Initial Environmental Examination

July 2017

Islamic Republic of Pakistan: Proposed Multitranche Financing Facility II (MFF II) Second Power Transmission Enhancement Investment Program (Tranche 2)

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

This is an updated version of the draft originally posted in June 2017 available on https://www.adb.org/projects/documents/pak-48078-004-iee

Initial Environmental Examination

Sub-Project 1: Construction of 220 kV Mirpur Khas Sub-station with associated Transmission Lines

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Prepared by National Transmission & Despatch Company Limited (NTDC)
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CURRENCY EQUIVALENTS

As of 28th July 2017
Currency Unit – Pak Rupees (PKR)
Pak Rs 1.00 = $ 0.009
US$1.00 = PKR 105

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
ACGIH	American Government Individual Hygienist
ANSI	American National Standards Institute
AOI	Area of Influence
BEIS	Biological Exposure Indices
BOQ	Bill of Quantities
CLL	Concurrent Legislative List
CO	Carbon Monoxide
COI	Corridor of Impacts
EA	Executing Agency
EC	Electrical Conductivity
EHS	Environment & Health Guidelines
EHV	Extra High Voltage
EIA	Environmental Impacts Assessment
EMF	Electric and Magnetic Field
EMMP	Environmental Management & Monitoring Plan
EMU	Environmental Management Unit
EPA	Environmental Protection Agency
ESIC	Environment and Social Impacts Cell
ft	feet
GHGs	Green House Gases

GOP	Government of Pakistan
GRM	Grievance Redress Mechanism
GSO	Grid Station Operation
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IEE	Initial Environmental Examination
IPIECA	International Petroleum Industry Conservation Associates
km	Kilo Meter
MFF	Multi tranche Finance Facility
NCS	National Conservation Strategy
NEP	National Environmental Policy
NEPRA	National Electric Power Regulatory Authority
NEQS	National Environmental Quality Standards
NESC	National Electrical Safety Code
NGOs	Non-Government Organizations
NOC	No Objection Certificate
NTDC	National Transmission and Despatch Company
Ops	Operational Policies
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated Biphenyl
PEL	Permissible Exposure Limit
PEPA	Pakistan Environmental Protection Act
PMU	Project Management Unit
PPEs	Personal Protective Equipment's
RE	Resident Engineer
REA	Rapid Environmental Assessment
RoW	Right of Way
SOP	Standard Operating Procedure/Practices
SPS	Safeguard Policy Statement
TL	Transmission Line
TLC	Transmission Line Construction
TLV	Threshold Limit Value
TOR	Terms of Reference
TPS	Thermal Power Station
UNDP	United Nations Development Program
WAPDA	Water and Power Development Authority
WMP	Waste Management Plan

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Executive Summary

Introduction

1. This document is the Initial Environmental Examination (IEE) for the proposed sub-project which consists of the following sub-components:

   - **Sub-component 1:** 2x220/132kV 250MVA transformers with allied equipment at Mirpur Khas S/S
   - **Sub-component 2:** Extension of two line bays at 220 kV Hala Road S/S
   - **Sub-component 3:** In/Out of D/C T/L Hala Road - Jamshoro at Mirpur Khas (70km)
   - **Sub-component 4:** D/C T/L T.M.Khan - Hala Road (10 km)

2. The Power Transmission Enhancement MFF loan has to be approved by ADB and the sub-project under consideration falls under tranche 2 of the MFF- II. ADB will fund the design, civil works and procurement of equipment. The PC-1 has been approved and detailed designs are being prepared.

Legislative and Regulatory Requirements

3. This sub-project will comply with ADB Safeguard policy, 2009, the national legislation relating with the environment in Pakistan, and other international protocols and obligations. The national legislation relating to the environment in Pakistan in order to obtain the required regulatory clearances is as follows:

   - ADB's Environmental Safeguard Policy Guidelines, 2009, describes ADB's policies and procedures for any project funded by ADB.
   - The Pakistan National Conservation Strategy (NCS), which outlines the country's primary approach towards encouraging sustainable development, conserving natural resources and improving efficiency in the use and management of resources.
   - Sindh Environment Protection Act 2014, which empowers the Pak-EPA to delegate powers to the Provincial EPAs, identifies categories of projects to which the IEE/EIA provisions will apply, develop guidelines for conducting IEE and EIAs and procedures for their submission, review and approval, develop environmental emission standards for parameters such as air, water and noise etc.
   - The National Environmental Quality Standards (NEQS), 2010 specify the maximum allowable concentrations of pollutants in municipal and liquid industrial effluents, maximum allowable concentration of pollutants in gaseous emissions from industrial sources etc.
   - The other provincial and departmental applicable laws and regulations. The Telegraphy Act, 1910 makes a provision of installing poles/towers without acquiring any land, Provincial Wildlife (Protection, Preservation, Conservation and Management) Acts, Ordinances and Rules (Act, 1972), Antiquities Act, 1975, Provincial local Government Ordinances, 2001 etc.

Project Description

4. The sub-project sub-components 1 and 3 are located in the districts of Hyderabad, Tendo Allahyar and Mirpur Khas in Sindh province. The sub-components 2 and 4 are located in Hyderabad district and pass through 8 villages and city area along the Rahoki distributary. The main objective of the sub-project is to enhance the transmission capacity of NTDC system to meet the growing power demand of HESCO.

5. The layout plan of the substation, which involves various installations of equipment, control room and ancillary facilities are standardized by NTDC. 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 the existing as well as proposed Grid stations and transmission lines.

Description of Environment

6. Environmental and social data was collected in the field through detailed field visits. Based on the collected information, an environmental profile containing physical, ecological and socio-economic parameters were developed.

7. The major settlements across the T/L route for sub-component 3, from west to east, are Mirani Goth Tando Hyder, Detha, Mori Manger, Tando Qaiser, Tando Jam, Goth Roze-u-Din-Mari, Haji Sono Khan Lashani, Bukera Sharif, Tando Allahyar, Kaamaro Sharif, Sultanabad and Mirpur Khas.

8. In the case of sub-component 4, the T/L route at the start passes along the Rahoki distributary and some populated areas of Hyderabad city. The remaining part of the T/L passes through agricultural land of the villages of Feroz Harryar, Kaku Machi, Penher, Thohi Panher, Qasim Penher, Sahibdin Halipota, Kathero, Qubba Nabi shah and Rahoki.

9. The districts of Hyderabad, Tendo Allahyar and Mirpur Khas generally have flat topography. Orchards of bananas, date palms, guavas and mangoes were observed. This section is a highly fertile land and has intensive cropping.

10. The months from April to October are hot. However, summer heat is considerably relieved by blowing of south-western breeze from the sea. The rainfall varies from year to year in the monsoon months between July to and September. The winter rains are insignificant. The soils formed here are sandy, silt loam/fine sand and calcareous / fine textured respectively.

11. The proposed route as per Building Code of Pakistan (BCP), 2007 (Seismic Provisions) falls entirely in the zone 2A, which is the region of moderate seismic risk. Hence all the applicable provisions of BCP, Mechanical and Electrical System should be met during the design and construction1 stage for safety against seismic hazards.

12. Groundwater and surface water exist at various locations. Most of the project area is located in fresh groundwater area. However, at certain locations, brackish groundwater also encountered. Irrigation requirements are fulfilled through these resources by installing tube wells, canals and rain (Barani).

13. There are different classes of land use i.e. utilizing the canal water, tube wells and lift pumps, irrigated agricultural land rain fed (Barani) agricultural land and uncultivable land. The project area in is rich in source of irrigation (i.e. canals/minors). The major crops are sugarcane, cotton, rice, banana gardens, wheat and fodder crops.

14. The climax tree species are Capparis, Salvadora, Tamarix, Prosopis and Zizyphus. Mammals found in the project area are mainly jackal (Canis aureus), rabbit (Lepus nigricollis). Porcupine (Hystrix indica) and wild boar (Sus scrofa) are common in the Reptiles include snakes and small sized lizards, which are a common sight in the area. Squirrel (Funambulus layardi) and Mouse (Mus musculus) are the basic rodents found in the project area.

15. There are no wetlands along the entire transmission line route. Thus, there will be no impact on any wetland biodiversity. Fishery activities were neither observed nor reported by the local inhabitants of the project area during field survey. The proposed project route will not pass through or cross any protected area i.e. Game reserves, National parks and/or and Wildlife sanctuaries etc.

16. Socio-economic and demographic characteristics are assessed based on primary and secondary information. Primary data was collected through field surveys and secondary data obtained from relevant publish material such as Census reports of the concerned districts.

Stakeholder Consultations

17. Meetings with Government officials of district Hyderabad and Mirpur Khas: Interactive sessions held with communities located near and around T/L Route and Grid station. This process has been conducted 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.

18. Much of the PC process to date has revolved around concerns for the mitigation of construction impacts and the possible side effects from the proximity of TL. 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.

Impact Assessment

19. During the preparation for the sub-project construction phase, the future contractors must be notified and prepared to co-operate with the executing and implementing agencies, sub-project management, construction 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 or train staff in the management of environmental issues and to audit the effectiveness and review the mitigation measures as the sub-project proceeds.

20. The grid station construction activities will be within the boundary wall. Work on the tower sites could cause some generation of air borne dust, but any nuisance from this is likely to be very localized and temporary. Other project activities, e.g. movement of heavy vehicles on unpaved tracks during the works, could generate considerable dust. Water is available in the study area, although surplus water may not always be available to suppress dust at vulnerable locations in the dry season.

21. Therefore, as a general approach it is recommended that where works are within 25 meters of any residential sensitive receivers, the contractor shall install segregation between the works and the edge of the sensitive receivers. The segregation shall be easily erectable 2.5 m high tarpaulin sheets and designed to retain dust and provide a temporary visual barrier to the works. Where dust is the major consideration, the barrier can take the form of tarpaulins strung between two poles mounted on a concrete base. The major social impacts will include disturbance to accessibility, communicable diseases, and security of public as well as workers. So to resolve the social conflicts, proper mitigation measures have been proposed. In order to mitigate high noise levels, temporary acoustic barriers shall be used, wherever felt necessary.

22. An effort has also been made to assess the environmental and social risks during the construction as well as operation stages. Proper mitigations (where required) have also been proposed.

Project Benefits

23. Along with negative impacts of the sub-project, some major expected positive impacts have also been identified including availability of electricity as per demand, installation of industry, employment opportunities and other linked benefits.

Environmental Management Plan

24. A comprehensive environmental management and monitoring plan (EMMP) has been prepared to effectively manage and monitor the environmental and social impacts of the project. The salient features of EMP are as under:

25. To manage the environmental and social impacts of the sub-project, significant negative impacts and their mitigations have been covered in this section. In order to understand and identify the impacts and to implement their mitigations, a mitigation matrix has been developed as a ready reference for the project proponent and contractor to minimize the negative impacts or to manage activities in such a manner to avoid any adverse negative impact.

Environmental and Social Monitoring Plan

26. Keeping in view the impacts and existing institutional setup of NTDC, an environmental and social management plan has been developed. Environment and Social Impact Cell (ESIC) of NTDC will be responsible for the overall environmental and social issues of the project. Responsibilities have been assigned to each key player of the project including Client, Consultant and Contractor.

Conclusions and Recommendations

27. Based on the preliminary plans, environmental and social field surveys and impact assessment of the proposed sub-project, it may be concluded that there are insignificant, short term and reversible impacts. The major impacts of the sub-project are summarized as follows:

- No acquisition of permanent land will be involved for erection of towers for transmission line as per Telegraphy Act, 1910. However, the payments for the loss of trees and crops will be made as per market rates.
- All the other impacts like soil erosion, soil contamination, water contamination, air pollution, high noise level, etc. are of temporary nature and can be controlled and mitigated.
- It is estimated that the implementation of project activities will involve cutting of about 11,500 forest trees and 1000 fruit trees and this loss of trees will be adequately compensated.
- An amount of PKR 25 million has been estimated for crops compensation for 8,000 acres of affected crops.
- No protected forest area or wildlife sanctuary or any other environmentally sensitive site exists along the sub-project corridor.
- No indigenous people and women headed households have been identified in the sub-project area.
- The other social issues such as safety of general public and workers, security problems, risk of communicable diseases, vector borne diseases etc. are of temporary nature.
- Most of the above impacts are of temporary nature and manageable through good engineering practices and none of these are irreversible.
- A comprehensive EMP has been developed identifying the impacts, mitigation measures, agencies responsible for implementation and monitoring of the proposed

measures. The EMP also describes the environmental and social monitoring responsibilities of ESIC.

- The total estimated cost for the environmental and social management comes to about PKR 7,245,000.

28. In the light of the above discussions, it is concluded that the proposed preliminary sub-project route will not cause any significant impacts on the project area. Thus, an IEE has been conducted which is sufficient and an EIA is not necessary.

1 Introduction

1.1 Overview

29. This document is the Initial Environmental Examination (IEE) for the proposed sub-project which consists of the following sub-components:
    - **Sub-component 1:** 2x220/132kV 250MVA transformers with allied equipment at Mirpur Khas S/S
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30. This IEE was prepared under the Tranche 2 of NTDC Power Transmission Enhancement Investment Program (MFF-II), funded by ADB.

31. NTDC has been nominated by Ministry of Water and Power (MoWP) to act as the Executing Agency (EA) with each Distribution Company (DISCO) being the Implementing Agency (IA) for work in its own area. NTDC's role in the processing and implementation of the investment program is that of a coordinator of such activities as preparation of PC-1s and PFRs, monitoring implementation activities; that includes submission of environmental assessments for all sub-projects in all tranches of the PDEMFF under ADB operating procedures. An IEE has been carried out to fulfill the requirements of ADB Guidelines.

32. This IEE report presents the screening of potential environmental impacts of the proposed project 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.

33. The Power Transmission Enhancement MFF loan has to be approved by ADB and the sub project under consideration falls under tranche 2 of the MFF- II. ADB will fund the design, civil works and procurement of equipment. The PC-1 has been approved and detailed designs are being prepared. The **Figures 1.1,1.2 and 1.3** depict the general locations of the project sites and project view in satellite image respectively.

Figure 1.1: General Location of the Project Site

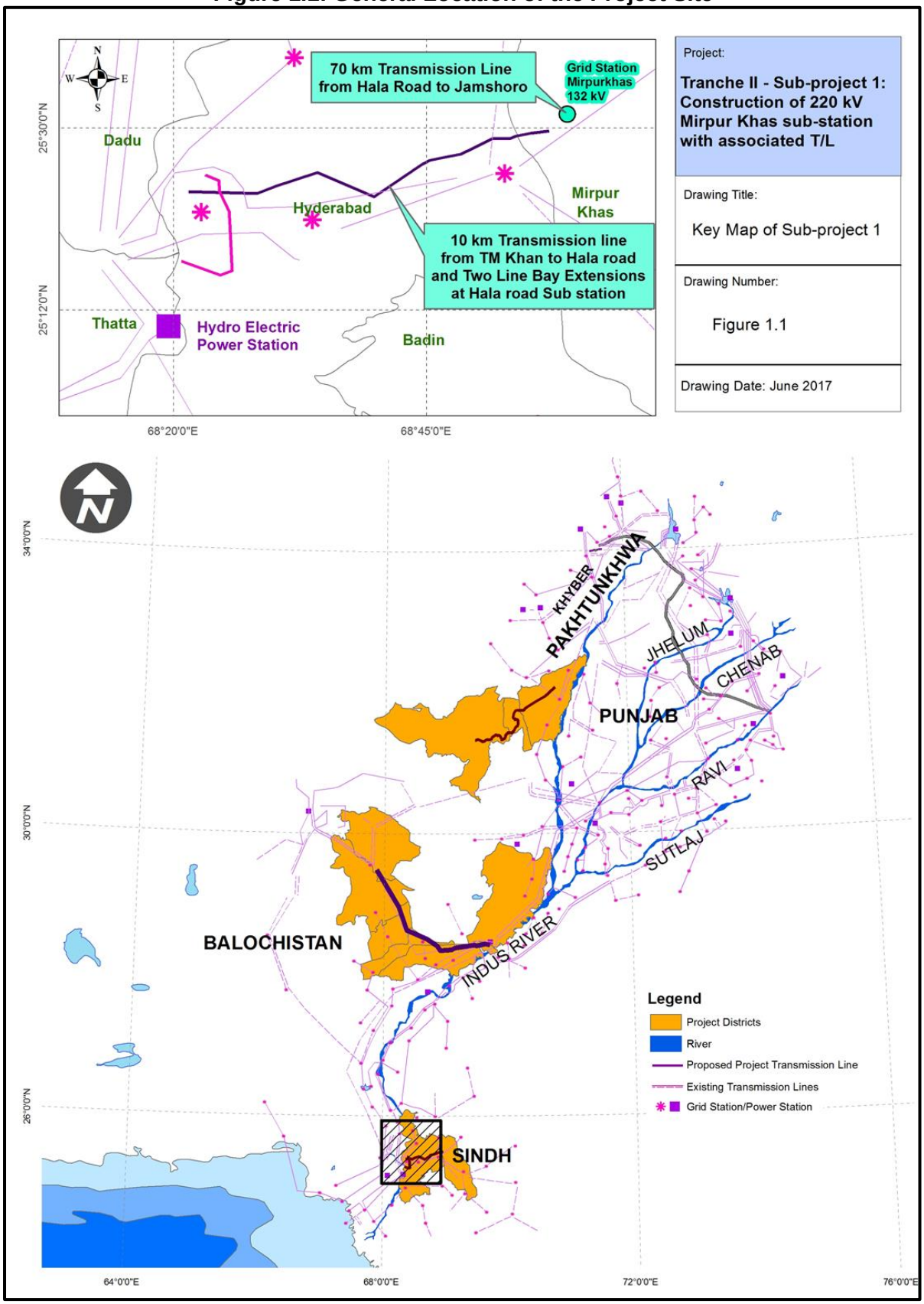


Figure 1.2: Project Area Map - Mirpur Khas G/S & 70 km TL from Hala road to Jamshoro

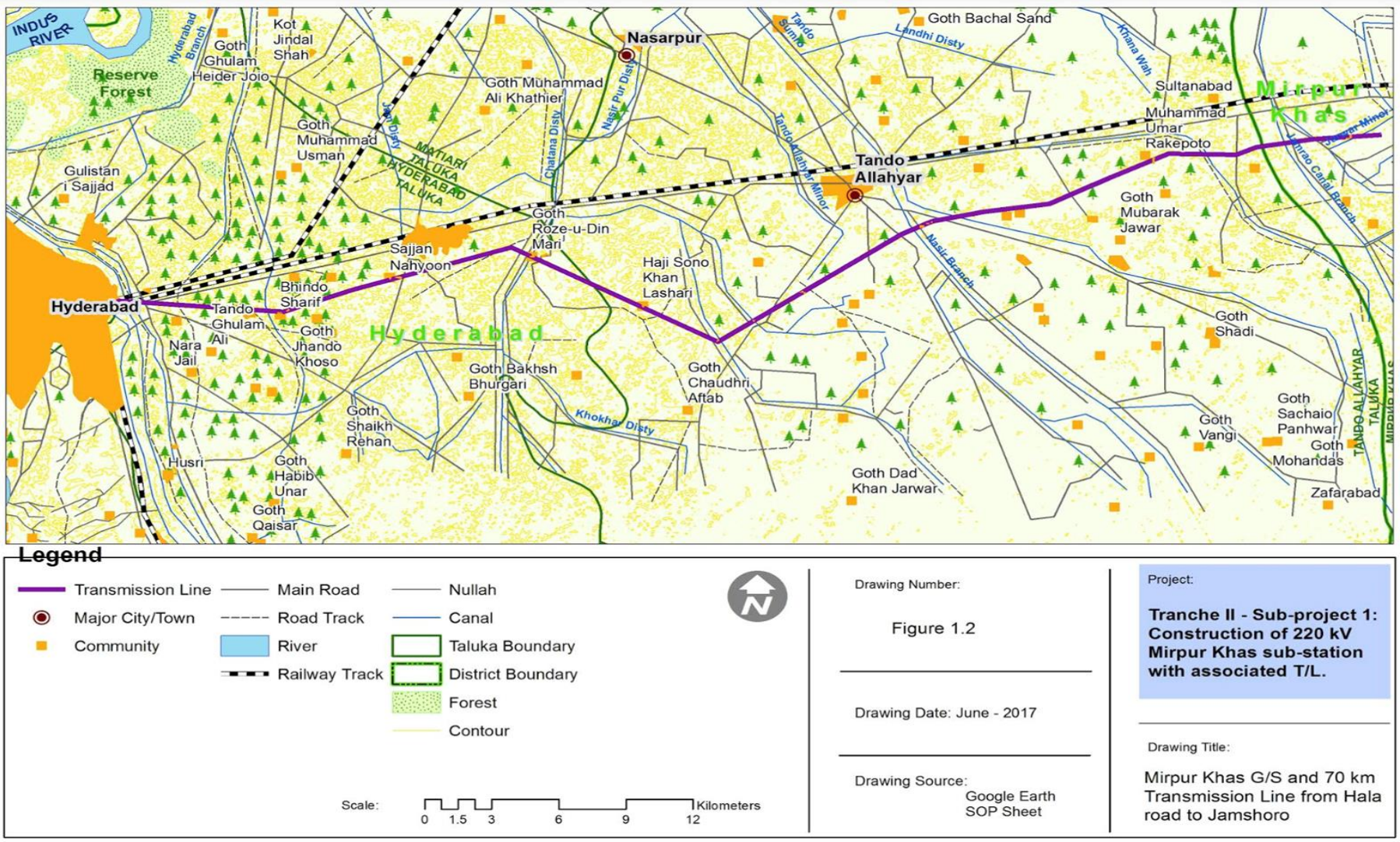
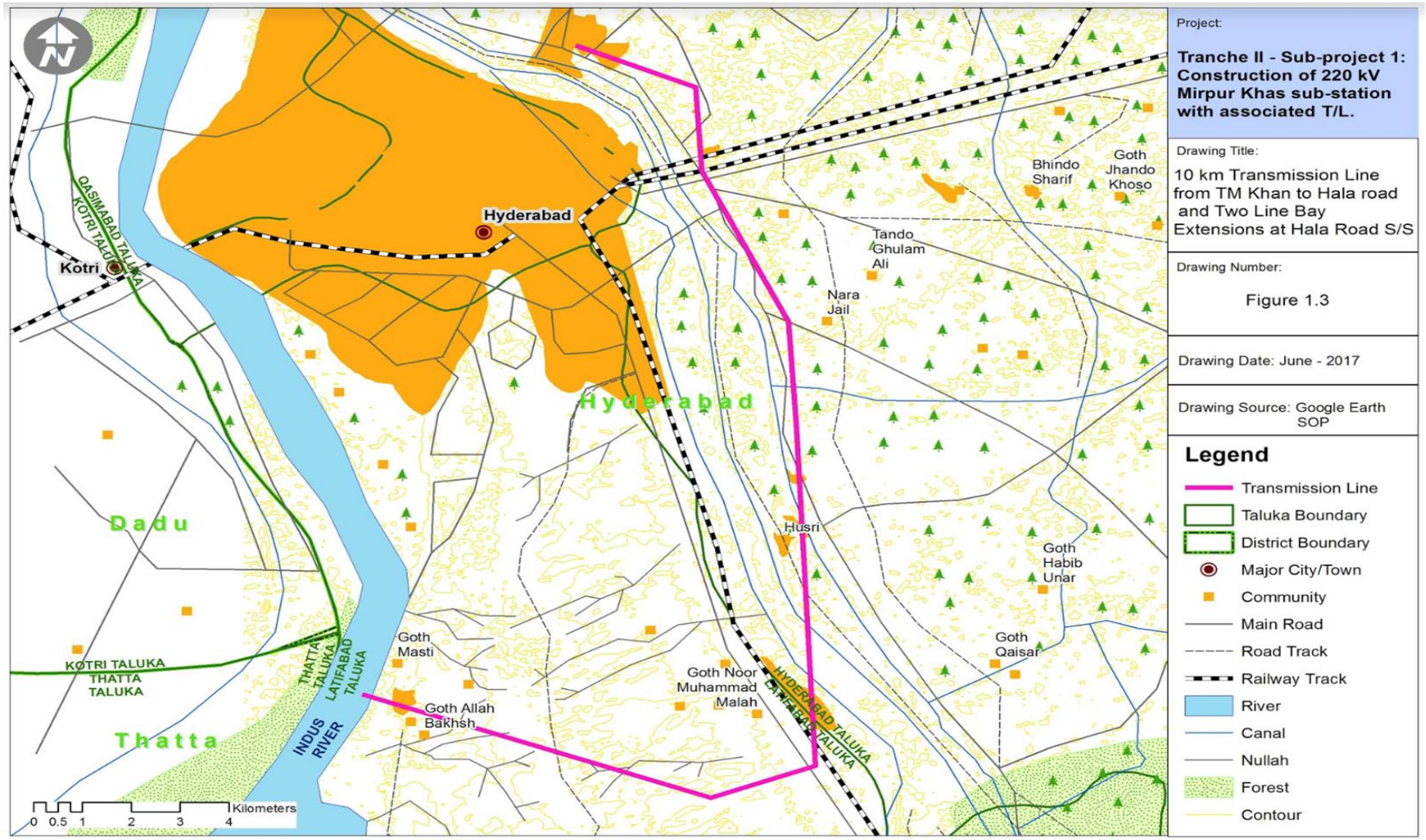


Figure 1.3: Project Area Map - 10 km TL from TM Khan to Hala road & Two Line Bay Extensions at Hala Road S/S



1.2 Environmental Category of the Project

34. According to ADB's Safeguard Policy Statement (SPS) 2009, a Rapid Environmental Assessments (REA) checklist was prepared for the sub-project (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 sub-project falls under Category 'B' of ADB and Schedule-I of Pak-EPA. Thus an IEE has been conducted.

