے کا آلہ نصب ہو۔ اسکے علاوہ تمام مزدوروں کو شور سے بچنے کا آلات مہیا کرنے ہیں۔	مناسب نگرانی	ٹھیکیدار ، کنسلٹنٹ	محکمہ ماحولیات
10 منصوبہ کے مختلف مراحل میں استعمال ہونے والے بارود کے شور کے اثرات کا جائزہ۔	- بارودی کام پاکستانی قانون کے مطابق ہو اور نزدیکی باسیوں کو پہلے سے مطلع کرنا، بلاسٹنگ سے متعلقہ مزدوروں کو تمام بچاؤ کے آلات مہیا کرنا ہے	مناسب نگرانی	ٹھیکیدار ، کنسلٹنٹ	محکمہ ماحولیات
11 تعمیراتی کاموں کی وجہ سے درختوں اور دیگر پودوں کا ضائع ہو جانا۔	- کوئی بھی پودا محکمہ جنگلات کی منظوری کے بغیر کاٹا جائے اور جو درخت کاٹا جائے اسکا معاوضہ دیا جائے اور انکی جگہ نئے پودے بھی لگائے جائیں۔	مناسب منصوبہ بندی	ٹھیکیدار ، کنسلٹنٹ	محکمہ ماحولیات
12 جنگلی حیات پر منصوبہ پر کام کرنیوالے لوگوں کے ممکنہ اثرات۔	- تعمیراتی کاموں کے مزدوروں کو جنگلی حیات سے بچاؤ کی تربیت دینا اور کسی قسم کے شکار کرنے پر پابندی عائد کرنا	مناسب منصوبہ بندی اور نگرانی	ٹھیکیدار ، کنسلٹنٹ	محکمہ ماحولیات
13 تعمیراتی کام میں ممکنہ حادثات کا جائزہ دلینا۔	- بلاسٹنگ کر جگہوں پر بچاؤ کے نشانات اور سائن بورڈ، تمام مزدوروں کو ہیلمٹ، ماسک اور حفاظتی عینک مہیا کرنا، ابتدائی طبی امداد کا انتظام کرنا، ڈرائیوروں کو اپنی حفاظت کی تعلیم دینا، ٹریفک کا صحیح انتظام کرنا، تمام احتیاطی تدابیر کی عام لوگوں میں تشہیر کرنا جس میں جگہوں کی نشان دہی اور ممکنہ خطرات بتانا شامل ہو	مناسب نگرانی جس میں محکمہ جنگلات کو بھی شامل کیا جائے ٹھیکیدار خصوصی طور پر اپنے لوگوں کو تفاذ کرے۔	ٹھیکیدار ، کنسلٹنٹ	محکمہ ماحولیات
14 تعمیراتی کام کا عوام کے استعمال کے ذرائع کو نقصان پہنچانا۔	عام عوام کے استعمال کے ذرائع پانی کی پائپ ٹیلیفون لائن بجلی کے پول بچانا لازم ہے اگر تبدیل کرنا ہو تو وہاں موجود آبادی کے مشورے سے کام کیا جائے۔	کنٹریکٹ میں ان باتوں کا تعین کرنا اور اس کی نگرانی کرنا۔	ٹھیکیدار ، کنسلٹنٹ	محکمہ ماحولیات
منصوبہ کی تکمیل کے بعد چلنے کی حالت میں				
تیز ڈھلوانی علاقے میں زمین کا کٹاؤ اور سبزیت کا کم ہو جانا۔	- درختوں اور دیگر پودہ جات کی مکمل حفاظت کرنا، تمام پراجیکٹ کی جگہوں میں نئے پودے لگانا۔	صوبے کے محکمہ جنگلات کے تعاون سے۔	این۔ٹی۔ڈی۔سی	این۔ٹی۔ڈی۔سی

ANNEXURE-VII

ARCHAEOLOGICAL CHANCE FIND PROCEDURES

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Background

The purpose of this document is to address the possibility of archaeological deposits becoming exposed during ground altering activities within the project area and to provide protocols to follow in the case of a chance archaeological find to ensure that archaeological sites are documented and protected as required.

The Antiquities Act, 1975, protects archaeological sites, whether on Government owned or private land. They are non-renewable, very susceptible to disturbance and are finite in number. Archaeological sites are an important resource that is protected for their historical, cultural, scientific and educational value to the general public and local communities. Impacts to archaeological sites must be avoided or managed by development proponents. The objectives of this 'Archaeological Chance Find Procedure' are to promote preservation of archaeological data while minimizing disruption of construction scheduling. It is recommended that due to the moderate archaeological potential of some areas within the project area, all on site personnel and contractors be informed of the Archaeological Chance Find Procedure and have access to a copy while on site.