1.3 Scope of IEE Study and Personnel

35. This IEE study has consisted of field reconnaissance for the sub-project with surveys taking place during July and August, 2016. The study area for the sub-project was the immediate environs. The works were identified and the sensitive receivers immediately adjacent to the sub-stations 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 within 30 meters, 15 meters and 100 meters from either side of the transmission line corridor.

36. The study process began with scoping and field reconnaissance during which the REA Checklist was completed to establish the potential impacts and categorization of network enhancement activities. The environmental impacts and concerns requiring further study in the environmental assessment were then identified.

37. The methodology of the IEE was then elaborated in order to address all interests. Subsequently, both primary and secondary baseline environmental data was collected, the intensity and likely location of impacts were identified with relation to the sensitive receivers, based on the work expected to be carried out at each site. The significance of impacts from the power transmission expansion works was assessed and for those impacts requiring mitigation, measures were proposed to reduce impacts to within acceptable limits.

38. The proposed project is classified as category 'B' according to ADB Environment safeguards, after preliminary site investigation and preparation of the REA Checklist. The potential 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. Thus, an initial environmental examination (IEE) has been prepared.

39. The project is proposed to be financed through International Financial Institutions (IFIs), subject to the approval of GoP. Execution of the project will be commenced in the year 2017 and is envisaged to be completed in the year 2018-19.

40. The completion of the proposed project will result in significant improvement in reliability of NTDCL network in HESCO area and will reduce the transmission system losses by 68.8 MW.

1.4 Project Benefits

41. The benefits associated with the proposed sub-project mainly include:

- Improvement in power supply position at/around 220 kV Mirpur Khas.
- Increase in the system capacity to meet future load demand of the area.
- Improvement in voltage profile of existing 132 kV grid station in the vicinity of Mirpur Khas.
- Reduction in transmission system losses.
- Reduction in the loading of 220/132 kV transformers at T.M Khan Road, Halla Road and Jamshoro.
- Elimination of overloading of 132 kV T/Lines from Tando Jam to Tando Alla Yar and from Halla Road to Matiari.
- Improvement in reliability of NTDC and HESCO system networks.
- Overall power supply position In Hyderabad area will be improved.
- The project will help to provide uninterrupted power supply to underdeveloped areas of Sindh province.
- Implementation of the project will help to uplift the social life of the area, creation of new jobs and business opportunities.
- Additional revenues to government exchequer from the levy of taxes on finished goods, electricity duty due to additional sale of power & GST etc.

42. The other benefits of the proposed sub-project are as follows:

- Improvement in reliability of NTDCL and HESCO system networks.
- Increase in the available system capacity to meet future load growth at/around proposed project.
- Serve 220 kV source of power to feed HESCO load center.
- Improvement in power supply position of HESCO.

1.5 Social Benefits

43. Envisaged social benefits of the project are:

- Provision of more reliable supply of electricity to the consumers.
- Fulfillment of power demand for rural electrification program etc.
- Improvement in living standards of the local communities.
- Creation of small business services.

- Creation of new job opportunities for local communities.
- Development of new accommodation facilities and the local people will be exposed to new income generation opportunities.
- Socio economic uplifts of the community such as improved production, incomes and market activities.
- Tube wells electrification which will provide additional water for irrigation, increase cropped areas and also production.
- Development of new industries in the area will create gainful employment to the increasing work force.
- Additional revenues to Government exchequer from the levy of taxes on finished goods, electricity duty due to additional sale of power & GST etc.

44. In the overall analysis, the improvement in ecological environments coupled with higher production is envisaged to bring out substantial economic gains for the people living in the project area.

1.6 Structure of Report

45. This IEE reviews information on existing environmental attributes of 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 subproject. This IEE also proposes various environmental management measures. Details of all background environmental quality, environmental impact/pollutant generating activities, pollution sources, predicted environmental quality and related aspects have been provided in this report. References are presented as footnotes throughout the text. Following this introduction the report follows ADB guidelines and includes:

- Executive Summary
- Introduction
- Policy, Legal and Administrative Framework
- Description of the Project
- Description of Environmental and Social Baseline Conditions
- Assessment of Environmental Impacts and Mitigation Measures
- Information Disclosure, Public Consultation and Participation
- Environmental Management and Monitoring Plan
- Conclusion and Recommendations

2 Policy Legal and Administrative Framework

46. Direct legislation on environmental protection is contained in several statutes, such as the Pakistan Environmental Protection Act (1997) and the Sindh Wildlife Protection Ordinance 1972 (No V). In addition, the Land Acquisition Act (1894) also provides powers in respect to land acquisition for public purposes. The international regulations, particularly compliance with the ADB guidelines is clearly presented in the report. There are also several other items of legislation and regulations that have an indirect bearing on the sub-project or general environmental measures.

2.1 Statutory Framework

47. The Constitution of Pakistan distributes legislative powers between the federal and the provincial governments through two 'lists' attached to the Constitution as Schedules. The Federal List covers the subjects over which the federal government has exclusive legislative power, while the Concurrent list contains subjects regarding which both the federal and provincial governments can enact laws. "Environmental pollution and ecology" is included in the concurrent list; hence both the federal and the provincial governments can enact laws on this subject. However, to date, after the 18th Constitutional Amendment, Federal Ministry of Environment has been dissolved and the provincial governments are authorized to formulate environmental laws and regulations. The key environmental laws affecting this sub-project are discussed below.

2.2 Pakistan Environmental Protection Act, 1997

48. The Pakistan Environmental Protection Act, 1997 is the basic legislative tool empowering the government to frame regulations for the protection of the environment. The act is applicable to a wide range of issues and extends to air, water, soil, marine, noise pollution as well as to the handling of hazardous wastes.

49. The key features of the law that have a direct bearing on the proposed sub-project relate to the requirement for an Initial Environmental Examination (IEE) and Environmental Impact Assessment (EIA) for development sub-projects. Section 12(1) requires that: "No proponent of a subproject shall commence construction or operation unless he has filed with the Federal Agency an Initial Environmental Examination [IEE] or, where the sub-project is likely to cause an adverse environmental effect, an Environmental Impact Assessment [EIA], and has obtained from the Federal Agency approval in respect thereof."

50. The Pakistan Environmental Protection Agency has delegated the power of review and approval of environmental assessments to the provincial environmental protection agencies, in this case the Sindh EPA.

2.3 Sindh Environmental Protection Act (SEPA), 2014

51. The PEPA, 1997 was the core legislation of Pakistan related to Environment. After the approval of the 18th amendment, powers of the Federal EPA has been delegated to provincial EPAs for the conservation and protection of environment. The Sindh Environmental Protection Agency as a part of Sindh Act No. VIII of 2014 prepared Sindh Environmental Protection Act (SEPA), 2014, which was passed by the provincial assembly of Sindh on 24th of February, 2014 and asserted by the Governor of Sindh on 19th of March, 2014 and notified on 20th of March, 2014.

52. It is a fairly comprehensive legislation and provides legislative framework for protection, conservation, rehabilitation and improvement of the environment. It contains concrete action plans and programs for the prevention of pollution and promotes sustainable development.

53. This Act has 11 parts with 37 sections followed by sub-sections and clauses. Part VI is related to the environmental examinations and assessments while part X is related to the public participation.

54. The law stipulates:

- No Proponent of a project shall commence construction or operation unless he has filed with the Government Agency designated by provincial EPAs an IEE/EIA and have obtained an NOC;
- Establishment and formation of the Pakistan Environmental Protection Council;
- Powers and functions of the Federal and Provincial EPA;
- Prohibition of certain discharges or emissions;
- National Environmental Quality Standards (NEQS), for wastewater, air emissions and noise; and
- Law also empowers provincial Government to issue notices and to enforce them for the protection of the environment.

2.3.1 Sindh EPA Regulations, 2014

55. Under Section 37 of the SEPA, 2014 EPA, Sindh has formulated Regulations, 2000 which are approved by the Government. A Project falling under any category specified, in Schedule II, requires the proponent to file an EIA with the Agency to initiate the process of NOC. After the submission of IEE or EIA, the Agency will confirm that the document submitted is complete for the purpose of review.

56. During this time, should the federal agency require the proponent to submit any additional information; the IEE or EIA will be returned to the proponent for revision, clearly listing those aspects that need further discussion. Subsequently, the Agency shall make every effort to complete an IEE/EIA review.

57. As per SEPA, 2014 and Sindh EPA Regulations, 2000, Schedule-II, an EIA study is required for the 11 kV and above T/L. In accordance with the requirements of the TOR, the EIA will include the assessment of T/L route with regard to interference with the protected areas, recommendation of mitigation measures and its cost estimate, review of regulatory measures, development of environmental monitoring and management plans and recommendations to enhance the institutional capability of NTDC. It is also worth mentioning here that the report will be submitted to SEPA.

2.4 Pakistan Environmental Protection Agency Review of IEE and EIA Regulations, 2000

58. The Pakistan Environmental Protection Act, 1997 (PEPA, 1997) provides for two types of environmental assessments: Initial Environmental Examinations (IEE) and Environment Impact Assessments (EIA). EIAs are carried out for sub-projects that have potentially 'significant' environmental impacts, whereas IEEs are conducted for relatively smaller sub-projects with a relatively less significant impact.

59. The Pakistan Environmental Protection Agency Review of IEE and EIA Regulations, 2000 (the 'Regulations'), prepared by the Pak-EPA under the powers conferred upon it by the PEPA, categorizes subprojects for IEE and EIA. Schedules I and II, attached to the regulations, list the sub-projects that require IEE and EIA, respectively.

60. The regulations also provide the necessary details on the preparation, submission, and review of IEEs and EIAs. The following is a brief step-wise description of the approval process:

- A sub-project is categorized as requiring an IEE or EIA using the two schedules attached to the regulations.
- An EIA or IEE is conducted as per the requirement and following the Pak-EPA guidelines.
- The EIA or IEE is submitted to the concerned provincial EPA if it is located in the provinces or the Pak-EPA if it is located in Islamabad and federally administrated areas. The Fee (depending on the cost of the subproject and the type of the report) is submitted along with the document.
- The IEE/EIA is also accompanied by an application in the format prescribed in Schedule IV of the Regulations.
- The EPA conducts a preliminary scrutiny and replies within 10 days of the submittal of a report, a) confirming completeness, or b) asking for additional information, if needed, or c) returning the report requiring additional studies, if necessary.
- The EPA is required to make every effort to complete the IEE and EIA review process within 45 and 90 days, respectively, of the issue of confirmation of completeness.
- Then the EPA accords their approval subject to certain conditions:

- Before commencing construction of the subproject, the proponent is required to submit an undertaking accepting the conditions.
- Before commencing operation of the subproject, the proponent is required to obtain from the EPA a written confirmation of compliance with the approval conditions and requirements of the IEE.
- An EMP is to be submitted with a request for obtaining confirmation of compliance.
- The EPAs are required to issue confirmation of compliance within 15 days of the receipt of request and complete documentation.
- The IEE/EIA approval is valid for three years from the date of accord.
- A monitoring report is to be submitted to the EPA after completion of construction, followed by annual monitoring reports during operation.

61. Distribution lines and grid sub-stations of 11 kV and above are included under energy sub-projects in Schedule II, under which rules EIA is required by GoP. Initial Environmental Examination (IEE) is required for distribution lines and grid stations less than 11 kV and large distribution subprojects (Schedule I). A review of the need for EIA/ IEE submission is therefore required by the relevant EPA.

2.5 National Environmental Quality Standards (NEQS)

62. The National Environmental Quality Standards (NEQS) were first promulgated in 1993 and have been amended in 1995 and 2000. The following standards that are specified in the NEQS may be relevant to this Tranche II sub-project:

- 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 (2 parameters) in gaseous emissions from vehicle exhaust and noise emission from vehicles.

2.6 ADB Policies

ADB's Safeguard Policy Statement (SPS), 2009

63. 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.

64. 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).

65. As a result of the completion of the REA checklist, the sub-project has been classified as Category ‘‘B’’ and thus a detailed and comprehensive IEE study has been prepared including the EMP.

ADB’s Public Communication Policy 2011

66. 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.

ADB’s Accountability Mechanism Policy 2012

67. 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.

2.7 Other Environment Related Legislations

68. 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.
Sindh 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 subproject.
Sindh Cultural Heritage (Preservation) Act, 1994	An Act to preserve and protect ancient places and objects of architectural, historical, archaeological, artistic, ethnological anthropological and national interest in the province of Sindh.
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 forest is situated in the Project area.
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 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.

Legislation/Guideline	Description
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 Conservation	There is a well-established framework for environmental 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 Project.
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.

Legislation/Guideline	Description
Kyoto Protocol/Paris Agreement	SF6 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 SF6 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 SF6 gas in medium and high voltage switchgear.
EMF Exposure limits by IFC for 'general public' and 'occupational exposure'	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.

2.8 Comparison of International and Local Environmental Legislations

69. 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.

70. 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.

71. 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.

72. 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.

73. Implications of national policies and regulations on proposed project

74. 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.

75. 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.

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

77. This IEE study will be submitted to the relevant provincial EPAs for review and any comments in order to receive the respective NOC from each province where the scope of work is to be conducted. Each provincial EPA 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.

78. Each provincial EPA 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.

2.9 Implications of ADB's safeguard policies on proposed project

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

- Avoid adverse impacts of projects on the environment and affected people, where possible;
- Mminimize, 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.

80. 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.

81. 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 2.2** below.

Table 2.2: ADB Policy Principles

No	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

No	Policy principle	Summary
		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.

2.10 EMF Exposure Guidelines

82. 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.

83. However, while the evidence of adverse health risks is weak, it is still sufficient to warrant limited concern. **Table 2.3** 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 2.4** provides the exposure limits for occupational exposure.

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

Table 2.3: 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 2.4: 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 2.5: 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 24 hr	20 ug/m^3 50 ug/m^3	Annual Mean 24 hrs	120 ug/m^3 150 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

85. This Chapter provides an overview of the project including the proposed transmission line, project components, design considerations, construction procedures, operation and maintenance activities. The safety parameters to be followed by NTDC (WAPDA) during the project construction and operation stages.

86. The sub-project is located in the districts of Hyderabad, Tendo Allahyar and Mirpur Khas in Sindh province. The main objective of the sub-project is to enhance the transmission capacity of NTDC system to meet the growing power demand of HESCO.

87. The addition of the project components to the NTDC system is a part of NTDC's overall power development program and is proposed to strengthen the transmission system. In the recent years, there was quantum jump in the power demand as a result of which NTDC systems have come under stress and congestion at various strategic locations. Thereby, the system was stretched beyond capacity and this caused overloading, which resulted in forced outages. This has necessitated that the transmission system be strengthened and expanded to fulfill the need for secure, safe and reliable power supply and to meet not only the existing requirements but also the future demand of the country for sustained economic growth.

3.2 Scope of Work

88. The scope of work of this sub-project consists of the following sub-components:

- **Sub-component 1:** 2x220/132kV 250MVA transformers with allied equipment at Mirpur Khas S/S
- **Sub-component 2:** Extension of two line bays at 220 kV Hala Road S/S
- **Sub-component 3:** In/Out of D/C T/L Hala Road - Jamshoro at Mirpur Khas (70km)
- **Sub-component 4:** D/C T/L T.M.Khan - Hala Road (10 km)

3.3 Sub-Project Alignment

89. The sub-project is on 'Turn-key' basis i.e. construction by a contractor/ developer and turn-over to NTDC in a ready-to-use condition which includes design, supply and installation. In this context, the proposed design provided by NTDC will be finalized by the contractor at the stage of implementation. The Survey & Investigation (S&I) wing of NTDC has marked the route alignment of transmission line on grand trunk sheet (G.T. Sheet). Thus, it is pointed out that although the proposed alignment/ route alignment of transmission line including design and right-of-way was provided by the concerned section of NTDC (i.e. Survey & Investigation), but still this will be finalized by the

contractor/ developer. 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.

90. Under sub-component 3, the transmission line will pass through 16 villages and the Rahoki distributary in Hyderabad district and there will be installation of about 210 towers. Under sub-component 4, the transmission line will pass through 8 villages and there will be installation of about 90 towers. Each tower will be erected at a distance of 335 m as reported by Survey & Investigation Section of NTDC.

3.4 Width of RoW

91. In consultation with the Survey & Investigation section of NTDC and the E&SIC (PMU), NTDC, the width of RoW for T/L considered was 30 m, i.e. 15 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 the Project

92. Categorization is based on the most environmentally sensitive component and this Transmission line sub-project is categorized as a Category “B” sub-project under ADB’s requirements.

93. The aspects of the sub-project with potential for significant environmental impacts need to be assessed in detail and the environmental assessment has therefore focused on significant impacts from the construction aspects as well as consultation with the communities all along the proposed alignment of the transmission line and grid station. This report has also surveyed the transmission line corridor and immediate hinterland that may be affected by knock on effects from impacts such as waste disposal.

3.6 Need for the Project

94. The conditions of the power distribution system in Pakistan are inadequate to meet rapidly growing demand for electrical power. This situation limits national development and economic growth. Electricity demand is expected to grow by 7.80% per annum during the next 10 years.

95. The existing power distribution infrastructure has to be improved and upgraded to ensure a reliable power supply to increasing number of industrial, agricultural, commercial and domestic consumers. 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. Overall, the

proposed MFF facility has been designed to address both investment and institutional aspects in the power sector.

96. As the result of this, enhancement in capacity of NTDC transmission system is required for power evacuation. The proposed sub-project has therefore been prepared to meet the requirement which will also result in overall power efficiency and stability to deliver adequate & quality power to the consumers. The main objective of this sub-project is to enhance the transmission capacity of NTDC system by addition to meet the growing power demand of DISCOs, particularly HESCO. The expected sub-project benefits are as follows:

- Improvement in power supply position at/around 220 kV Mirpur Khas.
- Increase in the system capacity to meet future load demand of the area.
- Improvement in voltage profile of existing 132 kV grid station in the vicinity of Mirpur Khas.
- Reduction in transmission system losses.
- Reduction in the loading of 220/132 kV transformers at T.M Khan Road, Halla Road & Jamshoro.
- Elimination of overloading of 132 kV T/Lines from Tando Jam to T.A Yar & from Halla Road to Matiari.
- Improvement in reliability of NTDC and HESCO system networks.

3.7 Design Aspects

3.7.1 Design Standards for Grid Station & Transmission Line

97. The layout plan of a substation, which involves various installations of equipment, control room and ancillary facilities are standardized by NTDC. 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 the existing as well as proposed Grid stations and transmission lines. The parameters considered for the system and human safety are described below in detail. The interconnection scheme for NTDC existing network (**Figure 3.1**), NTDC planned network (**Figure 3.2**) and schematic diagram of the proposed project (**Figure 3.3**) are provided below.

3.8 Climatic Consideration

98. 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.

- Maximum Temperature 41.5^{o}C

- Minimum Temperature 2.1°C
- Annual Mean temperature 29.6°C (maximum) to 14.6°C (minimum)
- Maximum Rainfall 420 mm/month
- Annual Relative Humidity 60.1%

3.9 Civil Works and Other Facilities

99. Civil works foundations for installation of grid station equipment and erection of towers will be required for construction of 220 kV double circuit transmission line and Grid Station at Mirpur Khas. Necessary provision has been made in the cost estimates accordingly.

3.10 Equipment & Machinery

100. Detail of equipment and machinery required for the different project sub-components is provided as **Tables 3.1** to **3.4** below.

Figure 3.1: Interconnection Schemes of Existing NTDC Network

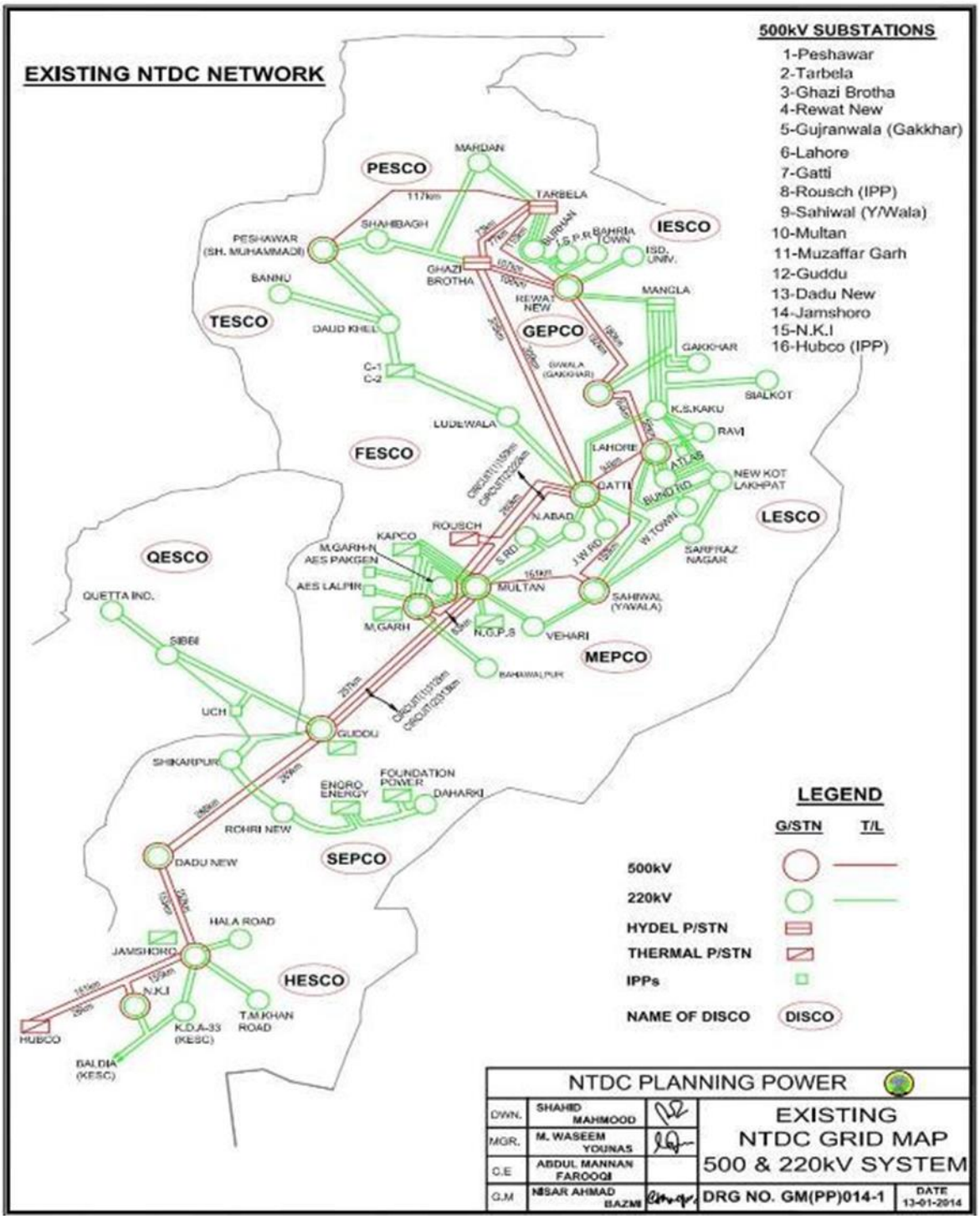


Figure 3.2: Planned NTDC Network

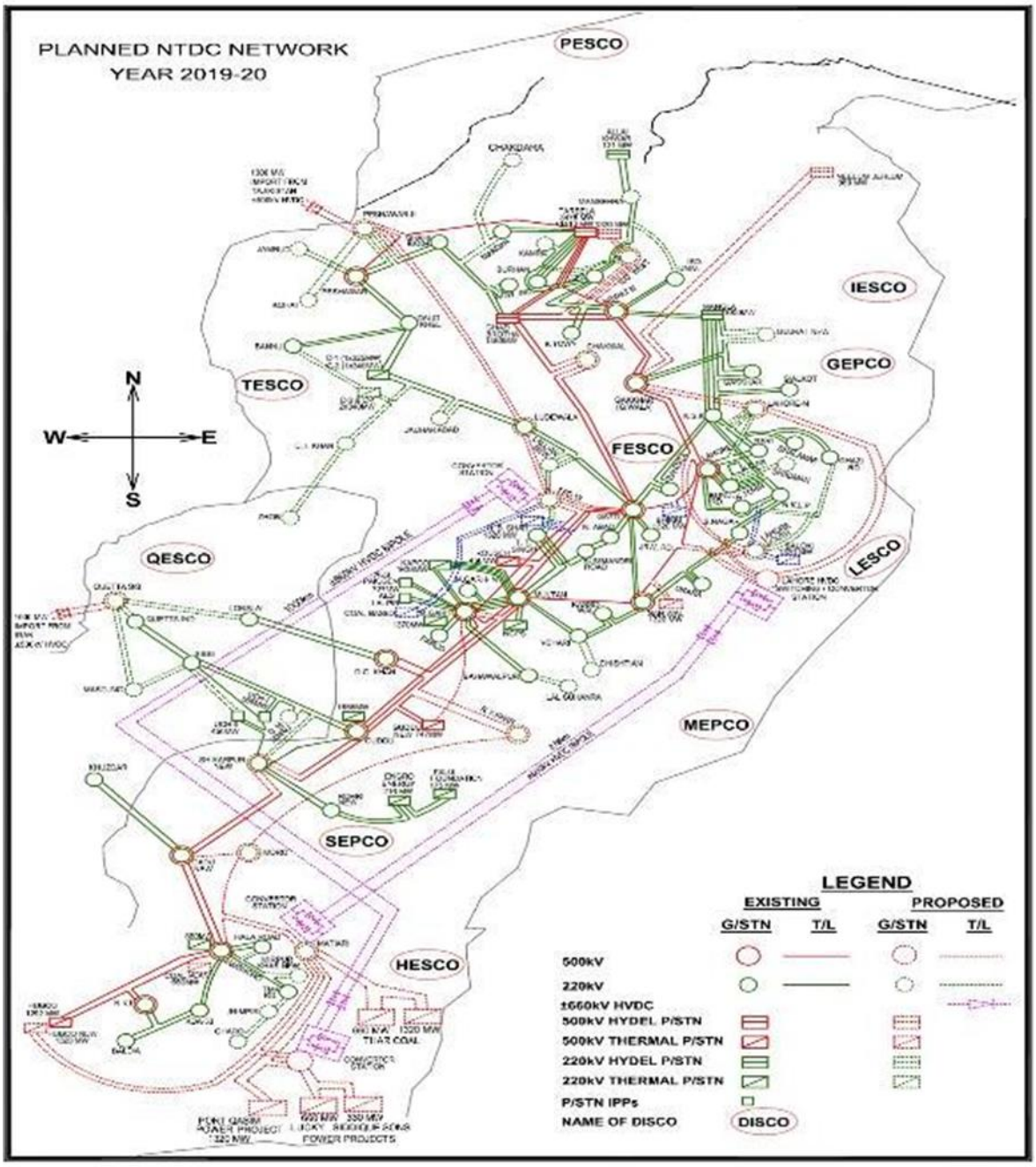


Figure 3.3: Schematic Diagram of Project Network

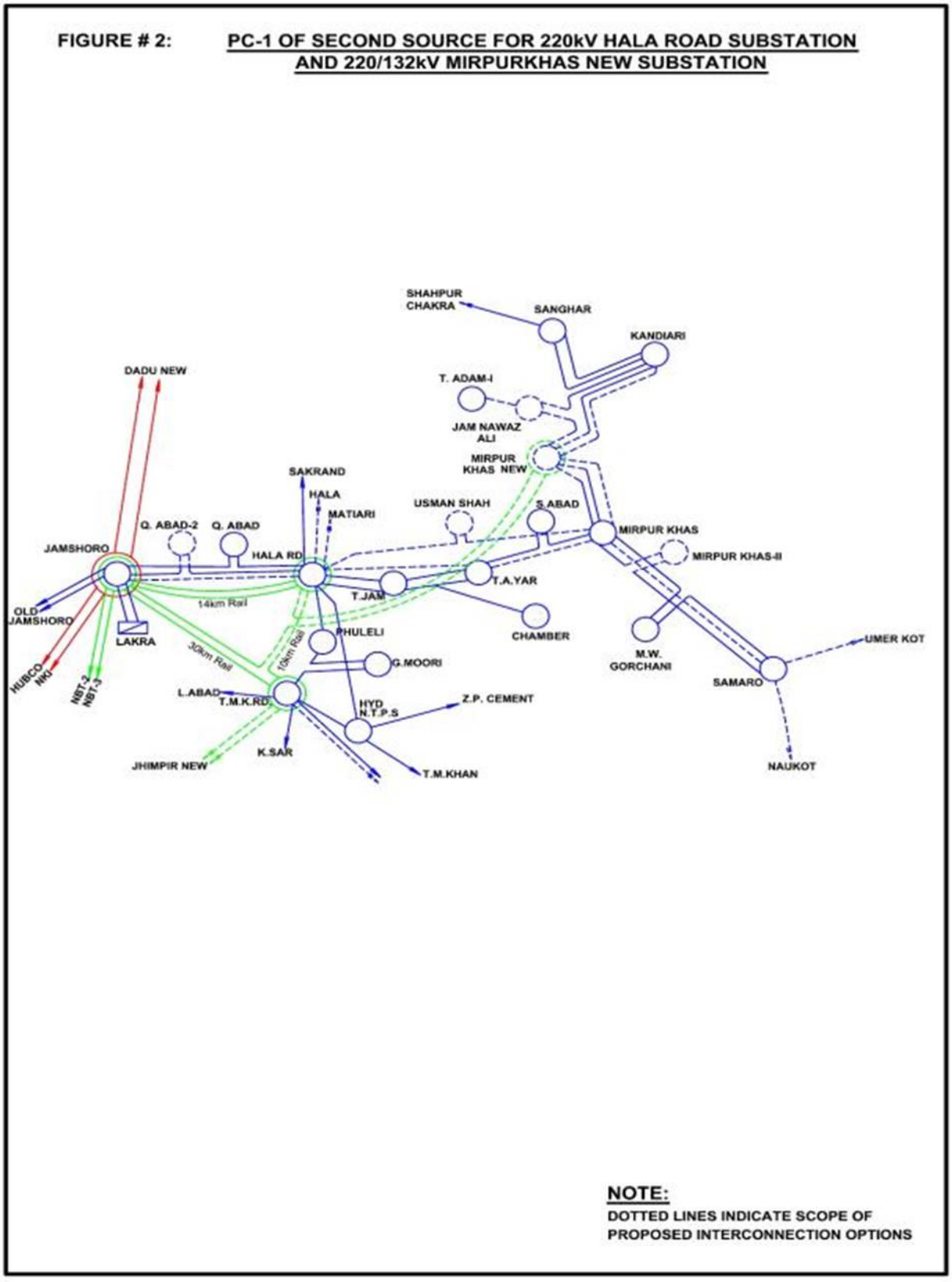


Table 3.1: List of Equipment Required for Extension at 220 kV Hala Road G/S (Sub-component 1)

No.	Item	Unit	Qty.
	220 kV Equipment		
1.	Circuit Breaker	Set	6
2.	Bus Isolator	Set	14
3.	Line Isolator	Set	2
4.	C.T	No.	24
5.	CVT	No.	10
6.	Lightning arrestor	No.	12
7.	Autotransformer 220/132 kV	No.	2
	132 kV Equipment		
1.	Circuit Breaker	Set	10
2.	Bus Isolator	Set	20
3.	Line Isolator	Set	6
4.	C.T	No.	36
5.	P.T	No.	12
6.	Lightning Arrestor	No.	9
7.	Aux. T/F 132/11kV, 6.3 MVA	No.	1

Table 3.2: List of Equipment Required for 220kV D/C T/L (70km) (Sub-component 3)

No.	Item	Unit	Qty.
1.	TOWERS		
	Light angle(DA1)	No.	42
	Heavy angle(DD1)	No.	32
	Suspension(DS1)	No.	138
	Total		**212**
2.	Conductor (Rail)	Km	882
3.	OPGW	Km	74
4.	INSULATORS		
	Suspension 100 kN	No.	13687
	Tension 100 kN	No.	44069
	Total		**57755**
5.	HARDWARE	Lot	1

Table 3.3: List of Equipment Required for 'Extension of Two Line Bays at 220 kV Hala Road S/S' (Sub-component 2)

No.	Item	Unit	Qty.
	220 kV equipment		
1.	Circuit Breaker	Set	3
2.	Bus Isolator	Set	6
3.	Line Isolator	Set	2
4.	C.T	No.	12
5.	CVT	No.	6
6.	Lightning arrestor	No.	6

Table 3.4: List of Equipment Required for 220kV D/C T/L (10 km) (Sub-component 4)

No.	Item	Unit	Qty.
1.	TOWERS		
	Light angle(DA1)	No.	06
	Heavy angle(DD1)	No.	05
	Suspension(DS1)	No.	19
	Total		**30**
2.	Conductor (Rail)	Km	126
4.	OPGW	Km	11
5.	INSULATORS		
	Suspension 100 kN	No.	1890
	Tension 100 kN	No.	6552
	Total		**8442**
6.	HARDWARE	Lot	

3.11 Governance Issues of the Sector Relevant to the Project

101. There is no major governance issue of the sector in execution of the project.

3.12 Tower Structures for Transmission Line

102. 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.

103. The normal foundations (inverted T shaped) as shown in **Figure 3.4** 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 1 to 5 meters wider.

104. 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).

105. 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 3.5 and 3.6** below.

Figure 3.4:Inverted 'T' Type Tower Foundation

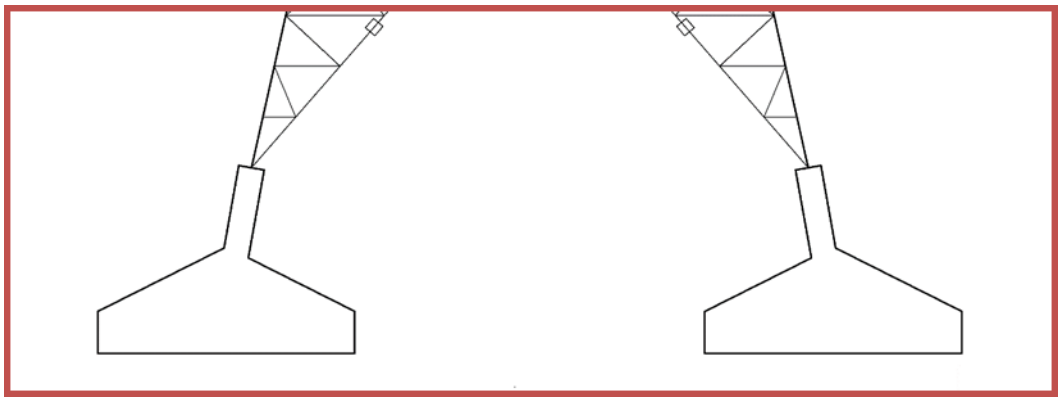


Figure 3.5: Proposed Elevation of Strain Tower

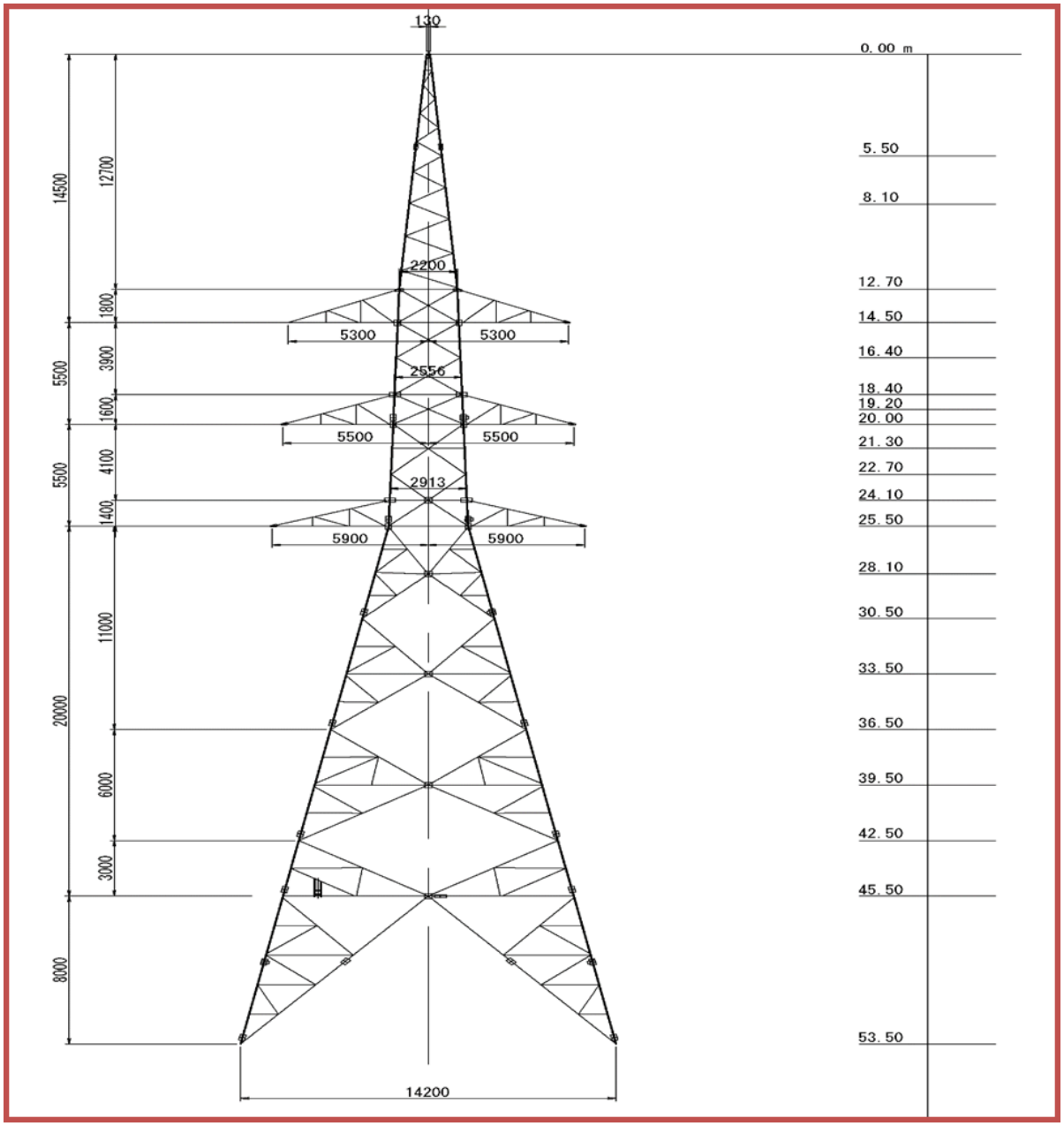
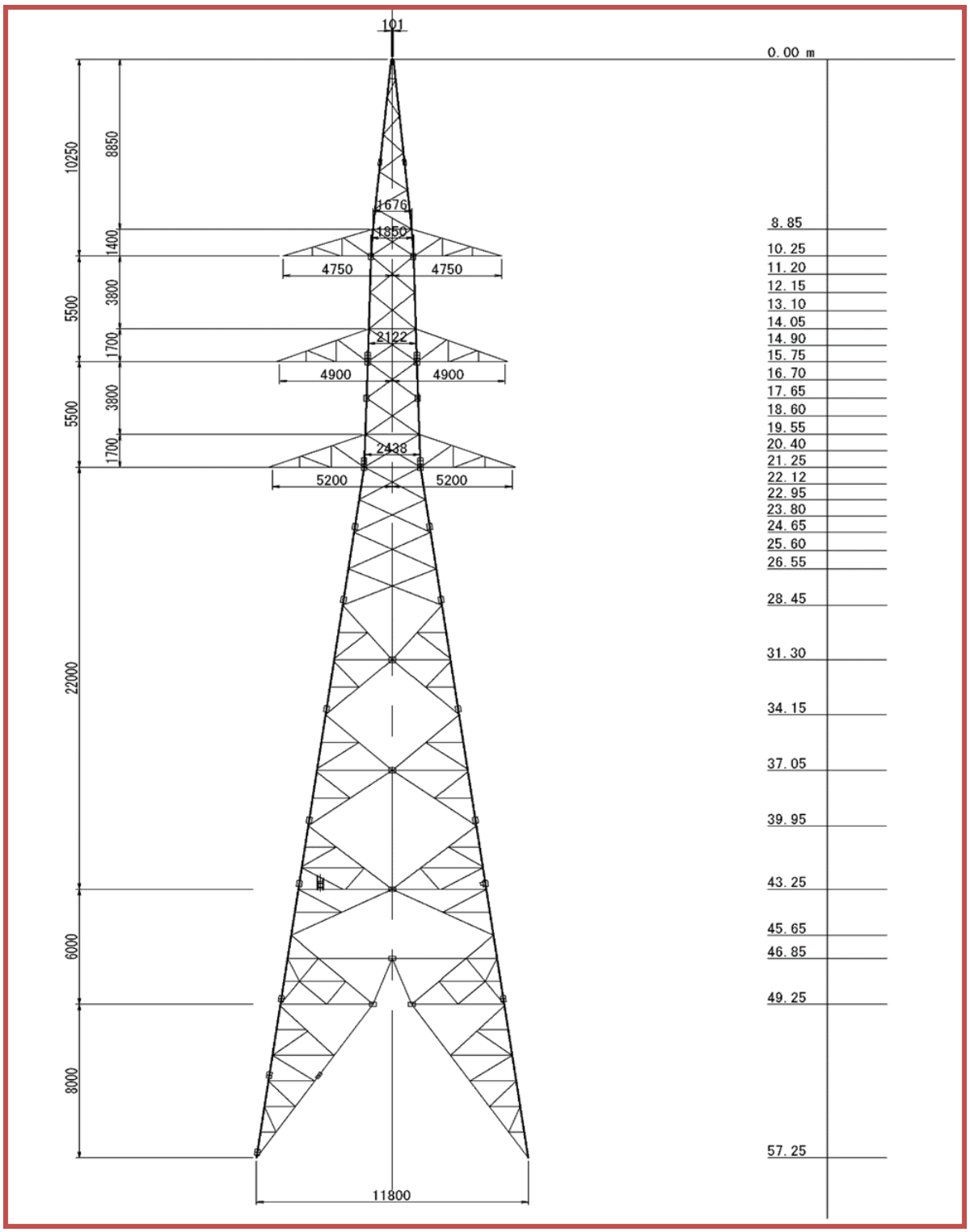


Figure 3.6: Proposed Elevation of Suspension Tower



3.13 Safety Parameters

106. For EHV lines, safety considerations are of two types. One is related with the safety of the system, while others are those that are related to the public. It is for this reason that NTDC (WAPDA) has adopted a 50 m wide (25 m either side from the centerline) corridor as the RoW for the allied 500 KV transmission line and 30 m for 220 KV Transmission line in this Project. The aspects are to be considered in this regard are as under:

3.14 System Safety

- **Conductor to Tower Clearance**: For the 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.
- **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. In order to ensure 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.
- **Lightning Performance**: The tower geometry, 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 level of the area. The accepted level is one trip out/ 100 km/ year due to lightning.
- **Security Arrangements**: Given the prevailing law and order and security position in the area around the proposed project area, necessary armed security staff is necessary. Reinforced security will be required at work base, labor camp, material depot, equipment yard and the locations where work is in progress.
- **Work Uniform and Health and Safety Equipment**: Grid Station and allied transmission line construction is a special 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 one going into the construction area will also wear safety helmet and safety shoes.

Special arrangements must be made for Fire protection by way of providing appropriate type of fire extinguishers with firefighting training to concerned personnel.

3.15 Public Safety

- **General Aspects**: In view of public safety, NTDC has adopted a policy such that, the existing orchards having fruit trees with a height of not exceeding 2.5 m are allowed to remain under the lines. Similarly, open wells, including Persian wheels, are allowed to remain under the transmission lines. However, tube wells and peter pumps are not permitted under the high voltage conductors. This is for the reason that piping and cranes used to refurbish such wells could come in contact with the lines.
- No residential or other public buildings such as factories, schools, hospitals 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.
- **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 Government of Pakistan (GOP) and NTDC practice.

Tower Erection and scale of the project

107. 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 with the tower 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.

108. 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, 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 T.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.

109. 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.

110. The entire project tract is flat and no considerable elevation difference exists except a small depression is present at some locations.

3.16 Analysis of Alternatives

111. This sub-project of Tranche-II of MFF will contribute to the improvement of the overall performance of the power transmission sector, improving transmission efficiency and 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 transmission services. Power users will benefit in terms of secure power and improved power safety and potentially increased productivity.

3.16.1 'Do Nothing' Scenario

112. Based on the available information, the predictions have indicated that without the tranche-II power transmission sub-projects, the supply will not be reliable. This sub-project is a part of an overall strategic improvement for the system.

113. 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.

3.16.2 Alternative Construction Methods

114. The feasibility of development of the 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.

3.16.3 Alternative Geometry

115. The design and route of transmission line is as short as it can be and avoids the local villages by erecting angle towers. The total length of the line route (sub-component 3 and 4) is 80 km and the settlements have been avoided by passing the line through cultivated and semi forested land. Some further detailed surveys may be carried out for the detailed design to determine the exact construction methods and locations, but no land acquisition is envisaged to be involved in this sub-project from private people.

116. The present assumption is that the transmission line will be completed as planned on the defined alignment and site. The detailed design and surveys are yet to be carried out.

3.17 Proposed Schedule for Implementation

117. The Project Proponent (NTDC) plans to have the tranche-II completed within 2 to 3 years, after completing the necessary arrangements. Working on these tasks is on fast track. There will not be any significant land acquisition or compensation process except for the crop compensation of the transmission line towers. Designs, power transmission arrangements, access, review of environmental management and construction processes will need to be completed in the next three months. Once the detailed designs are complete, tendering and award of contract will take place over three to six months. The construction period will follow and best estimates indicate a period of about eighteen months to two years

4 Description of Environment

4.1 General

118. This Chapter describes the environmental baseline condition in the project area. The data is based on the baseline surveys and secondary data such as DCRs, Google satellite imagery. Land use map was prepared based on the collected and available information utilizing Arc GIS and AUTOCAD.

119. Based on the collected information, an environmental profile containing physical, ecological and socio-economic parameters has been developed.

4.2 Physical Environment

120. The following section provides an overview of the information on physical environment of the project area collected from primary as well as secondary sources.

4.2.1 Physiography and Topography

121. The topography in the project area, passing through the districts of Hyderabad, Tendo Allahyar and Mirpur Khas is flat. Orchards of bananas, date palm, guava and mangoes were observed with the project areas being highly fertile land with intensive cropping.