Potential Impacts to Archaeological Sites

Developments that involve excavation, movement, or disturbance of soils have the potential to impact archaeological materials, if present. Activities such as road construction, land clearing, and excavation are all examples of activities that may adversely affect archaeological deposits.

Relevant Legislation

It ensures the protection, preservation, development and maintenance of antiquities in the entire country. The Act defines "antiquities" as ancient products of human activity, historical sites, or sites of anthropological or cultural interest, national monuments, etc. The Act is designed to protect these antiquities from destruction, theft, negligence, unlawful excavation, trade, and export. The law prohibits new construction in the proximity of a protected antiquity and empowers the Govt of Punjab to prohibit excavation in any area that may contain articles of archaeological significance. Under the Act, the subproject proponents are obligated to ensure that no activity is undertaken in the proximity of a protected antiquity, report to the Department of Archaeology, GoP, any archaeological discovery made during the course of the project.

Remedies and Penalties

The Antiquities Act, 1975 provides for heritage inspection or investigation orders, temporary

protection orders, civil remedies and penalties to limit contraventions. These powers provide:

‘’A contravention of any provision of this Act or the rules shall, where no punishment has been specifically provided be punishable with rigorous imprisonment for a term which may extend to two years, or with fine up to rupees ten hundred thousand, or with both. ‘’

Archaeological ‘Chance Find’ Procedure

If you believe that you may have encountered any archaeological materials, stop work in the area and follow the procedure below.

The following ‘chance-find’ principles will be implemented by the contractor throughout the construction works to account for any undiscovered items identified during construction works:

(i) Workers will be trained in the location of heritage zones within the construction area and in the identification of potential items of heritage significance.

(ii) Should any potential items be located, the site supervisor will be immediately contacted and work will be temporarily stopped in that area.

(iii) If the site supervisor determines that the item is of potential significance, an officer from the department of Archaeology (DoA), GoP will be invited to inspect the site and work will be stopped until DoA has responded to this invitation.

(iv) Work will not re-commence in this location until agreement has been reached between DoA and NTDC as to any required mitigation measures, which may include excavation and recovery of the item.

(v) A precautionary approach will be adopted in the application of these procedures.

Detailed Procedural Steps

- If the Director, department of Archaeology receives any information or otherwise has the knowledge of the discovery or existence of an antiquity of which there is no owner, he shall, after satisfying himself as to the correctness of the information or knowledge, take such steps with the approval of the Government, as he may consider necessary for the custody, preservation and protection of the antiquity.
- Whoever discovers, or finds accidentally, any movable antiquity shall inform forth with the Directorate within seven days of its being discovered or found.
- If, within seven days of his being informed, the Director decides to take over the antiquity for purposes of custody, preservation and protection, the person discovering or finding it shall hand it over to the Director or a person authorized by him in writing.

- Where the Director decides to take over an antiquity, he may pay to the person by whom it is handed over to him such cash reward as may be decided in consultation with the Advisory Committee.
- If any person, who discovers or finds any movable antiquity contravenes the provisions of the Act, he shall be punishable with imprisonment for a term which may extend to five (05) years, or with fine not less than fifteen hundred thousand rupees or with both and the Court convicting such person shall direct that the antiquity in respect of which such contravention has taken place shall stand forfeited to Government.
- The Director or any officer authorized by him with police assistance may, after giving reasonable notice, enter into, inspect and examine any premises, place or area which or the sub-soil of which he may have reason to believe to be, or to contain an antiquity and may cause any site, building, object or any antiquity or the remains of any antiquity in such premises, place or area to be photographed, copied or reproduced by any process suitable for the purpose.
- The owner or occupier of the premises, place or area shall afford all reasonable opportunity and assistance to the Director.
- No photograph, copy of reproduction taken or made shall be sold or offered for sale except by or with the consent of the owner of the object of which the photograph, copy or the reproduction has been taken or made.
- Where substantial damage is caused to any property as a result of the inspection, the Director shall pay to the owner thereof reasonable compensation for the damage in consultation with the Advisory Committee.
- If the Director after conducting an inquiry, has reasonable grounds to believe that any land contains any antiquity, he may approach the Government to direct the Revenue Department to acquire such land or any part thereof and the Revenue Department shall thereupon acquire such land or part under the Land Acquisition Act, 1894 (I of 1894), as for a public purpose.