4.2.2 Climate

122. This section presents the climate details of the meteorological gauging stations situated near the T/L with the climate of these districts being extreme. The months from April to October are hot. However, summer heat is considerably relieved by blowing of south-western breeze from the sea. The rainfall varies from year to year in the monsoon months between July to and September. The winter rains are insignificant with an average rainfall is around 230 millimeters. The **Table 4.1** describes the mean daily maximum and minimum temperatures in the summer and winter seasons of the meteorological gauging station.

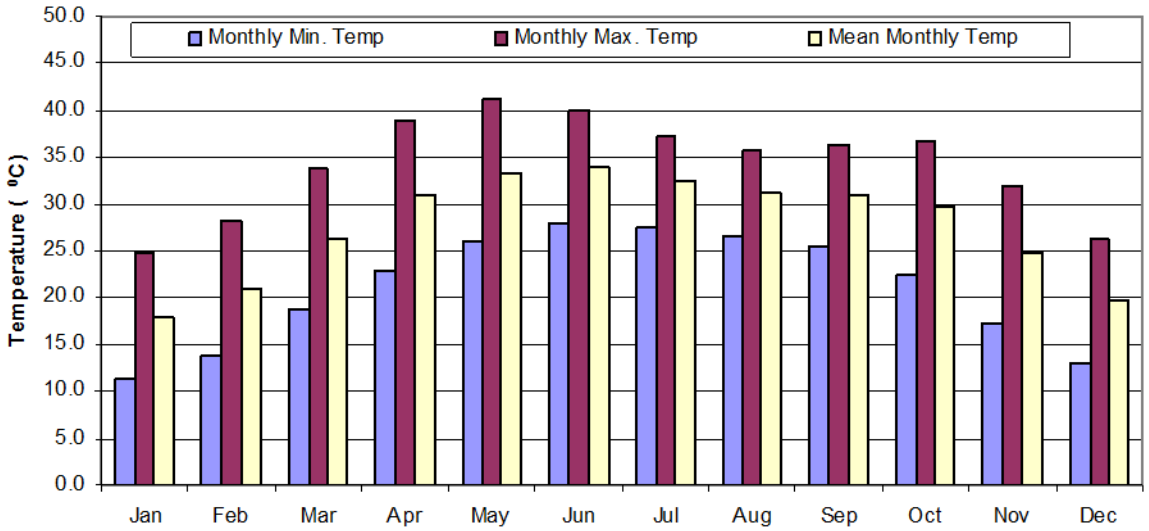
123. Graphical representations of the month wise temperature data of the Hyderabad meteorological gauging station is provided in **Figure 4.1** below.

Table 4.1: Describes the mean daily maximum and minimum temperatures

No.	Meteorological Gauging Station	District	Mean Daily Temperature (Summer) ^{0}C		Mean Daily Temperature (Winter) ^{0}C	
			Minimum	Maximum	Minimum	Maximum
1	Hyderabad	Hyderabad	32.4	34.0	18.0	19.6

No.	Meteorological Gauging Station	District	Mean Daily Temperature (Summer) ^{0}C		Mean Daily Temperature (Winter) ^{0}C	
			Minimum	Maximum	Minimum	Maximum
2	Chhor	Mirpur Khas/ Tendo Allahyar	24.70	37.78	10.91	31.97

Figure 4.1: Mean Monthly Temperature of Hyderabad Meteorological Gauging Station (1981-2010)



124. The relative mean monthly relative humidity over a year for the Meteorological gauging station is presented in **Table 4.2** below.

Table 4.2: Relative Humidity (1981-2010)

Month	Relative Humidity (%)			
	Mirpur Khas/Tendo Allah Yar	Hyderabad		
	Average	00:00 hr	03:00 hr	12:00 hr
January	45.52	24.7	11.4	18.0
February	44.45	28.1	13.9	21.0
March	42.55	33.7	18.8	26.2
April	42.73	38.8	22.8	30.9
May	46.81	41.3	26.1	33.3
June	56.40	40	27.9	34.0
July	67.23	37.2	27.6	32.4
August	70.15	35.6	26.5	31.1
September	64.76	36.3	25.4	31.0

Month	Relative Humidity (%)			
	Mirpur Khas/Tendo Allah Yar	Hyderabad		
	Average	00:00 hr	03:00 hr	12:00 hr
October	50.78	36.7	22.5	29.6
November	44.58	31.9	17.4	24.8
December	46.84	26.2	13.0	19.6

125. The mean monthly rainfall over the year for meteorological gauging stations is provided in **Table 4.3** below.

Table 4.3: Mean Monthly Rainfall (1981-2010)

Month	Mean Monthly Rainfall (mm)	
	Mirpur Khas/Tendo Allah yar	Hyderabad
January	0. 62	1.4
February	1.96	6.8
March	4.55	4.2
April	3.5	7.0
May	2.97	2.8
June	19.74	4.4
July	79.03	47.9
August	74.59	71.8
September	82.95	13.0
October	2.07	5.4
November	3.57	2.2
December	0.90	2.1
Annual	**231.97**	**169.0**

Source *(Pakistan Meteorological Department)*

126. The wind speed data at 3 hourly intervals for meteorological gauging station is provided in **Table 4.4** below.

Table 4.4: Mean Wind Speed at Synoptic Hours (1981-2010)

Month	Wind Speed (knots)		
	Hyderabad		
	00:00 hr	03:00 hr	12:00 hr
January	4.8	4.7	7.1
February	4.7	4.8	7.3
March	5.2	5.1	8.1
April	7.4	7.4	11.0
May	10.7	11.7	15.3
June	12.1	13.7	15.2
July	12.7	13.9	16.3
August	12.0	12.3	14.6
September	9.3	9.9	12.9
October	5.0	5.0	8.0
November	4.2	4.1	5.9
December	4.4	4.5	6.4

Source: (*Pakistan Meteorological Department)*

4.2.3 Soil

127. The soil is dependent on the geology of the area as the route of the proposed sub-project passes from various topographical locations such as desert and plain green fields. Soil of the desert area is composed of sand with no moisture and organic content having light brown appearance. The soils of the arid zone are generally sandy to sandy-loam in texture. The consistency and depth vary according to the topographical features. The low-lying loams are heavier and may have a hard pan. Some of these soils contain a high percentage of soluble salts in the lower horizons, turning water in the wells to brackish.

128. The soils formed here are sandy, silt loam/fine sand and calcareous / fine textured respectively. The soils are calcareous alluvial loam fine to medium textured homogenized and well drained. These are highly fertile and productive. Moisture content in the soils is very high. The soil falls in erinaceous zone. Suitability criteria of the soils for the construction of the grid station and T/L are provided below.

129. These include composition, structure, texture and susceptibility to frost, shrinkage, swell potential, permeability drainage, depth of water table, moisture and bearing capacity. Corrosiveness, sulphate content, electrical conductivity and salinity/alkalinity

are the common parameters considered for determination of soil suitability for the construction of towers and transmission lines.

4.2.4 Seismology

130. On the basis of Peak Ground Acceleration (PGA) values obtained through Probabilistic Seismic Hazard Assessment (PSHA), Pakistan is divided into five (05) seismic zones in line with the UBC (1997). The boundaries of these zones are defined on the basis as shown in **Table 4.5** below.

Table 4.5: Values of Seismic Zones of Pakistan

Sr. No.	Zone	PGA (g)
1	1	0.05 to 0.08
2	2A	0.08 to 0.16
3	2B	0.16 to 0.24
4	3	0.24 to 0.32
5	4	> 0.32 g

131. The proposed route as per Building Code of Pakistan (BCP), 2007 (Seismic Provisions) falls entirely in the zone 2A, which is the region of moderate seismic risk. Hence, all the applicable provisions of BCP, Mechanical and Electrical System should be met during the design and construction[2] for safety against seismic hazards.

4.2.5 Geology

132. The proposed T/L route passes the lower Indus basin and desert plain in the southern area of Pakistan.

4.2.5.1 Tectonics

133. Pakistan geologically overlaps both with the Indian and the Eurasian tectonic plates where its Sindh and Punjab provinces lie on the north-western corner of the Indian plate, while Balochistan and most of the Khyber-Pakhtunkhwa lie within the Eurasian plate which mainly comprises the Iranian plateau, some parts of the Middle East and Central Asia.

4.2.5.2 Geomorphology

134. The alluvial deposits along the proposed T/L are mainly from the Indus river. These alluvial landforms are distributed in an orderly pattern in relation to the amount of the deposits in the river. The Indus has flown through a broad track of active flood plain.

Building Code of Pakistan (Seismic Provisions – 2007), Ministry of Housing and Works

Flanking this landform and lying parallel to it are broad almost unbroken belts of meander flood plains. These have a general level somewhat higher than that of the river.

4.2.5.3 Alluvial Deposits

135. The proposed T/L will starts from Matiari district. The area comprises of stream and meander bed deposits consisting of unconsolidated silty sand/sandy silt intervened by levelled flood plains formed by the river Indus. The depth of such deposits may vary up to several hundreds of meter and belongs to Pleistocene to Recent age.

4.2.5.4 Alluvial and Eolian Sand Deposits

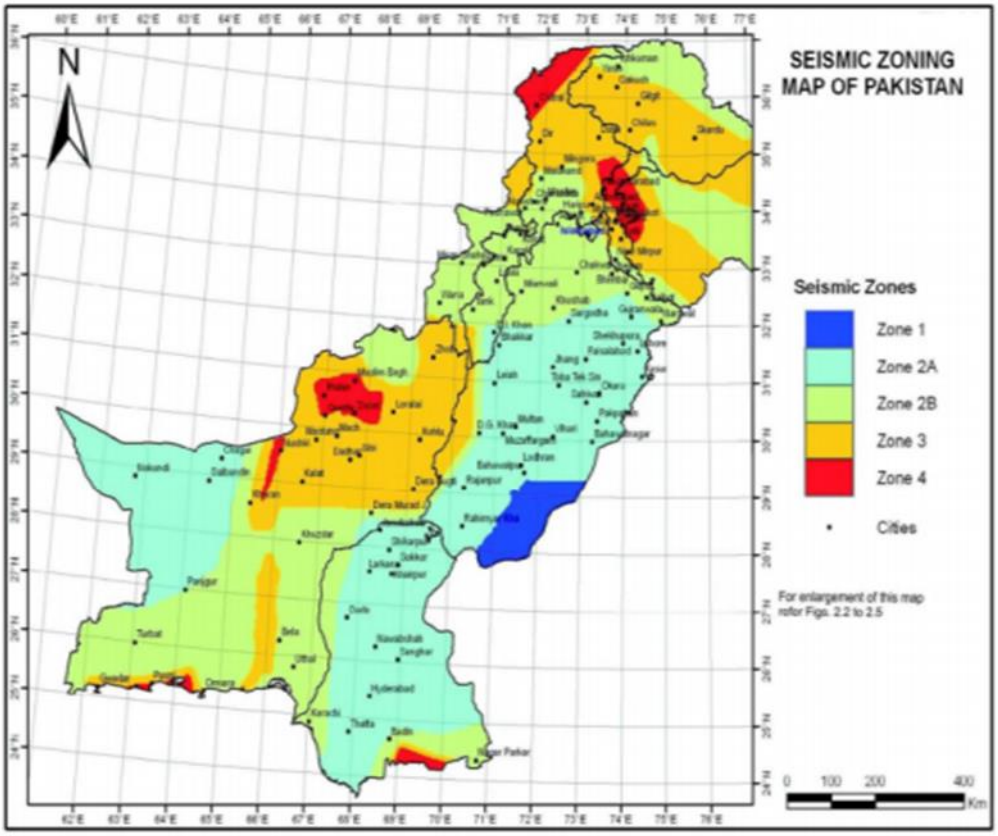
136. The area consists of Alluvial and Eolian deposits. The alluvial deposits consists of stream bed and meander belts deposits of Indus river, which on a later stage were transported by the wind action, forming low relief sand dunes.

4.2.5.5 Eolian Sand and Longitudinal Sand Dune Deposits

137. These are the loose sand deposited by the extinct streams with sandy silt/ silty sand as the surface layer in certain locations.

4.2.5.6 Eolian Sand Deposits

138. These are the loose sand deposited by the extinct streams with sandy silt as the surface layer in certain locations.



Source: Pakistan Metrological Department

4.2.6 Water Resources

4.2.6.1 Surface Water

139. In the project area, water resources i.e. groundwater and surface water exist at various locations. Surface water canals, streams, drains, rivers are of perennial and non-perennial nature. Most of the project area is located in fresh groundwater area. However, at places, brackish groundwater has also been encountered. Irrigation requirements are fulfilled through these resources by installing tube wells, canals and rain (barani). The branches of Nara canal and Jamarow west branch canal irrigate the area of Hyderabad, Tendo Allahyar and Mirpur Khas,

4.2.6.2 Groundwater

140. Groundwater in the project area is generally fresh and potable near canals and distributaries but at some locations, it is reported as brackish. Settlements in the project area use the groundwater for drinking and irrigation purpose through tube wells and hand pumps. In general, the depth of the ground water varies between 10 to 15 meters.

141. The water table depth decreases as we move away from the main canals. The settlements near the project area utilize the groundwater for drinking purpose through hand pumps and motor pumps. The groundwater is also utilized for irrigation purposes

through the tube wells, especially in the tail areas of the canals (minor), where the water supply through the canal stream is reduced.

4.2.6.3 Land use

142. There are different classes of land use i.e. utilizing the canal water, tube wells and lift pumps, irrigated agricultural land rain fed (barani) agricultural land and uncultivable land. The project area is rich in source of irrigation (i.e. canals/minors). The major crops are sugarcane, cotton, rice, banana gardens, wheat and fodder crops.

4.3 Ecological Environment

4.3.1 Major Habitats and Flora

143. The eco-region of sub-tropical thorn area includes the districts of Hyderabad, Tendo Allahyar and Mirpur Khas. The habitat is mostly modified due to human interventions in the area for many decades. The type of habitat includes low, open and pronouncedly xerophytic species in which thorny leguminous species predominate. It occupies almost whole of the Indus plain except the driest parts. The climax tree species are *Capparis*, *Salvadora, Tamarix, Prosopis* and *Zizyphus*. The soils range from flat alluvial to loams and sandy loams. The climate varies from semi-arid (250 to 750 mm rainfall) to arid (less than 250 mm rainfall). The summer temperature in the tract is as high as 48°C. This tract provides an ideal habitat to the wildlife of the area, which seasonally migrates according to their needs. The common tree species in these areas are listed in **Table 4.6** below.

Table 4.6: Common tree species in project area

Common Name	Scientific Name
Kandi	*Prosopis cineraria*
Kikar	*Acacia nitolica*
San	*Salvadora oleoides*
Khabar	*Salvadora oleoides*
Kander	*Alhaji camelorum*
Khip	*Leptadenia spartum*
Booi	*Aerva javanica*
Akk	*Calatropis procera*
Lai	*Tamarix dioica*
Mallah	*Zizyphus nummularia*

Sehwar	*Rhazia stricta*

144. The common plants are Thuhar (euphorbia caducifolia), phog (calligonum polygonoeides), ak (calotropis gigantea). In irrigated tracts babor/babul (acacia nilotica), talhi (dalkagia sisoo), neem (azatriteha indica) , jar (salvadora oleoides), kri (tamarix gallica) are found.

145. The project area passes through various types of land uses including agriculture, grass land, desert, etc. The major agricultural crops in Sindh province include rice, wheat, cotton, sugarcane, peanut, fodder crop and vegetables. .

4.3.2 Fauna

146. In order to collect baseline data, field survey was conducted in the project area. On-site observation as well as local information was recorded for the fauna species in the area, which is provided below.

4.3.2.1 Mammals

147. Mammals found in the project area are mainly jackal (*Canis aureus*) and rabbit (*Lepus nigricollis*). Porcupine (*Hystrix indica*) and wild boar (*Sus scrofa*) are common in the plains of Sindh. Domestic animals include cows, buffaloes, sheeps, goats, cats and camels. Another important domestic animal of the area is donkey, which is used for cart pulling.

4.3.2.2 Reptiles

148. Reptiles include snakes and small sized lizards, which are a common sight in the area.

4.3.2.3 Rodents

149. Squirrel (*Funambulus layardi*) and Mouse (*Mus musculus*) are the basic rodents found in the project area.

4.3.2.4 Amphibian

150. Toad (*Bufo bufo)* and Frog (*Rana tigrina*) are commonly found in the project area.

4.3.2.5 Avifauna

151. Important resident bird species/avifauna found in the project Area of Sindh are house sparrow (*Passer domesticus*), common crow (*Corvus splendons*), kite (*Elanus caeruleus*), dove (*Streptopelia decaocto*), Hoopoe (*Upupa epops*), Quail (*Cortunix cortunix*) Common Myna (*Acridotheres tristis*), desert lark, cattle egret etc.

152. Avifauna migration is from the lower hills towards the plains during cold winter in search of food and shelter, and from the flood plains towards the dry areas during floods and towards the rivers during the summer drought.

4.3.3 Endangered Fauna

4.3.3.1 Mammals

153. Some mammalian species which were once common in the tract have become extinct or near extinction in the area on account of excessive shooting, hunting and loss of habitat. These include Blue bull, Wolf, Wild boar, Hog dear, Chinkara and Black buck which are critical habitat triggers in the project area, as listed in the IBAT report.

4.3.3.2 Birds

154. Birds like Tilor (*Houbara bustard*), Marbled Teal (*Marmaronetta angustirostris*), Black partridge (*Francolinus francolinus*), Jal Kookri/Coot (*Fulica atra*) and Falcon (*Falco peregrinus*) have been subjected to excessive hunting and catching on account of their good quality and tasty meat or their commercial value as a prey bird, thus falling in the category of Endangered or Vulnerable species.

4.3.4 Wetlands in the Project Area

155. No wetlands which are notified by the GOP lie within the project area of the Project alignment in any Angle Marking of the project. Thus, there will be no impact on any wetland biodiversity.

4.3.5 Game Reserves, National Parks and Wildlife Sanctuaries

156. The proposed project route will not pass through or cross any protected area i.e. Game Reserves, National Parks, and Wildlife Sanctuaries etc. The proposed sub-project, therefore, will not cause any impact on the flora and fauna of the Reserved Forest.

4.3.6 Fisheries

157. Fishery activities were neither observed nor reported by the local inhabitants of the project area during field survey. As such, fishery discipline is conspicuous by its absence in the area; therefore, the project will not pose any threat/impact to the Fishery sector.

4.4 Socio-Economic Environment

158. The components of the human environment described in this section cover the socio-economic characteristics of the population, both provincially and locally in the project area.

4.4.1 Political and Administrative Settings

159. The potential administration system is more or less identical all over the country. Union Council (UC) is the lowest tier of the local government. A sherwan or village council in Pakistan is an elected local government body headed by a Nazim (which is equivalent to a mayor) and a Naib Nazim (Deputy Mayor). Union councils are the fifth tier of government in Pakistan and are often known as "village councils" in rural areas, the territory represented by a village council usually comprises a large village and surrounding areas, often including nearby small villages. The term "union council" may be used for localities that are part of cities.

160. Headed by a union Nazim, each union council has 13 elected members or councilors. In addition to four male and two female members elected directly, there are two male and two female representatives of the labour, a minority member, a union council Nazim and his deputy known as union council Naib Nazim. Beside elected members, there are several government employees and functionaries in every union council, who report to the secretary of the union council. The territory of a union council or village council is usually part of a tehsil (a district subdivision).

161. Taluka/Tehsil Council is the next tier of local government. About 4 to 5 UCs fall in the Taluka/Tehsil Council (TC). Taluka/Tehsil is a sub-unit of the district, which is the highest tier of the local government system, dealing with the administrative matters at district level. In Sindh province, it is called a Taluka Council.

162. A district is composed of 3 to 5 Talukas/Tehsils and is governed by the District Coordination Officer (DCO). The local government system comprises UCs consisting of members directly elected through an open competition, which is also from the Electoral College for the selection of the members for the next higher tier. This reveals that UCs have a sizable representation from the vulnerable groups belonging to the local community including female members. Considering the social, geographical as well as the traditional settings of the area in the project area, the lives of the people in rural areas have “Bradari system”, which determines the socio-economic pattern of the people’s life.

163. Union Council Nazim is responsible to collect and maintain statistical information for socio-economic surveys in the community and to consolidate village and neighborhood development needs and priorities them into union-wide development proposals with the approval of the Union Council and make recommendations thereof to the district government or Tehsil Municipal Administration, as the case may be. Union council nazim also manages O&M of public resources such as drinking water, including wells, water pumps, tanks, ponds and other works for the supply of water. Union council nazim have access to Tehsil Nazim and Tehsil Nazim has access to District Nazim. The district government takes funds from the provincial government and district Nazim allocate funds with the coordination of DCO to tehsil Nazim and tehsil Nazim allocates

funds as per the need of the administrative set up at district, tehsil and Union Council levels.

4.4.2 Approach and Methodology

164. Socio-economic and demographic characteristics are assessed based on primary and secondary information. Primary data was collected through field surveys and secondary data obtained from relevant publish material such as DCRs of relevant districts. To document the socio-economic conditions of the population settled in the COI, socio-economic surveys of the selected households were carried out.

165. One of the major steps after the identification of the villages and their estimated populations during the field visit was the calculation of sample size. For determining the sample size of potential affected persons, the variability or proportion estimated based on the critical parameters under the study is essential to determine a statistically valid and representative sample size from the target population. A representative sample size is also important to derive meaningful results from the information collected in the field consisting of individual interviews, community/ group consultations and village level information.

166. The sample households were selected randomly from different categories of potential affected households, i.e., land owners, tenants, shopkeepers/ businessmen, laborers etc. To ensure the reliability and validity of the information, every head of the household in the COI was considered as a unit of analysis.

4.4.3 Sensitive Receptors

167. The different key receptors observed during the extensive field surveys are provided in **Table 4.7** below.

4.4.4 Demography

168. The baseline conditions, demographic characteristics and socio-economic profile are provided below.

4.4.5 Family / Household Size

169. The highest average household size is 8.5 and the lowest average household size is 5.5. Joint family system is common throughout the project area, whereas only small percentage of families is living as a single family (called nuclear family system). In a few areas, tribal system exists, thus people give preference to live as a joint family. During the discussions with the locals, it was clarified that larger family size is treated as the strength of the family. Based on social survey, overall average household size is concluded as 7, which is higher than DCRs average family size. The higher values of

household size are based as most of the part of the proposed T/L will cross the rural areas, while in DCRs, average household size of the entire district is provided.

4.4.6 Sex Ratio

170. As per socio-economic surveys, the average sex ratio (males per 100 females) was worked out as 114. Majority of the people are employed or doing business in Sukkur, Hyderabad and Karachi cities.

4.4.7 Ethnicity/ Caste Groups

171. The core unit of social organization is the bradari/caste group, which is either defined on the basis of specific occupation or lineage. Occupationally defined caste groups are considered as lower status in the social setup in which they are living. For instance, occupationally defined bradri/caste groups are Mochi (Cobbler), Machi (Fisherman), Nai (Barbar), Gujjar (Dairy and Livestock), Julahay (Weavers) while linage based biraderi/caste groups are Mammon, Halipota, Somoro, Solingi, Thaker, Syed and Panher, Mochi (Cobbler).

172. It is worth mentioning here that the major castes/ tribes were important because they have a key role in decision making regarding the resolution of social issues of family matters. For instance, Landlord (locally named as Vadaira/Raise) and Shah as well as the head/ or elder of the respective tribe generally make decisions related to the social issues at village level as well as the social development works in their areas. It was assessed that prior to the initiation of any project/ program, it is essential to involve these effective groups/ tribes at each stage from design, implementation and operation of the project for the success of the project.

4.4.8 Languages Spoken

173. Sindhi as a mother tongue is spoken in the project area. However, Urdu, Punjabi, Saraiki, Balochi and Pashto are also spoken.

4.4.9 Dwellings

174. Housing condition is also an important parameter for the assessment of the living standard / household well-being of the locals. Information collected from primary as well as secondary sources indicate that settlement pattern of the houses in all the districts of Sindh province is very simple.

175. In the project area, poor people are living in a hut consisting of mud or cattle walls and a roof of thatch with a hedge round it. It consists of living rooms, kitchen, store room, bathroom etc. The houses of Zamindar (Landlord) and well off people are constructed of sun dried bricks with a flat roof. It consists of a living room, with one or two side

rooms, which serves as box-rooms. The houses of the rich people are distinguished by ample accommodation and more grandeur along the same lines. In the big towns such as Hyderabad, Tendo Jam, Tendo Allahyar and Mirpur Khas, houses are usually made of burnt bricks and provided with necessary furniture and other luxury items.

4.4.10 Nature of Tenure

176. As per DCRs, nature of tenure of the houses of the districts shows that the majority of people have their own houses and the only few percent people are living in rented houses. However, during the social survey, it was observed that about 99% respondents had their own houses while the remaining 1% are tenants or laborers who are working as employees under the landlord.

4.4.11 Decision Methods adopted in the Villages of the project area

177. The methods of the decision for social conflicts in the project area are panchayat, court, jirga, caste groups and others (method constituted at the spot considering major and scope of the conflicts). According to the collected information, panchayat is most commonly accepted method of decision in the project area. In the “Panchayat” system, team lead by village leader Vadaira, Raise and religious scholar make decisions based on investigations and witnesses.

4.4.12 Existence of Associations

178. The strong and effective village societies/associations and other community based organizations can play an important role in the designing, implementation and operation of community/social and development projects. Based on the village profile, it was observed that on the whole, there is no single NGO working in the villages of the project area.

4.4.13 Cooking Method

179. As per DCR, different sources are being used for cooking purpose in the project area. Data reveals that majority of people are using locally available wood and animal dung for cooking purpose, while gas is the second highest source for cooking. Compared to wood, only few people use kerosene oil because of high prices of kerosene oil. The rationale to utilize wood for cooking is due to the fact that it is cheap and easily available in rural areas as compared to other methods.

4.4.14 Role of Women

180. The emancipation of women is a campaign to give women equal rights and status with men. The emancipation of women i.e. their liberation from economic and sexual

oppression, their access to higher education and their escape from narrow gender roles is not easily achieved due to tribal setup and remoteness in the area. Rural society of Sindh is dominated by men. Cultural tradition, social practices and low female literacy ratio have left women in a vulnerable position.

181. Women are restricted to performing household work and excluded from decision-making both on the domestic front and at the community level. Women's access to education and health care is limited because such services are not available close to home in the project area. Women take active part in agricultural activities, collects fuel wood and fetch water, in addition to household work and family duties, but their due status is not given by the society.

182. Women in the project area are also vulnerable through economic, social and psychological poverty. Economic poverty is due to lack of assets and low endowment of human capital. Social poverty derives from the inability of the society to accept women's equality and their economic, political and cultural rights. Psychological poverty is a product of the subjugation of women, under the dictates of customs and traditions, which deprives them control of even their own lives.

183. In the rural set-up, women are kept under-educated or uneducated. They are mainly dependent on male members of the family for economic reasons and cannot take decisions regarding their own lives. Indeed, women cannot use their rights to caste votes during general elections, they have no say in the family matters and are not asked about their preference for marriage. Yet for the paucity of rights, women play a vital part in the society fetching water and firewood from distant places, nurturing children and cooking and cleaning for the family. Nonetheless, these conditions make communication with women within the tribal regions more difficult and there are numerous aspects of women lives in the region, which need to be explored.

4.4.15 Average Annual Income

184. Generally, income of the households consists of farm income and non-farm activities. The farm based income is obtained by selling crops. The income earned by conducting off-farm activities is referred as non-farm income. The assessment of annual household income is one of the important indicators to measure the well-being/ livelihood of the household.

185. During the field surveys, it was observed that in case of farm households, the major sources of income included the income from crops and livestock (dairy products). For non-farm or landless households, the main sources of income are the income from off-farm activities, such as business, Government or private employment, labour etc.

186. The survey results reveal that in the project area, average annual household income is computed to be PKR 122,000/- while the monthly amount is PKR 10,167/-. The

average annual and monthly per capita income is estimated as PKR 28,477/-and PKR 2,373/- respectively.

4.4.16 Education Facilities

187. During the field visit, it was observed that in the project area, educational buildings are available. Educational institutions were found but were observed to be in poor condition. Due to the non-availability of students as well as teachers, most of the school buildings have collapsed or are in a poor condition.

4.4.17 Literacy Rate

188. According to Pakistan's National Literacy policy, "a person is literate if he/she can read and write a paragraph of at least three lines in any regional or national language along with comprehension". In the project area, the literacy ratio is 30 percent.

4.4.18 Health Infrastructure

189. Health facilities are inadequate in the project area. The people in the project area have a tendency to get treatment from indigenous healers, due to the lack of suitable and sufficient health facilities. Bad sanitary conditions, insufficient medical facilities and meager parental care, all contribute to the prevalence of ill health and high rate of mortality in the project area.

4.4.19 Sanitation / Drainage Facilities and Solid Waste

190. Sanitation is poor in the area. There is no proper sewerage system available and only a few villages of the project area are connected with the sewerage system. In a majority of the cases, the village wastewater is disposed of into open spaces or nearby ponds. Ultimately, wastewater is drained into a pond/nullah, thus it becomes a source of pollution. Similarly, there is no proper arrangement for disposal of solid waste.

4.4.20 Archaeological Sites

191. No archaeological or historical sites were observed within the project area during the field visits.

4.4.21 Indigenous People

192. As per social survey, no indigenous people were found in the project area.

Table 4.7: Sensitive receptors in project area along TL alignments

Receptor Name	Receptor Type
Mirpur Khas G/S & 70 km TL from Hala road to Jamshoro	
Hyderabad city	Community settlements
Tando Ghulam Ali	Community settlements
Sajjan Nahyoon	Community settlements
Goth Roze-u-Din Mari	Community settlements
Haji Sono Khan Lashari	Community settlements
Muhammad Umar Rakepoto	Community settlements
10 km TL from TM Khan to Hala road	
Northern tip of TL next to Hyderabad city	Community settlements
Husri	Community settlements
Hyderabad Taluka	Community settlements
Goth Allah Bakhsh	Community settlements

5 Assessment of Environmental Impacts and Mitigation Measures

5.1 Sub-project Location

5.1.1 Impact Assessment and Mitigation

193. The location and scale of the works are very important in predicting the environmental impacts. Therefore, it is essential that a proper analysis is carried out during the sub-project planning period. This process of impact prediction is the core of the IEE process and it is critical that the recommendations and mitigation measures are carried out according to, and with reference to the conditions on the ground in the affected areas in the spirit of the environmental assessments process. In this section, the potential environmental impacts are reviewed.

194. Where impacts are significant enough to exceed accepted environmental standards, mitigation is proposed in order to reduce residual impact to acceptable levels. In this regard, the impact prediction plays a vital role as these predictions are used for developing mitigation measures and any alternative options, if appropriate. When the detailed designs are completed, the impacts and mitigation measures will need to be further reviewed to take account of how the contracts are set up and in the light of any fine tuning of the sub-project proposals.

195. The environmental management plan has been prepared based on the assessment and shall be reviewed in due course at sub-project inception and through construction in order to provide a feedback on any significant unpredicted impacts. It is based on the analysis of impacts, primarily to document key environmental issues likely to arise from sub-project implementation, to prescribe mitigation measures to be integrated in the subproject design, to design monitoring and evaluation schedules to be implemented during sub-project construction and operation and to estimate costs required for implementing sub-project mitigation measures.

196. The EMP must be reviewed in the sub-project inception by the sub-project management and approved before any construction activity is initiated, to take account of any subsequent changes and fine tuning of the proposals.

5.1.2 General Approach to Mitigation

197. Based on professional experience on heavy transmission line and grid station projects, contractors have put emphasis on the financial compensation for nuisances. This may be acceptable for some social impacts where evacuation is necessary or where structures have been accidentally damaged. However, it is not the best international practice to accept payment for environmental impacts. An approach whereby the sub-

project contractor pays money for nuisances rather than control impacts at source will not be acceptable. This practice should not be allowed and financial compensation shall not be allowed as mitigation for environmental impacts or environmental nuisance.

198. During the preparation for the sub-project construction phase, the future contractors must be notified and prepared to co-operate with the executing and implementing agencies, subproject management, construction 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 or train staff in the management of environmental issues and to audit the effectiveness and review the mitigation measures as the sub-project proceeds.

199. The effective implementation of the EMP will be audited as part of the loan conditions and the executing agency (NTDC) must be prepared for this. In this regard, the NTDC must fulfill the requirements of the law and guidance prepared by Pak-EPA on the environmental aspects of power sub-projects and the recommendations already made for this sub-project in this IEE and under Pakistan's PEPA 1997 and Sind Environmental Protection (Amendment) Act, 2014.

200. The location of the residences, mosques, schools, hospitals and civic, cultural and other heritage sites has been reviewed. As far as sub-component 3 is concerned, there are a few residences lie along the proposed line at Rahoki, Lashari, Hasan Khan Thoro, Bukera, Khokhar, Pak Singaar, Jerwer, Misson, Dolat Tando Jam, Goth Roze-u-Din-Mari, Haji Sono Khan, Tando Allahyar, Kaamaro Sharif, Sultanabad and Mirpur Khas on which there could be some potential impacts in the construction stage from disturbance and significant noise and dust. The line route was selected in a way that minimum disturbance to human settlements occur and the alignment is along cultivated and barren land and has no human settlements and structures in its ROW of 30 meters.

201. As far as sub-component 4 is concerned, at the start of the T/L and along the Rahoki distributary up to 7 km, the T/L area falls under the urban area of Hyderabad city, but the impacts will be minimum because of sufficient corridor of irrigation canal where open space will be available for T/L corridor. The remaining corridor area is rural area consisting of scattered villages. The villages near to the sub-project might bear some potential impacts in the construction stage from disturbance and significant noise and dust.

202. The grid station construction activities will be within the boundary wall. Work on the tower sites could cause some generation of air borne dust, but any nuisance from this is likely to be very localized and temporary. Other project activities, e.g. movement of heavy vehicles on unpaved tracks during the works, could generate considerable dust.

Water is available in the study area, although surplus water may not always be available to suppress dust at vulnerable locations in the dry season.

203. Therefore, as a general approach, it is recommended that where works are within 25m of any residential sensitive receivers, the contractor should install segregation between the works and the edge of the sensitive receivers. The segregation should be easily erectable 2.5 m high tarpaulin sheet and designed to retain dust and provide a temporary visual barrier to the works. Where dust is the major consideration, the barrier can take the form of tarpaulins strung between two poles mounted on a concrete base. These can be moved along from tower base to tower base as the work proceeds. In order to mitigate high noise levels, temporary acoustic barriers shall be used, wherever felt necessary.

204. Noise from the construction of the towers should not be a major consideration unless very close to schools or hospitals where construction should be avoided at sensitive times. In addition to the physical effect of mitigating dust and noise with barriers, installation of such measures should be discussed with the local population and serve as a vehicle for further public consultation at the implementation stage to assist in public relations.

5.1.3 Cultural Heritage, Mosques, Religious Sites, and Social Infrastructure

Impact Analysis

205. The location of mosques and other cultural and other heritage SR sites has been reviewed. There is no mosque, graveyard, tomb or any other religious/archaeological site in the ROW of the transmission line. Therefore, no impact on such sites is expected.

206. The clinic / hospitals are all more than 100m from the center line of the sub-project and there will be sufficient buffer distance between the works and the SR such that no significant impact would be expected from the works.

207. The location of schools is more than 100m from the edge of the sub-project. There will be sufficient buffer distance between the works and all the SR such that no significant impacts can be expected. Public consultation should be undertaken at the implementation stage to ensure nuisances are not allowed to escalate.

Mitigation measures

No measures required.

5.2 Impacts during Pre-Construction Stage

5.2.1 Impact due to Land Acquisition

Impact Analysis

208. The proposed project will not involve the acquisition of land on permanent basis for construction of Transmission line as per NTDC practice. Only the crop & trees compensation will be made.

Mitigation measures

No measures required.

5.2.2 Encroachment, Landscape and Physical Disfiguration

Impact Analysis

209. 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 and extension of the grid station. The grid station extension will not pose any encroachment, as it will be constructed within a boundary wall.

Mitigation Measures

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

5.2.3 Loss of Crops

Impact Analysis

211. The grid station area is free of any crops or agricultural resources. However, the transmission line will encounter cultivated lands and orchards. For construction of sub-component 3 i.e. 70 km of transmission line and tower stringing, approximately 6500 acres of crops will be lost. For construction of sub-component 4 i.e. 10 km of transmission line and tower stringing, approximately 1500 acres of crops will be lost.

Mitigation Measures

212. Compensation of crops will be paid to the owners as mentioned in LARP. An approximate amount of PKR 25 million has been estimated for the compensation of crops.

5.3 Impacts during Construction Stage

Physical Impacts

5.3.1 Ambient Air Quality

Impact Analysis

213. 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. These air emissions may contain particulate matter (PM), smoke, dust, CO, SOx and NO_2. 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.

Mitigation Measures

- Good engineering practices will be used at quarry areas to minimize the impact of dust emissions.
- 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 NEQS applicable to gaseous emissions generated by the construction vehicles, equipment and machinery will be enforced during the construction works. Contractor shall ensure 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 accepted international standards. 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.
- Implementation of plantation plan for trees & plants
- 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.

5.3.2 Noise Level

Impact Analysis

214. It is anticipated that powered mechanical equipment and some local labour with hand tool methods will be used to construct the sub-project works. No blasting is anticipated. 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 schools or hospitals present near the construction site.

Mitigation Measures

- To minimize such impacts, the contractor for the sub-project shall 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 100m from the boundary wall of any residential unit and while following the NEQS of 45dB (A).
- Noise from construction of sub-stations is not covered under any regulations. However, in order to keep in line with best international practice, it is recommended that construction should not be allowed during night time (9 PM to 6 AM).
- All noisy equipment should be located within DGS or as far away from sensitive receptors as possible to prevent nuisances to dwellings and other structures from operation. However, if the noise still exceeds NEQS limits, then noise barriers will be installed around the equipment to reduce the effects of the noise.
- Vibration from construction of piles to support pads may be required for some tower construction and may be a significant impact, but this shall be of short duration. Where vibration could become a major consideration (within say 100m of schools, religious premises, hospitals or residences), a building condition survey shall be conducted prior to construction.
- The physical effect of piling shall be assessed prior to construction and necessary measures shall 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 level from construction activity can be reduced by regular maintenance of machinery. Noise can be controlled through engineering control e.g. hammering actions can be substituted by hydraulic. Ensure that the workers are wearing PPE's (ear plugs, ear muffs etc.) where engineering control is not applicable to reduce the impact of noise.

5.3.3 Soil Erosion

Impact Analysis

215. Soil erosion may occur in the workshop areas as a result of improper runoff drawn from the equipment washing yards and improper management of construction activities.

Mitigation Measures

216. Good engineering practices will help control soil erosion both at the construction sites and in peripheral areas, particularly at the sub-station site, 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.

5.3.4 Drainage

Impact Analysis

217. No impact is anticipated on the natural drainage by the implementation of the project. However, temporary drainage system for toilets and workshop effluent needs to be developed.

Mitigation Measures

218. Design engineer will ensure appropriately sized drainage to avoid negative impacts due to sewage effluent. During the construction phase, temporary drains and embankments shall be constructed to channel the runoff appropriately.

5.3.5 Soil Contamination

Impact Analysis

219. Lands may get contaminated from the spillage of chemicals such as 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. The possible contamination of soil by oils and chemicals at camp sites, workshop areas, and equipment washing-yards may limit the future use of land for vegetation purposes.

Mitigation Measures

220. Control measures will be needed for oily residues such as transformer oil and lubricants in the case of accidental or unexpected release. Transformer oil is supplied in drums from an imported source and tap tanks are topped up as necessary on site. It shall be ensured that no PCB containing transformer oil is used. There are facilities in some sub-project DGS maintenance yards for recycling (dehydrating) oil from breakers.

221. However, the areas upon which these recycling facilities are located have no dedicated drainage which can capture run-off. Oily residues and fuel and any contaminated soil residues will be captured at source and refueling and maintenance will take place in

dedicated areas away from surface water resources. Contaminated residues and waste oily residues will be disposed at a site agreed with the local authority.

222. Transformer oil has a long life (typically over 15 years, which depends upon the level of load the transformer serves). Oil spills are very rare and are pre-empted by routine maintenance. Good housekeeping techniques will be used to control oil spillage by ensuring transformers are placed on an impermeable surface bunded to 110% of capacity in case of oil spill or leak. Responsible authority will ensure that the maintenance schedule of each piece of hardware is adhered to.

223. Solid waste generated at the campsites will be properly treated and safely disposed of only in the demarcated waste disposal sites.

224. Proper drainage system will ensure proper disposal of sewage, which will offset any impact on soil. Sewage will be connected to sewage network for offsite treatment or will be connected to septic tank.

5.3.6 Cut and Fill and Waste Disposal

Impact Analysis

225. Disposal of surplus materials must also be negotiated through local authority approvals prior to the commencement of construction. The sub-project work does not involve any significant cutting and filling but the 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.

Mitigation Measures

- If surplus materials arise from the removal of the existing surfaces from specific areas, these will be used elsewhere on the sub-project 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. Moreover, it will also save the cost of bringing the material from some other locations.
- The sub-project detailed designers have so far estimated that no substantial additional materials will be required subject to confirmation at the detailed design stage.

226. Contractual clauses will be included to require each 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 will 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 the local residents. Financial compensation will not be allowed as mitigation for environmental impacts or environmental nuisance.

- Mitigation measures will seek to control the impacts at source in the first place. The engineer shall be responsible to update the sub-project cut and fill estimates and create Materials Master Plan to facilitate materials exchange between the different contract areas along the power line and sub-contractors on the power line and to provide an overall balance for materials and minimize impacts on local resources.

5.3.7 Impact on Water Resources

Impact Analysis

227. Project lies in an agriculturally rich area, where there is no scarcity of water. However, the use of local water supplies for construction purpose can create a big issue. As acknowledged during the public consultation, 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

228. 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.

5.3.8 Contamination of Surface and Ground Water

Impact Analysis

229. With regards to sub-component 3, only the Rahoki Branch canal will be crossed by the proposed T/L. This Canal is being used for agriculture and domestic purpose. Other than that, small drains are present in AOI. It is anticipated that the project activities will not cause any impact on these surface water bodies as these are not near campsite, which lies within the GS boundary, and no construction activity will be done near them.

230. With regards to sub-component 4, only Jhang Branch canal will be crossed by the TL, being used for agriculture and domestic purpose. It is anticipated that the project activities will not cause any impact on these surface water bodies as these are not near campsite, which lies within the GS boundary, and no construction activity will be done near them.

231. 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

232. 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 Biological Environment

233. This section describes impacts on flora and fauna and corresponding mitigation measures.

5.4.1 Flora, Trees, Ecology and Protected Areas

Impact Analysis

234. There is no protected area, as per identification of National Conservation Strategy, inside or anywhere near the project. As far as sub-component 3 is concerned, around 8,500 forest trees and 500 fruit trees and some shrubs will have to be removed from the project land and along the transmission line. With regards to sub-component 4, 3,000 forest trees and 500 fruit trees and some shrubs will be removed. The trees to be removed are not part of a fragmented forest. Wood trees include Jungli Kikar (Wild Acacia niloica), Sufaida (Eucalyptus), Aak (Calotropis), Sheesam (Dilbergia Sisso) and Jandh (Prosopis cineraria). Fruit trees include mango, banana, guava and date palms. Dust during the construction phase will also cause an adverse impact on surrounding orchards and crops.

Mitigation Measures

235. Trees will be enumerated species wise and compensatory plantation will be arranged along roads and paths of the project area. To replace the removed trees, sufficient areas will be identified to allow plantation of trees at a rate of 3:1. Moreover, owners of the affected trees will be paid compensation for their loss.

236. In addition to this, the contractor will be requested to spray water twice or thrice a day (as per needed) to avoid dispersal of dust on the adjacent flora.

5.4.2 Wildlife and Fauna

Impact Analysis

237. Mammals, amphibians, birds and reptiles will be disturbed with the clearance of flora and leveling of land. Birds can easily fly away to the trees that are retained from original flora. Moreover, grazing activity of animals will also be disturbed.

238. 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.

239. 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 sub-project.

Mitigation Measures

- While constructing boundary wall around the project area, outlets near the ground surface will be provided at suitable intervals in order to facilitate the mammals and reptiles to migrate out of the disturbed project rea. As far as possible, the original habitat will be retained.
- Moreover, the 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.
- 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.

5.5 Socioeconomic and Cultural Environment

240. This section describes the impact of the proposed sub-project on local communities, construction workers, indigenous and vulnerable people as well as on structures or sites of cultural and religious significance.

5.5.1 Impacts on Local Communities/Workforce

Impact Analysis

241. The area's surrounding communities 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 such as 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 labor may cause cultural issues with the local community.
- Theft problems to the community by the contractor workers and vice versa.

Mitigation Measures

242. 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. 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.
- Haul-trucks carrying concrete, aggregate and sand fill materials will be kept covered with tarpaulin to help contain construction materials being transported between the sites.
- 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 is found guilty of such activities, he will have to pay heavy penalty and will be handed over to the police. Similarly, at the time of employment, Contractor has to take care that the workers shall 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.

5.5.2 Indigenous, Vulnerable and Women Headed Households

Impact Analysis

243. During the social field survey of the project, no indigenous group of people were identified. So, no impact on the indigenous people is envisaged due to the implementation of the project. No woman headed household was identified during the social survey of the project.

Mitigation Measures

244. No mitigation measures required.

5.5.3 Public Health and Safety Hazards

Impact Analysis

- Construction of transmission line and grid station extension will require large number of workers who will obviously be accommodated in congested temporary camps. This scenario may lead to spreading of diseases such as malaria, cholera, typhoid, hepatitis A, B and C etc.
- Occurrence of accidents/incidents during the construction stage is a common phenomenon as evident from previous experience of NTDC.
- During the operation stage, people believe that they will be prone to danger due to the current flows from towers, breaking of conductors, etc.
- Safety of general public at construction sites.
- During the operational stage, electric current (induction) may travel into the sub-station and will become a hazard to the public/animals.

Mitigation Measures

- 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.
- Complying with the safety precautions for construction workers as per International Labor Organization (ILO) Convention No. 62, as far as applicable to the project contract.
- Workers will 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, 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.

5.5.4 Religious, Cultural and Historical Sites

Impact Analysis

245. The location of mosques and other cultural and other heritage SR sites has been reviewed. There is no mosque, graveyard, tomb or any other religious/archaeological site within 100m boundary from the edge of the sub-project; Therefore, no impact on the site is expected. There will be sufficient buffer distance between the works and all the SR such that no significant impacts can be expected.

However, in case the need arises, the 'Chance find' procedures are provided as **Annexure VI**.

Mitigation Measures

- No measures required.

5.5.5 Sanitation, Solid Waste Disposal, Communicable Diseases

Impact Analysis

246. 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

- 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.
- 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.
- Disposal of surplus materials must also be negotiated through local authority approvals prior to the commencement of 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 the new transformers and 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 sub-project 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 will 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 will 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.

5.5.6 Disease Vectors

Impact Analysis

247. 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 camp site.

Mitigation Measures

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

5.6 Impacts during Operational Stages

5.6.1 Air Pollution and Noise from the Enhanced Operations

Impact Analysis

249. The sub-project works will involve installation of new power transmission lines. No houses, mosques or schools are close to the new GS in the operational phase. The operation of the facility is not likely to cause any appreciable increase in the noise level already generated by the existing equipment. However, it is recommended that an acoustical check be made on the detailed design to determine of any noise barriers are required. There is no source of atmospheric pollution from the sub-project. In the operational phase, any nearby industrial facilities with fuel powered mechanical equipment will be the main polluters.

Mitigation Measures

- All the emissions will be very well dissipated in the open terrain and there will be no cumulative effect from the sub-project.
- Noise impacts from the operation of the DGS equipment will be reviewed at the detailed design stage. The NEQS for noise close to residential areas will be complied with 45 dB(A) Leq (exterior, boundary of DGS).
- The specifications of the new equipment that shall be installed shall follow international standards and best practices to avoid use of chemicals causing Green House Gas (GHG) emissions. All equipment procured shall be free from Polychlorinated Biphenyls (PCBs). If SF6 (Sulfur Hexaflouride), a highly non-toxic greenhouse gas (GHG) based equipment is installed, a proper maintenance management program will have to be implemented to avoid leakage beyond international norms for GHG to the atmosphere.

5.6.2 Pollution from Oily Run-Off, Fuel Spills and Dangerous Goods

Impact Analysis

250. Impacts from spillage of oily residues such as transformer oil and lubricants are expected to arise in this sub-project. However, control measures will be needed in the case of accidental or unexpected release.

Mitigation Measures

251. Transformer oil is supplied in drums from an imported source and tap tanks are topped up as necessary on site. There are facilities in some sub-project DGS maintenance yards for recycling (dehydrating) oil from breakers. However, the areas upon which these recycling facilities are located have no dedicated drainage which can capture run-off.

252. Oily residues and fuel and any contaminated soil residues will be captured at source and refueling and maintenance will take place in dedicated areas with impermeable surface away from water resources. Contaminated residues and waste oily residues will be disposed at a site agreed with the local authority.

253. Transformer oil has a long life (typically over 15 years, which depends upon the level of load the transformer serves). Oil spills are very rare and are preempted by routine maintenance. Good housekeeping techniques will be used to control oil spillage. Responsible authority will ensure that the maintenance schedule of each piece of hardware is adhered to.

5.6.3 Impacts on Ecological Resources

254. No more tree cutting is to take place, during the operation stage. On the other hand, tree plantation, on the ratio of 3:1 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.

255. There will be healthy and positive impacts on flora and fauna during the operation stage. Sub-station operation will enhance the risks for reptiles, amphibians and mammals and they will prefer not to return to the area, thus causing a minor negative impact. Sufficient funds will be allocated to maintain the trees at operation stage and the local communities would be also involved for the maintenance of these plants. This will ultimately have a positive impact.

5.6.4 Enhancements

256. Environmental enhancements are not a major consideration within the sub-project site. However, it is noted that it is common practice to create some local hard and soft landscaping and successful planting of fruit trees at such sites. This practice will be encouraged as far as practicable. Other opportunities for enhancements can be assessed prior to construction and proposed enhancements will be discussed with the local population to serve as a vehicle for further public consultation at the implementation stage and to assist in public relations.

5.7 Environmental and Social Risk Assessment

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

- 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

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

5.7.1 Effect of Electro Magnetic Field (EMF)

259. 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 but there is no panic because the researchers cannot prove that the power lines are the cause of leukemia. They have admitted that their findings may be due to some chance.

260. 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 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 the populated areas. During the operation stage, check will be kept by the NTDC that no construction will be allowed within 100 m of the substation and transmission line.

5.7.2 Excessive Noise Problem

261. Due to the EMF around the substation, 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. To overcome this problem, the route has been selected passing through the least populated area.

262. 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.

5.7.3 Failure to Work of Electronic Devices/Equipment

263. The failure of electronic devices/equipment to work under the EHV transmission line is a common apprehension of the stakeholders. To avoid this risk, NTDC has planned to keep excessive clearance as compared to international standards. If proper required clearance is provided, the severity of the risk is minimized, for which observations were made in the field under the existing EHV transmission lines deliberately. Secondly, as the selected route will not pass close to the settlements, the risk is also minimized.

5.7.4 Danger to Bird Movements

Impact Analysis

264. 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:

265. 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.

266. 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

267. 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:

268. 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**

269. 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.

5.8 Cumulative impacts

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

271. There is no other transmission line project or any other infrastructure projects being planned in the project area alone the transmission line alignment. Thus, no cumulative impacts are expected.

5.9 Environmental and Social Benefits of The Project

272. 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.
- Grid station and transmission line will open new employment opportunities for locals.

6 Information Disclosure Public Consultation and Participation

273. 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).

274. Meetings were conducted with Government officials of district Hyderabad and Mirpur Khas. Interactive sessions held with communities located near and around T/L route and grid station. This process has been conducting 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.

275. Much of the PC process to date has revolved around concerns for the mitigation of construction impacts and the possible side effects from the proximity of TL. The process of consultation is expected to continue through all stages of the project in order to accommodate stakeholder concerns 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. 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.

6.1 Consultation Process

276. The process of public consultation is likely to continue throughout the project cycle. The focus of this consultation is the population living near the proposed T/L route i.e. the population that is living around the radius of 200 m to around 1.5 km of the proposed T/L. The disclosure of information to the stakeholders beforehand has advantages in the environmental assessment and mitigation of impacts.

277. Public consultation can also provide a conduit for the improvement of the project implementation to better serve the stakeholders. 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.

278. Photos presenting awareness and public consultation campaign are provided in **Annex IV**. Surveys were carried out in order to investigate physical, biological and socio-economic resources falling within the immediate area of influence of the project. 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.

Consultations were held with the officers provided in the Table below.

No.	Date	Venue of Meeting	Name of Participants
1	8-8-16	Fareed Ahmad Sadique, Project Director NTDC Hyderabad and Saeed Hadayat, SDO NTDC Hyderabad	0335 7401968
2	9-8-16	Munir Abbasi, Deputy Director EPA Hyderabad	022 9200996
3	9-8-16	Hydiatullah Chegro, District Agr Officer Hyderabad and Abdul Ikhlas Sheikh, Agri Officer Hyderabad	022 9200060 & 0336 2866900
4	9-8-16	Niaz Ahmad, Divisional Forest Officer (Direction Dvn) and Amjad Ali Shah Divisional Forest Officer (Planning Dvn)	022 9200225 & 022 9200227

6.2 Identification of stakeholders

279. 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 within the corridor of the transmission line.
- 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.

280. 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.

281. 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). Subsequent to the stakeholder identification, guidelines and questionnaires (Annex

II) 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.

282. 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 these consultation meetings have been attached as **Annex-III.**

6.3 Consultation Findings

6.3.1 Stakeholders' Concerns

283. The residents of the project area generally were positive regarding the proposed project development. They raised the following comments and/or concerns:

- Importance of providing information early and well before the start of work
- Targeting minimum wastage of crops
- Compensation according to the appropriate shares in crops
- Employment as laborer during installation of T/L
- Avoiding extensive tree cutting
- Advance payment should be made before harvesting the crops
- T/L should be diverted to avoid the community houses
- Community members are interested to become guard/chowkidar (watchman) during implementation of the TL
- Prompt compensation and less wastage
- Payment should be made to the affected person, not to the landowner only
- Compensation should be through crossed check
- Early & fairly compensation required
- Need of wide publicity of compensation schedule and employment as laborer during installation of T/L.

284. Women folk did not point out many problems but their confidence to respond was limited. The issues raised by women groups included:

- Early information before start of work,
- Employment should be given to local men,
- Company works should not disturb us during field work,
- Project should offer jobs to the affected persons and compensation should be according to shares in crops.
- Minimum wastage of crops & trees,

- Company workers should take care of the community's culture during installation of T/L,
- Fair & timely compensation of crops,

285. Small number of contribution of women folk towards issues/problems of this sub-project were perhaps, due to the fact that construction of transmission line did not have any direct impact on the community and transmission line is passing through agricultural land.

286. On the basis of the consultations so far, the consultants reckon that the social and environmental impacts of this project are not insurmountable, and NTDC will make sure that compensation and assistance amounts are paid properly including skilled and unskilled employment to the affected people (AP) as far as is reasonably practicable.

287. All of the above concerns and expectations have been adequately incorporated in the project design in the form of the mitigation measures included in the Environmental Management Plan and the communities were so informed during the consultation meetings.

288. The consultations identified some potential environmental and social impacts and perceptions of the affected communities. The public consultation was held in July & August, 2016. Overall, the community supported the construction of the transmission line and extension in grid. All the above points would be reflected in Social Framework Agreement (SFA) between the local community and the NTDC and when the project is commissioned for construction.

6.4 Social Framework Agreement

289. The project proponent has committed that they will work hand-in-hand with the community for the successful completion of the project. SFA shall be considered as a "follow up" of the public consultation and public hearing (has to be held) and indicates that NTDC and the communities are mutually facilitating the construction process of Mirpur Khas grid station and allied transmission line sub-project.

6.4.1 Parties to Agreement

290. 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. SFA shall be signed by NTDC Resident Engineer (RE) representing the project proponent and by the Chairman of villagers' committee representing the local community before two-month start of the construction work.

6.4.2 Agreement Contents

291. 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 TL project

7 Environmental Management and Monitoring Plan

7.1 General

292. This chapter provides an overall approach for managing and monitoring the environment related issues and describes the institutional framework and resource allocations proposed by NTDC to implement the EMMP for the proposed sub-project. The main objectives of EMP are to:

- Provide the details of the project impacts along with the proposed mitigation measures and a corresponding implementation schedule.
- Define the responsibilities of the project proponent, contractor, supervisory consultants and other role players, and effectively communicate environmental issues among them.
- Define a monitoring mechanism, reporting frequency, auditing and identifying monitoring parameters to ensure that all the mitigation measures are completely and effectively implemented.
- Identify the resources required to implement the EMP and outline the corresponding financing arrangements.

7.2 Environmental Management Plan (EMP)

293. The environmental protection and enhancement are achieved in various ways. These approaches should begin right at the embryonic stage i.e. i) project location, ii) design, specifications and tender/contract documents, iii) construction activities and iv) post completion activities i.e. operation and maintenance stage. Appropriate environmental management measures are required to be exercised in a cascade order by NTDC at each stage of the project.

294. In this way, it is envisaged that the project will achieve maximum ongoing cost-effectiveness, environmental sustainability and social soundness, far beyond the end of implementation of the project. All the stages of the project have to be managed by adopting the proposed environmental mitigation measures, where, besides engineering aspects, due importance is to be accorded to mitigation measures which make a perfect blending with the surrounding ecosystem. The key environmental and social issues, which have already been discussed in **Chapter 5** are as under:

- Impacts on Crops and Trees
- Contamination of air, water and soil during the construction activities
- Borrowing of aggregate materials
- Soil erosion and soil contamination
- Impact of noise generated by vehicles, machinery and equipment during the construction activities

- Impact on community and work force safety as a result of accident hazards during the construction and operation of the project
- Vegetation clearing for tower foundations and establishment of camp facilities

295. An Environmental Management Plan is provided in **Table 7.1**, which establishes the linkages between the environmental and social impacts, mitigation strategy and the agencies responsible for execution

Table 7.1: Environmental Management Plan

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Implementation Responsibility	Monitoring Responsibility
DESIGN STAGE						
1. Social Impacts	To ensure that the adverse impacts on crops and trees are mitigated according to the LARP provisions.	1. NTDC to select the route in a way that minimum impact on trees and crops occur. 2. Assessment of losses of tree and crops damages (if any) due to construction of transmission line towers. 3. Preparation of LARP for the proposed project before commencement of construction activities. 4. All the payments / entitlements are paid according to the Entitlement Matrix, prepared according to the LARP. 5. All the impacts identified by the IEE are incorporated in to the project as well as the LARP and relevant entitlements included into the Entitlement Matrix.	Before the construction of the transmission line and all other structures, the APs should be given sufficient time and compensation to satisfy them.	Affected Persons will be compensated by NTDC through its land acquisition officers.	NTDC / LAOs	MC and External Monitors
2. Hydrological Impacts	To minimize hydrological and drainage impacts during constructions.	1. Hydrological flow in areas where it is sensitive, such as water courses or bridges and culverts. 2. Adequate culverts should be provided where any water channel is needed tobe crossed for transmission line	Before the commencement of construction activities/during designing stage.	Considered locations are as in the design report.	NTDC with the Design Consultant	NTDC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Implementation Responsibility	Monitoring Responsibility
		construction activities.				
3. Noise Barriers	Ensure cumulative noise impacts are acceptable in operational phase.	1. Conduct detailed acoustic assessment for all residential buildings, schools, (other sensitive structures) within 50m of RoW. 2. If noise at sensitive receiver exceeds the permissible limit, the construction activities should be monitored and controlled.	During detailed design stage, and in include in the contract.	Noise sensitive locations to be identified after detailed design.	NTDC with the design consultant	NTDS and Construction Supervision Consultant (CSC if any)
4. Waste Disposal	Ensure adequate disposal options for all waste including unsuitable soils, scrap metal.	1. Identify sufficient locations for disposal of transformer oils, unsuitable soils, scrap metal “cradle to grave”. 2. Include in contracts for unit rates for re-measurement for disposal. 3. Designate disposal sites in the contract and cost unit disposal rates accordingly. 4. Prepare a PCB spill handling procedure and equip such teams with special clothing, steel containers and solvents.	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.	ADB and NTDC with the design consultant	NTDC and CSC
5. Temporary Drainage and Erosion Control	Include mitigation in Preliminary and detailed designs for erosion control and temporary drainage.	1. Identify locations where drainage or irrigation crossing RoW may be affected by works. 2. 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 CSC
6. Avoidance of Sensitive and High Value Areas	The sitting of transmission facilities	When sitting in such areas cannot be avoided	During designing stage no later than	Locations based on crossing	NTDC and Design Consultant	NTDC and CSC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Implementation Responsibility	Monitoring Responsibility
	must seek to avoid to the maximum extent possible areas of high ecological, cultural, economic, and aesthetic value and sensitivity.	altogether, the area of disruption should be minimized and the impacts mitigated.	pre-qualification or tender negotiations	RoW		
7. EMF Reduction	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).	• 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.	Design Stage	Project Area	NTDC	NTDC
8. Health & Safety	To ensure all health and safety aspects are considered during the project design phase.	• Ensure seismic design requirements are incorporated in the project design.	Design Stage	Project Area	NTDC	NTDC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Implementation Responsibility	Monitoring Responsibility
1.1.1.1.1 CONSTRUCTION STAGE						
1. 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.	1. Consideration of weather conditions when particular construction activities are undertaken. 2. Limitations on excavation depths in use of recharge 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.	1. Prepare a thorough plan to be approved by SC one month prior to a commencement of construction. 2. Proper timetable prepared in consideration with the climatic conditions of each area, the different construction activities mentioned here to be guided.	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.	CSC or NTDC to actively supervise and enforce	NTDC
2. Orientation for Contractors, and Workers	To ensure that the CSC, contractor and workers understand and have the capacity to ensure the environmental requirements and implementation of mitigation measures.	1. NTDC to engage environmental specialist in the PMC to monitor and progress all environmental statutory and recommended obligations. 2. 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	Induction of all relevant staff required for implementation of EMP. At early stages of construction for all construction employees as far as reasonably practicable.	All staff members in all categories. Monthly induction and six month refresher course as necessary until contractor complies.	Contractor and the CSC and record details	NTDC & CSC to observe and record success

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Implementation Responsibility	Monitoring Responsibility
		achievement test. 3. Agreement on critical areas to be considered and necessary mitigation measures, among all parties who are involved in project activities. 4. Continuous progress review and refresher sessions to be followed.				
3. 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.	1. Compile temporary drainage management plan one month before commencement of works. 2. Proper installation of Temporary Drainage (TD) and Erosion Control (EC) before works within 50 m of water bodies. 3. Proper construction of TD and EC measures, maintenance and management including training of operators and other workers to avoid pollution of water bodies by the considerate operation of construction machinery and equipment. 4. Storage of lubricants, fuels and other hydrocarbons in self-contained dedicated enclosures >50m away from water bodies. 5. Proper disposal of solid waste from construction activities and labor camps. 6. Cover the construction	Prior to 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 CSC to enforce 2. Contractor has to check water quality and report to NTDC. 3. CSC supervises monitoring activities.	NTDC review results

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Implementation Responsibility	Monitoring Responsibility
		material and spoil stockpiles with a suitable material to reduce material loss and sedimentation and avoid stockpiling near to water bodies. 7. Topsoil stripped material shall not be stored where natural drainage will be disrupted. 8. Borrow sites (if required) should not be close to sources of drinking water.				
4. Air Quality	To minimize effectively and avoid complaints due to the airborne particulate matter released to the atmosphere.	1. Control all dusty materials at source. 2. All heavy equipment and machinery shall be fitted in full compliance with the national and local regulations. (Relevant regulations are in the Motor vehicles fitness rules and Highway Act). 3. Stockpiled soil and sand shall be slightly wetted before loading, particularly in windy conditions. 4. Fuel-efficient and well-maintained haulage trucks shall be employed to minimize exhaust emissions. 5. Vehicles transporting soil, sand and other construction materials shall be covered. 6. Limitations to speeds of such vehicles necessary. Transport through densely	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 should maintain acceptable standard CSC to supervise activities.	NTDC/CSC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Implementation Responsibility	Monitoring Responsibility
		populated area should be avoided. 7. To plan to minimize the dust within the vicinity of orchards and fruit farms. 8. Spraying of bare areas with water. 9. Concrete plants to be controlled in line with statutory requirements should not be close to sensitive receptors.				
5. Noise / Ground Vibration	To minimize noise level increases and ground vibrations during construction operations.	1. 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. 2. As a rule, the operation of heavy equipment shall be conducted in daylight hours. 3. Hammer- type percussive pile driving operations shall be not be allowed at night time. 4. Construction equipment, which generates excessive noise, shall be enclosed or fitted with effective silencing apparatus to minimize noise. 5. Well-maintained haulage trucks will be used with speed controls. 6. Contractor shall take	Maximum allowable noise levels should be below 75dB (A) L_{EQ} at the boundary of the construction site.	During construction stage, the most sensitive locations need special attention.	Contractor should maintain the acceptable standards CSC to supervise relevant activities.	NTDC / CSC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Implementation Responsibility	Monitoring Responsibility
		adequate measures to minimize noise nuisance in the vicinity of construction sites by way of adopting available acoustic methods.				
6. Soil Erosion/ Surface Run-off	Prevent adverse water quality impacts due to negligence and ensure unavoidable impacts are managed effectively. To minimize soil erosion due to the construction activities of towers, stringing of conductors and creation of access tracks for project vehicles.	1. Schedule works in sensitive areas (e.g. rivers) for dry season 2. Temporary erosion control plan one month before commencement of works. 3. Proper installation of TD and EC before works within 50m of water bodies. 4. Meaningful water quality monitoring up and downstream at any tower site within a river or stream during construction. Rapid reporting and feedback to CSC. 5. Back-fill should be compacted properly in accordance with design standards and graded to original contours where possible. 6. Cut areas should be treated against flow acceleration while filled areas should be carefully designed to avoid improper drainage. 7. Stockpiles should not be formed within such distances behind excavated or natural slopes that would reduce the stability of the slopes.	Because the area can be subject to un seasonal heavy rain plan before and during construction (cut and fill, land reclamation etc.) while considering the climatic conditions.	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 and CSC	NTDC/ CSC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Implementation Responsibility	Monitoring Responsibility
		8. In the short-term, either temporary or permanent drainage works shall protect all areas susceptible to erosion. 9. 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. 10. 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. 11. Clearing of green surface cover to be minimized during site preparation. 12. 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.				
7. Exploitation Handling, Transportation and Storage of	To minimize contamination of the surroundings	1. In order to minimize and or avoid adverse environmental impacts arising out of construction material exploitation,	Update monthly	1. List of borrow areas to be prepared one month prior to	Contractor and CSC to agree format of reporting	NTDC/CSC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Implementation Responsibility	Monitoring Responsibility
Construction Materials	(Due to Implementation of works, concrete and crushing plants).	handling, transportation and storage measures to be taken in line with any EPA conditions/recommendations in approval. 2. Conditions that apply for selecting sites for material exploitation. 3. Conditions that apply to timing and use of roads for material transport. 4. Conditions that apply for maintenance of vehicles used in material transport or construction. 5. Conditions that apply for selection of sites for material storage. 6. Conditions that apply for aggregate production. 7. Conditions that apply for handling hazardous or dangerous materials such as oil, lubricants and toxic chemicals.		construction. 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. 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.		
8. Construction Waste Disposal	Minimize the impacts from the disposal of construction waste.	1. Waste management plan to be submitted to the CSC and approved by MC one month prior to starting works. 2. Estimating the amounts and types of construction waste to be generated by the project. 3. Investigating whether the waste can be reused in the	Update monthly	A list of temporary stockpiling areas and more permanent dumping areas to be prepared at the contract stage for agreement	Contractor and CSC should supervise and take action to complete contractor's relevant activities according to EIA/IEE/ EMP requirement	NTDC/ CSC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Implementation Responsibility	Monitoring Responsibility
		project or by other interested parties. 4. Identifying potential safe disposal sites close to the project or those designated sites in the contract. 5. Investigating the environmental conditions of the disposal sites and recommendation of most suitable and safest sites. 6. 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. 7. Used oil and lubricants shall be recovered and reused or removed from the site in full compliance with the national and local regulations. 8. Oily wastes must not be burned. Disposal location to be agreed with local authorities/EPA. 9. Machinery should be properly maintained to minimize oil spill during the construction. 10. Solid waste should be disposed at an approved solid waste facility, open burning is illegal and contrary to good			& environmental standards.	

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Implementation Responsibility	Monitoring Responsibility
		environmental practice				
9. 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.	1. 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. 2. Cutting of trees shall be avoided and removal of vegetation shall be minimized. 3. 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. 4. 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 of to the nearest sanitary landfill or site having complied with the necessary permission of local authority permission 5. The Contractor shall organize and maintain a waste separation, collection and transport system.	Update once a month	Location Map is prepared by the Contractor.	Contractor	NTDC/ MC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Implementation Responsibility	Monitoring Responsibility
		6. 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. 7. 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. 8. Exposed areas shall be planted with suitable vegetation. 9. NTDC and Supervising Engineer shall inspect and report that the camp has been vacated and restored to pre-project conditions.				
10. 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.	1. 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. 2. The contractor's staff and	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

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Implementation Responsibility	Monitoring Responsibility
		labor will be strictly directed not to damage any vegetation such as trees or bushes. 3. 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 to. 4. Clearing of green surface cover for construction, for borrow of for development, cutting trees and other important vegetation during construction should be minimized. 5. Landscaping and road verges to be re-installed on completion. 6. Compensatory planting of trees/shrubs/ornamental plants (at a rate of 3:1) to contribute to the aesthetic value of the area and compensate for the lost capability of the area to absorb carbon dioxide in line with best international practice. 7. At completion all debris and waste shall be removed. 8. All temporary structures, including office buildings, shelters and toilets shall				

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Implementation Responsibility	Monitoring Responsibility
		be removed.				
11. Safety Precautions for the Workers	To ensure safety of workers	1. Providing adequate warning signs. 2. Providing workers with skull guard or hard hat. 3. Contractor shall instruct his workers in health and safety matters, and require the workers to use the provided safety equipment. 4. 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 and CSC	NTDC/ CSC
12. Traffic Condition	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.	1. Submit temporary haul and access routes plan one month prior to start of works. 2. Formulate and implementation of a plan of alternate routes for heavy vehicles. 3. Vicinity of schools and hospitals to be considered. 4. 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. 5. Provision of culverts on water channels and drains. 6. Widening/upgrading of access paths/roads	Prior to and throughout the construction.	The most important locations to be identified and listed. Relevant plans of the Contractor on traffic arrangements are available.	Contractor and Engineer	NTDC/CSC
13. Social Impacts	To ensure minimum	1. Potential for spread of vector borne and communicable	Complaints of APs	The whole	Contractor and the	NTDC/

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Implementation Responsibility	Monitoring Responsibility
	impacts from construction labor force. To ensure minimum impacts on public health. To ensure minimum effects of indirect impacts of constructions to the people who are living close to the boundaries of ROW; Dust, Noise, Vibration and Rock blasting effects etc. To minimize access problems for local population during construction.	diseases from labor camps shall be avoided (worker awareness orientation and appropriate sanitation should be maintained). 2. Claims/complaints of the people on construction nuisance/damages close to ROW to be considered and responded to promptly by the Contractor. 3. Contractor should organize temporary means of access and make alternative arrangements to avoid local community impacts and to avoid such short-term negative impacts.	to be solved as soon as possible. Necessary evacuations to be done as when necessary if construction impacts are of significant duration and close to APs.	alignment route of transmission line.	CSC	CSC
14. Institutional Strengthening and Capacity Building	To ensure that NTDC officials are trained to understand and to appreciate EMP.	Capacity building activities were taken by Environmental Officer in Tranche 1 and 2. Environmental and Social Impact Cell (ESIC) was setup within NTDC under GM (Projects) in Tranche 1. Trainings and provisions of proper monitoring facilities to ECIS are recommended.	Initiate preconstruction and continue beyond project completion	Awareness training for all management and senior staff in NTDC at senior engineer and above in PMU and related units.	NTDC	NTDC & ADB
OPERATIONAL STAGE						
1. Compensatory Tree Planting	Maintain survival of trees planted	Employ landscaping contractor to monitor, water, feed and replace dead specimens as necessary.		All Project sites	NTDC	NTDC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Implementation Responsibility	Monitoring Responsibility
2. Crops and Vegetation	Monitor impacts from maintaining tree clearance under transmission lines	▪ Track growth of large trees under the conductors. ▪ Tree planting shall be conducted at suitable locations in project area, as near as possible from locations where any trees might be uprooted, if necessary. ▪ Required measures for vegetation management shall be taken such as minimizing use of chemicals, avoiding invasive plant species, risk of forest fires etc.		All Project sites	NTDC	NTDC
3. 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.		All Project site	NTDC	NTDC
4. Danger to bird movement	To minimize potential risk to birds of getting electrocuted or colliding in the transmission lines.	▪ Align transmission corridors to avoid critical habitats (e.g. nesting grounds, heronries, rookeries, bat foraging corridors and migration corridors). ▪ Maintain 1.5 meter (60 inch) spacing between energized components and grounded hardware or, where spacing is not feasible, covering energized parts and hardware ▪ Retrofitting existing		All Project site	NTDC	NTDC

Environmental Concern	Objectives	Mitigation Measures (MM) Recommended	Timing to Implement MM	Location to Implement MM	Implementation Responsibility	Monitoring Responsibility
		transmission or distribution systems by installing elevated perches, insulating jumper loops, placing obstructive perch deterrents (e.g. insulated 'V's'), changing the location of conductors, and/or using raptor hoods. ▪ Installing visibility enhancement objects such as marker balls, bird deterrents or diverters.				

FLAGGING

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.

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

7.3 Environmental and Social Monitoring Plan

296. This section provides a monitoring plan that identifies the roles and responsibilities of the project staff involved in environmental and social monitoring under the proposed Project, and list the parameters that will be used in the monitoring process.

7.3.1 Objectives

297. The main objectives of the pre-construction and construction phase monitoring plans will be:

- The compensation for loss of assets will be monitored during the pre-construction activities as per latest rates announced by the government as every year rates have to be revised by the government. This aspect will be strictly monitored.
- Monitor the actual impact of the construction activities on the project corridor's physical, biological and socio-economic receptors. This will indicate the adequacy of the IEE.
- Recommend mitigation measures for any unexpected impact or where the impact level exceeds that anticipated in the IEE.
- Ensure compliance with legal and community obligations including safety at construction sites.
- Monitor the impacts on land, water resources, air quality, noise level and cutting of trees in the project area as described in the EMP.

298. The main objectives of environmental monitoring during the operation phase will be to:

- Appraise the adequacy of the IEE with respect to the project's predicted long-term impact on the corridor's physical, biological and socio-economic environment.
- Evaluate the effectiveness of the mitigation measures proposed in the EMP and recommend improvements, if necessary.
- Compile periodic accident data to support analysis that will help to minimize the future risks.

7.3.2 Role and Responsibilities of Project Management Consultants (PMC)

299. 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 EMMP;

- 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.

7.3.3 Role and Responsibilities of Contractor

300. 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 EMMP, or adherence to all the provisions of the EIA and EMMP and any environmental or other code of conduct required by SEPA. Overall responsibility for the Contractor's environmental performance will rest with the NTDC.

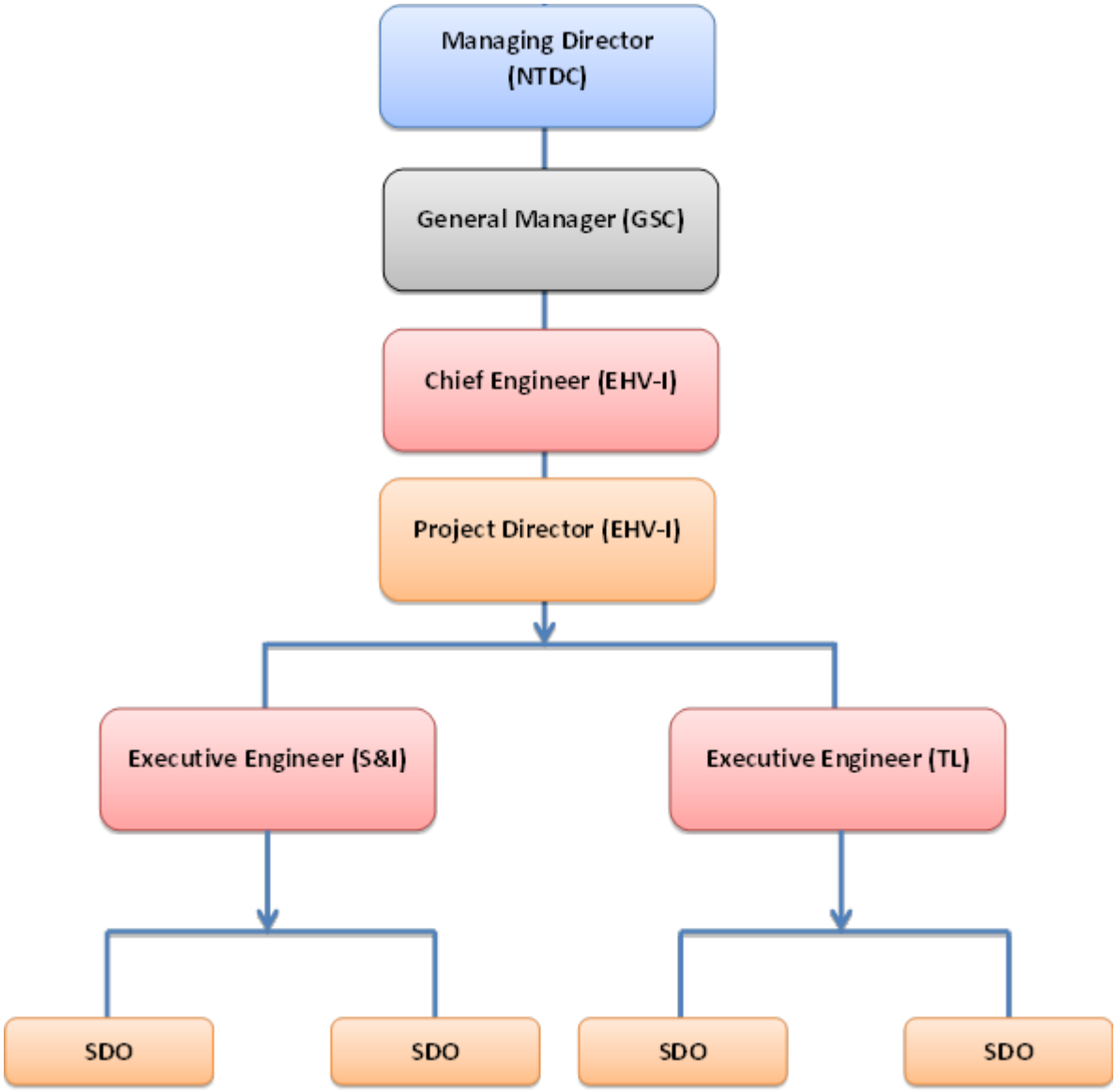
301. The project contractor will also responsible for following items:

- Implementation of, or adherence to, all provisions of the IEE/EIA 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.

7.3.4 Institutional Structure for Implementation and Operation of the Project

302. 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 **Figure 7.1**. 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.

Figure 7.1: NTDC's Institutional Setup for Project Implementation



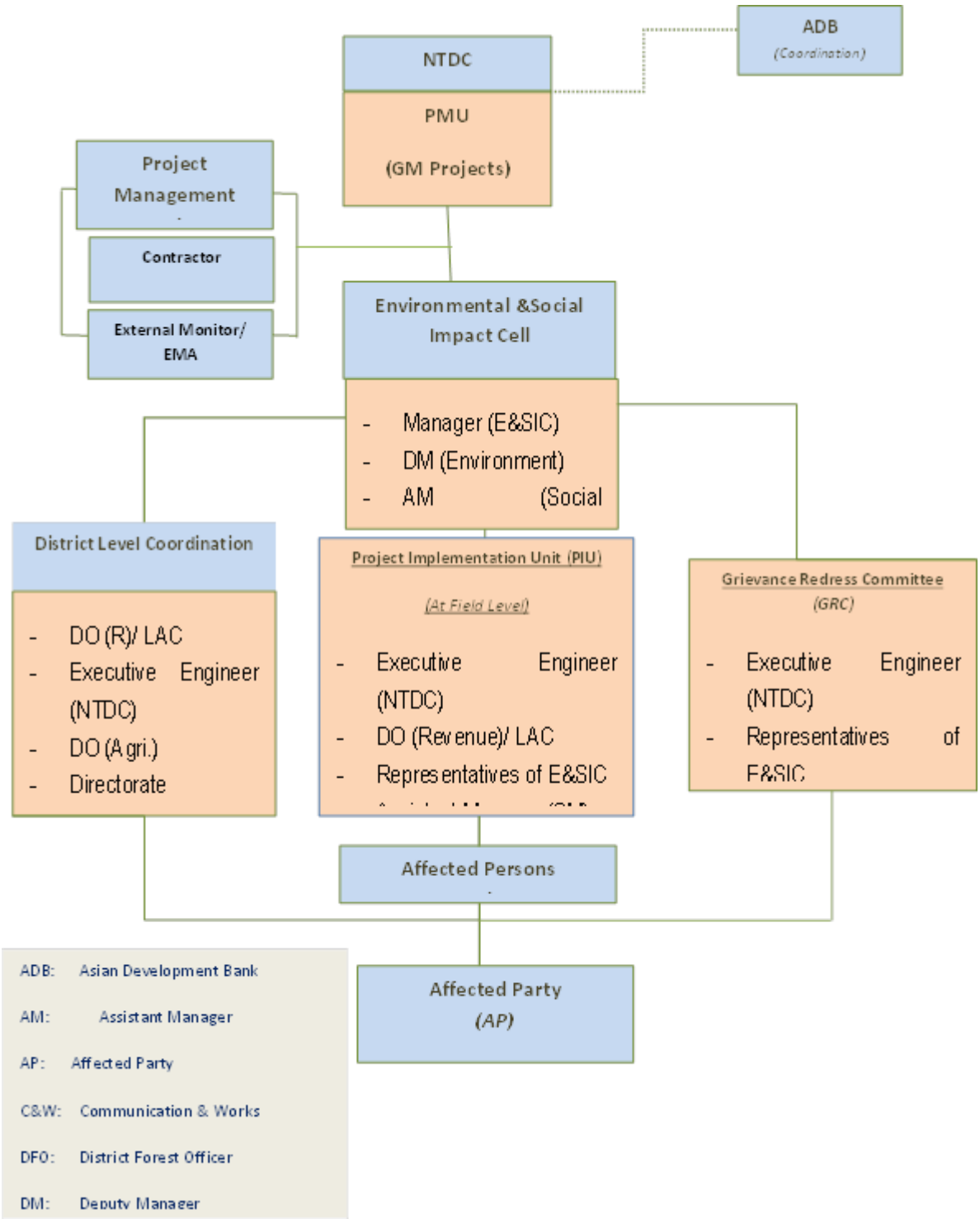
303. The NTDC federal headquarter is based in Lahore, and is responsible for managing the project at the policy level. At the highest level, the Chief Engineer (EHV-I) will be responsible for day-to-day project management at project implementation stage. He will report directly to the General Manager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

304. 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.

305. After completion of the project, it 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. 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.

306. 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 **Figure 7.2**.

Figure 7.2: Organogram of NTDC Environment and Social Impact Cell



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

308. The ESIC is composed of one Manager, one Deputy Manager, and two Assistant Managers (refer to **Figure 7.2**). 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 and social and ecological impact mitigation. It is recommended that an environmental specialist will be made part of team of supervisory consultants for effective monitoring of EMP provisions.

309. The duties of the ESIC include but will not be 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 document 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 monthly/quarterly progress report on environmental and social safeguards for submission to financing agencies.
- 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 Sindh EPA

7.4 Environmental and Social Monitoring by ESIC

310. 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 sub-station 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.

311. The pre-construction Environmental Monitoring Plan is provided as **Table 7.2** and the Environmental Monitoring Plan is provided as **Table 7.3** below.

7.5 Environmental Training

7.5.1 Capacity Building and Training

312. Capacity building and training programs are necessary for the project staff in order to control the negative impacts resulting from the project construction and during its operation phase. They will also require trainings on monitoring and inspecting of such a project for environmental impacts and for implementation of mitigation measures.

313. The details of this capacity building and training program are presented in the **Table 7.4** below.

Table 7.2: Pre-Construction Environmental Monitoring Plan for Baseline Development

Parameter to be measured	Objective of Monitoring	Parameters to be Monitored	Measurements	Location	Frequency	Responsibility
Ambient Air Quality	To establish baseline air quality levels	CO,NO_x & PM_{10} (particulate matter smaller than 10 microns) concentration at receptor level	1-hr concentration levels	At any three random project sites	Once	ESIC
Ambient Noise	To establish baseline noise levels	Ambient noise level near receptors at project site	1-hr concentration levels	At any three random project sites	Once	ESIC
Safety of Workers and Community members	To minimize risk of hazards and accidents by ensuring only trained and certified personnel with experience of high voltage and working at height are employed to undertake this work.	Review and verify profiles of workers to be engaged for project and ensure they possess relevant credentials and experience	Verification of relevant skills and experience	At time of hiring of staff	Once	ESIC & Contractor

Table 7.3: Environmental Monitoring Plan

FOR TRANSMISSION LINE

Environmental concern	Performance indicator	Frequency to monitor	Timing to check	Locations to implement	Responsible to implement	Resp supervision
Construction Phase for TL						
1. Encroachment and Physical Disfiguration	Landscape Conditions, Baseline Environment	Once (update monthly as necessary)	One Month after Construction Work	All NTDC'S alignment	Contractor	NTDC, ESIC cell
2. Soil Erosion	Soil Compression, Land Clearing, Vegetation Removal	Once (update monthly as necessary)	Prior to construction. Update monthly	All NTDC'S alignment	Contractor	NTDC, ESIC cell
3. Soil Contamination	Fuels Spillage, Chemicals Containers	Monthly	During Construction	All NTDC'S alignment	Contractor	NTDC, ESIC cell
4. Ecological Resources	Land Clearing, Habitat destruction	Monthly	Update monthly	All NTDC'S alignment	Contractor	NTDC, ESIC cell
5. Loss of Barani Crops	Number of People affected due to unavailability of Opportunistic Agriculture	Once (update monthly as necessary)	During Construction	All NTDC'S alignment	Contractor	NTDC, ESIC cell
6. Local Community Work Force	Disturbance due to Stringing, Good engineering practices adopted	Once (update monthly as necessary)	Update monthly	All NTDC'S alignment	Contractor	NTDC, ESIC cell

Environmental concern	Performance indicator	Frequency to monitor	Timing to check	Locations to implement	Responsible to implement	Resp supervision
7. Safety Hazards	Zero near miss, minor, major and fatal accidents	Monthly	Update monthly	All NTDC'S alignment	Contractor	NTDC, ESIC
8. Noise	Most stringent noise standards at nearest receptor to works.	Once every three months on a typical working day	1-hr concentration levels	At any three random project sites	Contractor's Environmental officer	NTDC, ESIC
Operational Phase for TL						
1. Electric Current	Earthing of the Towers, Safety Plan by the contractor to be followed	Monthly	During Operation	All NTDC'S alignment	Contractor	NTDC, ESIC Cell
2. Breaking of Conductors	Frequency of Conductors Tripping, Complaints reported	Quarterly	Throughout the Project	All NTDC'S alignment	Contractor	NTDC, ESIC Cell
3. Towers Collapse	Soil Geology, Climatic Conditions, Records on displacement (if any)	Six Monthly	During Implementation Phase	All NTDC'S alignment	Contractor	NTDC, ESIC Cell
4. Avifauna Movement	Reported death of Birds, Audit Report by the ESIC cell	Quarterly	After Transmission Line is erected	All NTDC'S alignment	Contractor	NTDC, ESIC Cell

Environmental concern	Performance indicator	Frequency to monitor	Timing to check	Locations to implement	Responsible to implement	Resp supervision
5. Safety	Security Plan, Good Engineering Practices, Complaints on the Register	Quarterly	During Operational Phase	All NTDC'S alignment	Contractor	NTDC, ESIC Cell
6. Monitoring of EMF levels post optic fiber installation	No over exposure to EMF by community members or workers	Once every three months on a typical working day	During Operational Phase	All NTDC'S alignment	Contractor	NTDC, ESIC Cell

Note: *LAFC = Land Acquisition Compensation Fixation Committee. RAP, SIA and other engineering considerations may change, EIA=environmental impact Assessment. EPA= Environmental Protection Agency. ADB * = ADB checks that processes have been completed and signed off by NTDC's before moving to construction stage. MoFSC = Ministry of Forest and Soil Conservation.*

ESIC = Environmental and Social Impact Cell (NTDC)

Table 7.4: Capacity Development and Training Programme for Project Contractor(s)

Provided by	Organized by	Contents	Target Audience	Venue	Duration
Pre-construction Phase NTDC offering specialized services in environmental management and monitoring	Project Director	Short seminars and courses on: Environmental Management Plan and Environmental Monitoring Plan	Contractor staff	NTDC ESIC Office	One day long training seminar
Construction Phase NTDC offering specialized services in social management and monitoring	Project Director	Short seminar on Environmental risks associated with construction phase. Development of Environmental Performance Indicators Occupational Health and Safety (OHS) issues	Contractor staff	NTDC ESIC Office	One day long training seminar

7.6 Estimated Environmental and Social Management Costs

314. The **Table 7.5** below provides the estimated costs for the compensation of trees damages and implementation of EMP. The compensation costs include the costs for cutting of trees due to construction of sub-project. It should be noted that as referred earlier, 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.

315. The cost for implementation of mitigation measures prescribed in Environmental Management Plan (EMP) has also been given. The mitigation measures include; water sprinkling, provision of PPEs to workers, arrangement of first aid kits at site, waste management etc.

316. The total estimated cost for the environmental and social management comes to about **PKR 7,245,000**. This includes the cost of environmental implementation of mitigation measure. Cost estimates of mitigation and other environmental management measures are summarized in **Table 7.5** below.

Table 7.5: Estimated Environmental and Social Management Costs

Particulars	Details	Total Cost (PKR)
Contractor Staffing, audit and monitoring	1 person for 2.5 years1	1,800,000
Monitoring activities	As detailed under EMP2	500,000
Mitigation measures	As prescribed under EMP and IEE3	1,900,000
	(i) Water Sprinkling	800,000
	(ii) Tree replanting	500,000
	(iii) Provision of PPEs	300,000
	(iv) Waste Management	300,000
Transport	1 dedicated vehicle 2.5 years4	2,700,000
Contingency	5% contingency	345,000
	Total	**7,245,000**

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.

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

[4] @ PKR 90,000 per month rental charges and fuel and operating cost.

7.7 Grievance Redressal Mechanism

317. This section describes mechanism to receive and facilitates the resolution of affected party including women' concerns and grievances. A grievance mechanism will be available to allow an AP appealing any disagreeable decision, practice or activity arising from land or other assets compensation. APs will be fully informed of their rights and of the procedures for addressing complaints whether verbally or in writing during consultation, survey and time of compensation.

318. The grievance redress procedure will comply with the requirements of ADB SPS (2009) in addressing people's concerns and complaints promptly and in a transparent manner as shown in **Figures 7.3** and **7.4** below.

319. APs/ local community will enter their complaints/ concerns and issues formally including the information of date, name and address of complainant as well as the description of the complain. The Assistant Manager (social mobilization) at PIU will maintain a register named as "community complaint register (CCR)". The register will include the information as date, name and address of complainant, description of complaints and will enter the complaints in a date covering the minimum information of name and address of complaint, description of complaints, action taken, status of redress of complaints and reasons in case the issue is not resolved.

320. GRC will work at field level, while unsettled issues will be referred to the PMU at sub-project level. The field level PIU (AM Environment) will inform the affected persons about GRC and its mechanism by passing the information at known places.

321. Efforts will be made to avoid the APs/ community concerns by implementing the sub-project in accordance with the EMP, i.e. proper information disclosure, community consultations, payments as per entitlements and coordination with APs/ APC, PIU and PMU. However, a Grievance Redress Committees (GRC) will also be established to redress the unresolved issues. The composition of GRC will be as provided below:

GRC at PIU Level

- Executive Engineer (NTDC)
- Representative of E&SIC (Assistant Manager (Social Mobilization)
- Representative of CSC
- Representative of Contractor
- Representatives of Affected Person Committee (APC) including Nazim/Village Notable person
- A comprehensive grievance redress process regarding land compensation and other compensation is described below.

Table 7.6: Grievance Redress Process

Land / Crop Compensation Issues	Other Environmental and Social Issues
• First, complaints will be redressed at field level through the involvement of PIU and APC as well as other local committees.	• First, complaints will be redressed at field level through the involvement of PIU and APC as well as other local committees.
• If issue is unresolved, then it will be lodged to the DO (Revenue)/ LAC who will have 14 days to make decision on it.	• If no solution is accomplished, then grievance will be lodged to GRC. • The GRC will provide the decision within 3 weeks. The GRC decision must be in compliance with this EMP and provisions given in the EMP.
• If issue still unsettled, then grievance will be forwarded to GRC. • GRC will provide decision within 3 weeks, which should be in compliance with the EMP and provisions given in the EMP.	• If the grievance redress system does not satisfy the APs, then, the grievance can be submitted to the GM Projects (PMU), where decision will be made in a period of 2 weeks.
• In case, the grievance redress system does not satisfy the APs, then they can pursue by submitting their case to the appropriate court of law.	• If still APs are not satisfied, they can pursue their case to appropriate Court of law.

GRM – Preconstruction Phase

322. During the pre-construction phase of the project, the most likely grievances that may be encountered involve land acquisition and compensation.

323. The mechanism shall comply with land acquisition, land use right implementation, compensation, allowances, resettlement sequences and procedures provided in the LARP of this project in accordance with national and provincial laws and regulations. In general, the grievance redress mechanism of the project during the pre-construction phase shall observe the following steps and outlined in **Figure 7.3** below:

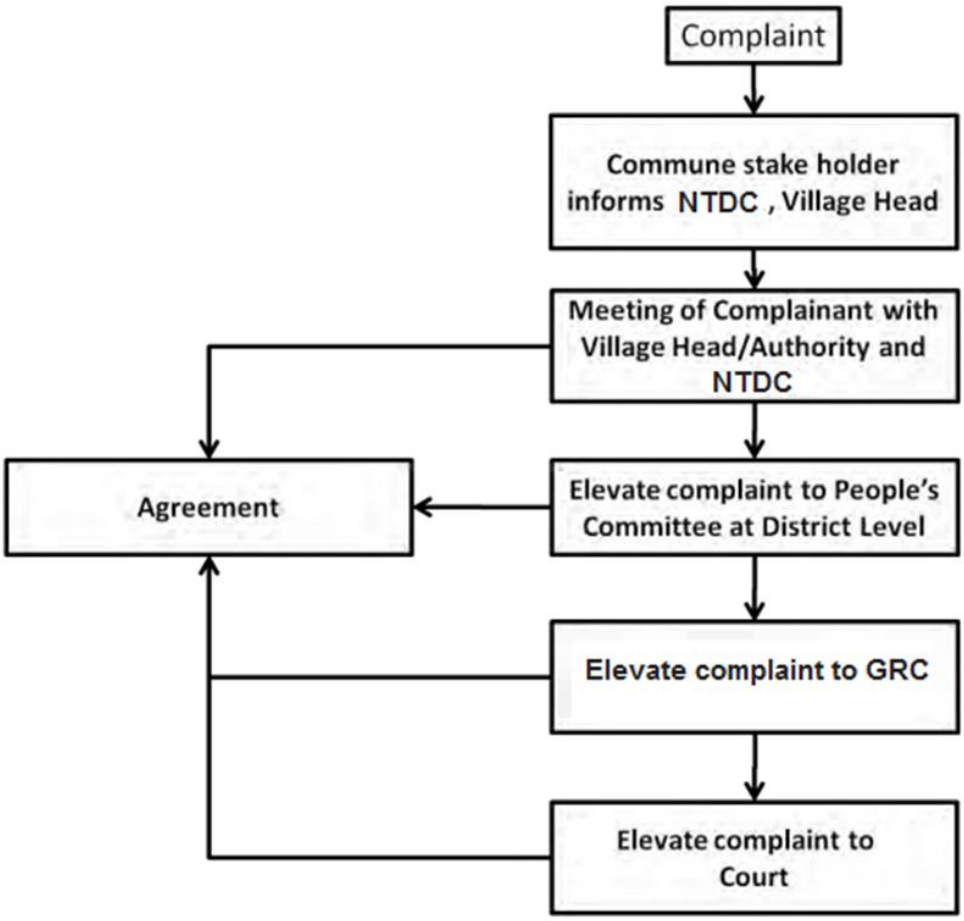
Step 1: The project affected person informs the village head and NTDC about his/her concerns on the project. A meeting at the community level will be conducted to discuss the concerns of the complainant.

Step 2: If the project affected person is not satisfied with the resolution of the complaint at the community level, he/she can submit a complaint to the district officer Revenue/LAC at the district level.

Step 3: If the affected person does not agree with the administrative action or decision of the district level, the affected person can elevate the complaint to the GRC.

Step 4: If the affected person is still not satisfied with the decision of the GRC, the complaint is sent to the Court. The decision of the Court becomes the final legal basis for the implementation of the compensation.

Figure 7.3: Grievance Redress Procedure during the Pre-Construction Phase



GRM - Construction and Operational Phases

324. Grievances during construction may also include impacts related to physical construction works on the towers and sub-station and the site clearing activities. During the operational phase of the project, the complaints that may be anticipated are related to maintenance activities of the connection lines and facilities.

Step 1: A complainant may send his/her concerns about the construction or operation of the project to NTDS or the construction contractor and the head of the commune. Immediate action on the complaint is expected from the contractor or the NTDC on the concern raised by the complainant. The resolution of the complaint should be done within two weeks.

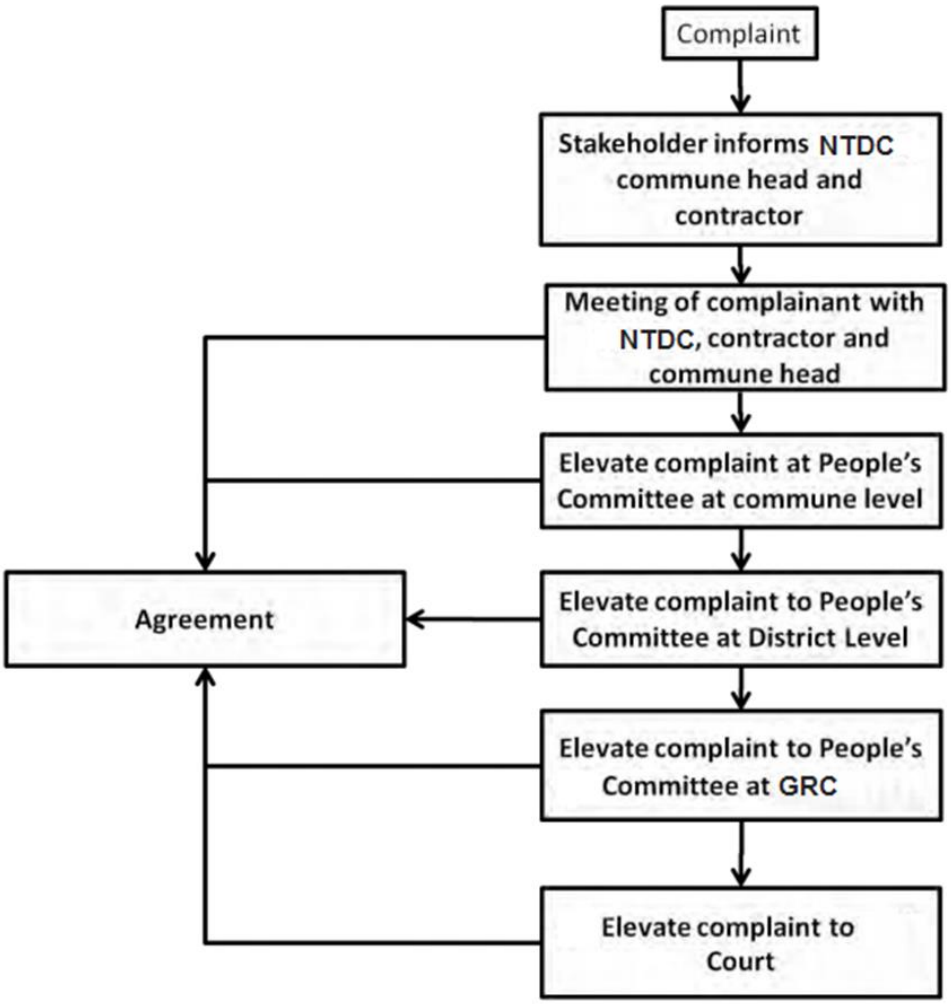
Step 2: When the complainant is not satisfied with the action or decision of the NTDS or the contractor, the complainant can inform the head of the community about the matter. The community head/authority through the Commune People's Committee will then call a meeting of the complainant, NTDS, and contractor to resolve the complainant.

Step 3: When the complainant is not satisfied with the action or decision on the complaint, it the then elevated to the district level for resolution.

Step 4: Complaints not resolved at the district level is elevated to the People's Committee at the GRC level for resolution.

Step 5: When the complaint is not resolved at the People's Committee at the GRC, the complaint is then elevated to the Court. The decision of the Court becomes the final legal basis for the decision on the complaint.

Figure 7.4: Grievance Redress Procedure during the Construction and Operational Phases



8 Conclusion and Recommendations

8.1 Conclusions

325. Based on the preliminary plans, environmental and social field surveys, and impact assessment of the proposed sub-project, it may be concluded that there are insignificant, short term and reversible impacts of the project. The major impacts of the project are summarized as follows:

- No acquisition of permanent land will be involved for erection of towers for transmission line as per Telegraphy Act, 1910. However, the payments for the loss of trees and crops will be made as per market rates.
- All the other impacts such as soil erosion, soil contamination, water contamination, air pollution, high noise level, etc. are of temporary nature and can be controlled and mitigated.
- No protected forest area or wildlife sanctuary or any other environmentally sensitive site exists along the Project corridor, which may be affected by the Project.
- No indigenous people and women headed households have been identified in the Project.
- The other social issues such as safety of general public and workers, security problems, risk of communicable diseases, vector borne diseases etc. are of temporary nature.
- Most of the above impacts are of temporary nature and manageable through good engineering practices and none of these are irreversible.
- A comprehensive EMP has been developed identifying the impacts, mitigation measures, agencies responsible for implementation and monitoring of the proposed measures. EMP also describes the environmental and social monitoring responsibilities of ESIC.
- The total estimated cost for the environmental and social management comes to about PKR 7,245,000.

326. In the light of the above discussions, it may be concluded that the proposed preliminary project route is environmentally friendly and will cause the least effects on the area's existing social and environmental settings.

8.2 Recommendations

327. Comprehensive mitigation measures have been proposed in the report to minimize the negative impacts and to enhance the positive impacts of the project. However, major recommended mitigation measures are summarized as follows:

- Temporary labor camps will be developed inside the grid station boundary and will be facilitated with proper drainage facilities.

- Soil erosion and contamination, water contamination, air pollution and high noise levels will be controlled with the use of good engineering practices.
- Contractor will develop plans such as traffic management, solid waste management and material management etc. before starting the construction activities.
- Fair and negotiated compensation in accordance with the prevailing market prices will be made for loss of crops and trees during the construction activities of the project.
- Erection of towers in the water bodies will be avoided as far as possible. However, at places where realignment of the transmission line is unavoidable, towers with the maximum span will be used to minimize the number of towers in the water body.
- Contractor(s) will 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 community, particularly women considering their peak movement hours.
- Contractor will take due care of the local community and its sensitivity towards local customs and traditions.
- EMP proposed in **Chapter 7** will be implemented in true letter and spirit.

ANNEXURES

Annexure-I: REA 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 1: 220 kV Mirpur Khas Sub-station with Transmission Line

Sector Division: Power Transmission

SCREENING QUESTIONS	Yes	No	REMARKS
A. Project Siting Is the Project area adjacent to or within any of the following environmentally sensitive areas?			
▪ Cultural heritage site	☐	☒	No cultural heritage site near the project corridor.
▪ Protected Area	☐	☒	No protected site near the project corridor.
▪ Wetland	☐	☒	
▪ Mangrove	☐	☒	
▪ Estuarine	☐	☒	
▪ Buffer zone of protected area	☐	☒	
▪ Special area for protecting biodiversity	☐	☒	
B. Potential Environmental Impacts Will the Project cause…			

SCREENING QUESTIONS	Yes	No	REMARKS
▪ encroachment on historical/cultural areas, disfiguration of landscape and increased waste generation?	☒	☐	No impact on historical site, but landscape will be disrupted and waste will be generated. That will be managed by implementation of EMMP
▪ encroachment on precious ecosystem (e.g. sensitive or protected areas)?	☐	☒	
▪ 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?	☒	☐	The impact will be minimum and limited to the tower foundation sites. The appropriate mitigation measures will be built into the EMP to address this impact.
▪ damage to sensitive coastal/marine habitats by construction of submarine cables?	☐	☒	Such activities are not involved in proposed project.
▪ deterioration of surface water quality due to silt runoff, sanitary wastes from worker-based camps and chemicals used in construction?	☒	☐	As per EMP provisions, respective mitigation measure will be followed.
▪ increased local air pollution due to rock crushing, cutting and filling?	☒	☐	Appropriate mitigation measure 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?	☒	☐	The impacts will be short term and will be observed only in construction phase. Respective mitigation measures will be adopted to minimize the impact.
▪ chemical pollution resulting from chemical clearing of vegetation for construction site?	☐	☒	NTDC does not use any chemical for vegetation removal.
▪ noise and vibration due to blasting and other civil works?	☒		Blasting will not be involved, but the noise and vibration will be generated during construction phase by heavy machinery. These impacts will be occur, even though it will be mitigated by implementing the Environment Management Plan.
▪ dislocation or involuntary resettlement of people?	☐	☒	
▪ disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable groups?	☐	☒	
▪ social conflicts relating to inconveniences in living conditions where construction interferes with pre-existing roads?	☒	☐	Contractors will be strictly advised not to interfere the local community resources.
▪ hazardous driving conditions where construction interferes with pre-existing roads?	☒	☐	The drivers will be advised to keep the speed below 30km/hr. and traffic planning to avoid hazardous circumstances.
▪ creation of temporary breeding habitats for vectors of disease such as mosquitoes and	☒	☐	This impact can be minimized by proper waste management and other

SCREENING QUESTIONS	Yes	No	REMARKS
rodents?			remedial measures.
▪ dislocation and compulsory resettlement of people living in right-of-way of the power transmission lines?	☐	☒	
▪ environmental disturbances associated with the maintenance of lines (e.g. routine control of vegetative height under the lines)?	☒	☐	Properly control the vegetative growth during operation phase with due consideration of environmental protocols.
▪ facilitation of access to protected areas in case corridors traverse protected areas?	☐	☐	There is no protected area is nearby the project corridor**.**
▪ disturbances (e.g. noise and chemical pollutants) if herbicides are used to control vegetative height?	☐	☒	NTDC does not use any herbicide for 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)?	☐	☒	It may not likely be happened, as the line passes mostly away from population, more over the contractor will advised for proper care to avoid social conflict.
▪ social conflicts if workers from other regions or countries are hired?	☐	☒	It will not likely be happened, as mostly the local labor is hired.
▪ poor sanitation and solid waste disposal in construction camps and work sites, and possible transmission of communicable diseases from workers to local populations?	☒	☐	These impacts will be mitigated by proper implementation of EMP provisions regarding health, safety, waste management and sanitation protocols.
▪ risks to community safety associated with maintenance of lines and related facilities?	☒	☐	Community associated safety safeguards are considered during operation phase.
▪ community health hazards due to electromagnetic fields, land subsidence, lowered groundwater table, and salinization?	☐	☒	Al ready considered in the feasibility/design stage.
▪ 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?	☒	☐	Explosive material will not be used, but other materials like fuel, oil etc. will be kept in the construction camps only. Transport and disposal of such materials will be according to protective measures given in EMP. Therefore, risk to community health and safety is manageable by maintaining H&S protocols.
▪ 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?	☒	☐	These impacts will be mitigated by implementing EMP provisions during all the stages of project implementation.

Annexure II - SURVEY QUESTIONNAIRE

Village Profile Survey *(220 KV DC T. LINE FROM 500 KV FAISAL ABAD WEST TO 220 KV LALIAN NEW SUBSTATION)*

آپ کے گاؤں میں درج ذیل میں سے کون سے لوگ معتبر/صاحب رسوخ 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 اور قدرتی وسائل کے استعمال سے متعلق معاملات/تنازعہ درج ذیل میں سے کونسے طریقوں سے حل کیے 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 درج ذیل نوعیت کے کونسے بڑے مسائل ہیں؟

Sr.No	Types of Problems	Proposed Solutions

Village Profile Survey *(220 KV DC T. LINE FROM 500 KV FAISAL ABAD WEST TO 220 KV LALIAN NEW SUBSTATION)*

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 کونسے قبیلے ہیں نام بتائیں؟

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

Village Profile Survey *(220 KV DC T. LINE FROM 500 KV FAISAL ABAD WEST TO 220 KV LALIAN NEW SUBSTATION)*

Comments of the Interviewer انٹرویو کرنے والے کی اپنی رائے

— END —

Village Profile Survey *(220 KV DC T. LINE FROM 500 KV FAISAL ABAD WEST TO 220 KV LALIAN NEW SUBSTATION)*

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					

Village Profile Survey *(220 KV DC T. LINE FROM 500 KV FAISAL ABAD WEST TO 220 KV LALIAN NEW SUBSTATION)*

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 درج ذیل میں سے کونسی زندگی کی طرز سہولیات 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

Village Profile Survey *(220 KV DC T. LINE FROM 500 KV FAISAL ABAD WEST TO 220 KV LALIAN NEW SUBSTATION)*

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?

1. Yes ☐ 2. No ☐ کیا آپ کے گاؤں میں بچے کی پیدائش کے لیے دائی موجود ہے؟

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؟ براہ مہربانی اُن کے نام بتائیں؟

1. _____
2. _____
3. _____

Village Profile Survey *(220 KV DC T. LINE FROM 500 KV FAISAL ABAD WEST TO 220 KV LALIAN NEW SUBSTATION)*

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 کن 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?

Village Profile Survey *(220 KV DC T. LINE FROM 500 KV FAISAL ABAD WEST TO 220 KV LALIAN NEW SUBSTATION)*

A		
B		
C		
D		
E		
F		

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

کیا آپ کے گاؤں میں ماضی قدیم سے متعلق یادگاریں/مقامات/اشیاء 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؟

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Annexure III - PUBLIC CONSULTATION

Sr. No	Participant Name	Village	Remarks/Concerns
1	Shafi Mohammad s/o Allah Dina Mohammad Yousaf s/o Mohammad Damin 0305 3918184 Mohammad Ali s/o Ghulam Mohsan Wahid s/o Mohammad Ali Wadero s/o Khawal Bahish Keri Bahish s/o Johejo	Rahoki	There were no major or serious concerns regarding the T/L project. Some of the general concerns of participants are as follows: In case of land acquisition, compensation should be according to the will of the locals/ stakeholders. During construction phase, labor and general workers should be inducted from the adjoining villages/areas. Preference will be given to locals during hiring of staff in operational phase. All in all, the stakeholders were in favor of this project.
2	Mohammad Ajan s/o Din Mohammad 0306 9197054 Karim Bahish s/o Sakindar Mokaram Khan s/o Lashari Mohammad Hasham Wadera Ali Raza Lashari Nabi Bahish Lashari Nazim Haji Badar Mohammad	Lashari	
3	Javed Khan Saifullah Khan Wali Mohammad Ashraf Tendojam Ghulam Mustafa Mohammad Hassan	Hasan Khan Thoro	
4	Shahid Ali Shah s/o Pir Ashraf 0303 3003879 Alli Dino s/o Sawan Ali Nawaz s/o Mohammad Yousaf Wajid Ali s/o Abdul Haq Haji Hair Mohammad s/o Ghulam Hasan Khokhar Manzoor Ali Batijo s/o Bakhtawar Khan Mohammad Younis s/o Derwesh Memon	Bukera	
5	Haji Hair Mohammad Khokher s/o Haji Mohammad Khan Abdullah S/O Loweng Mohammad Usman s/o Mohammad Ayub 0312 3160819 Mir Mohammad Khokhar s/o Haji Ghulam Hasan Habib s/o Chino Mohammad Dilbar s/o Siandad	Khokhar	

Sr. No	Participant Name	Village	Remarks/Concerns
6	Mohammad Ali Palai s/o Haji Buchin Palai Mir Allah Nawaz s/o Mir Nawaz Mohammad Nazim Jalil Dar Qadir Bahish s/o Mohammad Bahish Imdad Ali s/o Karim Bahish Ghulam Mohammad s/o Mohammad Khan 0301 3620351 Altaf s/o Haji Imdad Paput s/o Khora Rashid s/o Qader Bahish	Pak Singaar	
7	Majid s/o Qasim Abdul Razaq s/o Haji Sinjeno Misri s/o Ahmad Khan Faisal Karim s/o Karam Dad 0333 4119505 Sian Misri s/o Ahmad Raja s/o Ali Mohammad Alam Khan	Jerwer	
8	Nazim Ali Mohammad Lughario Ijaz Ali s/o Qurban Ali 0314 2615206 Ali Muraz s/o Azizullah Sardar s/o Abdul Karim Mohamad Ibraheem s/o Wacho Khan Mukhtiar Lughari s/o Jan Mohammad Makhdum Ali s/o Jan Mohammad Lashari Mohammad Sharif	Missan	
9	Nabi Bahish s/o Mohammad Suleman Haji Majon s/o Sher Mohammad Shafi Mohammad s/o Haji Sobat Mohammad Ayub s/o Farid Mohammad Zulfiqar Mohammad s/o Arif Din 0324 3583110 Tarra s/o Rattan Umaid Ali s/o Mitho Mahboob Ali s/o Bachina	Dolat Lughari	

Annexure-IV: PHOTOLOG

Meeting with Divisional Forest Officer (Direction Division) Mr Niaz Ahmad and Divisional Forest Officer Planning Sind Mr Amjad Ali Shah

Meeting with District Officer Agriculture Hyderabad

Meeting with Deputy Director EPA, Mr Muneer Ahmad Abbasi

Meeting with Project Director NTDC Hyderabad Mr Fareed Ahmad Sidique


آفیس یونین


گورنمينٽ گرلس پرائمري اسڪول

Annexure-V: BROCHURE

ماحولیاتی انتظامی منصوبہ برائے بجلی گھر / ترسیلاتی لائن (گرڈ سٹیشن /ٹرانسمیشن لائنز)					
نمبر شمار	متوقع ماحولیاتی اثرات	طریقہ ہائے تدارک	ذرائع تدارک	لاگو کنندہ محکمہ / ادارہ	نگرانی
		دوران تعمیر			
1.	پراجیکٹ کے بارے میں لوگوں کو آگاہی	مقامی آبادی کو پراجیکٹ شروع کرنے سے پہلے آگاہ کرنا کہ: • پراجیکٹ کی تعمیر سے کیا فوائد ہونگے • دوران تعمیر کونسے عارضی نقصانات ہونگے	محتاط نگرانی کرنا	کنسلٹنٹ کا ماحولیاتی ماہر	این-ٹی-ڈی-سی
2.	پراجیکٹ سے مقامی آبادی اور متاثرہ لوگوں کی شکایات کا ازالہ	شکایات کے ازالہ کے لیئے مقامی/متاثرہ اور پراجیکٹ پر مشتمل کمیٹی کا قیام	محتاط نگرانی	کنسلٹنٹ/ این-ٹی-ڈی-سی	این-ٹی-ڈی-سی
3.	شکایات ازالہ کمیٹی کے کام کرنے کا طریقہ کار	• سب سے پہلے شکایت مقامی طور پر متاثرہ فرد/افراد اور انتظامیہ حل کرے گی • شکایت مقامی طور پر حل نا ہونے کی صورت میں متاثرہ فرد/افراد شکایت ازالہ کمیٹی کے پاس جائے گا • شکایت ازالہ کمیٹی 3 ہفتہ کے اندر حل کرے گی جبکہ ماحولیاتی انتظامی منصوبے کے عین مطابق ہوگا • متاثرہ فرد/افراد کی تسلی نا ہونے کی صورت میں پراجیکٹ منیجر کو شکایت کی جائے گی جبکہ دو (2) ہفتہ میں فیصلہ کرے گا • اگر پھر بھی متاثرہ شخص کی تسلی نہ ہو تو وہ دادرسی کے لیئے مقامی عدالت میں جا سکتا ہے	محتاط نگرانی متاثرہ آبادی، پراجیکٹ انتظامیہ، ٹھیکیدار اور کنسلٹنٹ کے نمائندوں پر مشتمل کمیٹی کا قیام	کنسلٹنٹ/ پراجیکٹ انتظامیہ	پراجیکٹ انتظامیہ
4.	آمدورفت کی گزرگاہ کی بہتری، ڈھلوان کی وجہ سے زمینی کٹاؤ اور منصوبہ کے مختلف مراحل کا جائزہ	زمینی کٹاؤ کو کم کرنے کے لیئے پانی کے بہاؤ کے صحیح راستے بنانا	محتاط نگرانی	ٹھیکیدار اور ماحولیاتی انجینیئر	این-ٹی-ڈی-سی
5.	ریت مٹی پتھر وغیرہ کی وجہ سے سطح زمین کا غیر ہموار یا خراب ہونا	• مٹی، ریت اور پتھر وغیرہ صرف ہنجر، فالتو زمین یا دریا سے لیئے جائیں • پیداواری زمین کی ہر حال میں حفاظت • مٹی، ریت اور پتھر کے حصول کے بعد متاثرہ جگہوں کی ہمواری	محتاط نگرانی/ ٹھیکہ میں ماحولیاتی نگرانی کی شرائط کا اندراج	ٹھیکیدار اور ماحولیاتی انجینیئر	این-ٹی-ڈی-سی
6.	تعمیراتی سامان کے حصول کی جگہ کا جائزہ	• تعمیراتی سامان کے حصول کی جگہ لائسنس یافتہ ہو • نئی جگہ سے تعمیراتی سامان لینے سے پہلے محکمہ کی باقاعدہ اجازت درکار ہو گی	محتاط نگرانی	ٹھیکیدار اور ماحولیاتی انجینیئر	این-ٹی-ڈی-سی
7.	تعمیراتی سامان کا جائزہ، دوران تعمیر پانی کی ترسیل اور آلودگی کا جائزہ	• پٹرول اور موبل آئل وغیرہ کو پانی کے ذریعے سے دور رکھنا اور سامان کی مکمل حفاظت • پانی کے ذرائع کی مکمل حفاظت • فالتو اور خارج سامان کو مناسب طریقے سے محفوظ جگہ پر ٹھکانے لگایا جائے	محتاط نگرانی/ معاہدے کی شرائط کے مطابق	کنسلٹنٹ	این-ٹی-ڈی-سی
8.	دوران تعمیر نکاسی آب کے مسائل	بارش کے پانی کی درست نکاسی اور اور نقصان کی صورت میں دوبارہ تعمیر	محتاط نگرانی	کنسلٹنٹ/ ٹھیکیدار	این-ٹی-ڈی-سی
9.	رہائشی کالونی اور کیمپ کے سماجی اثرات اور کوڑا نمٹائی کے ماحولیاتی اثرات کا جائزہ	• مزدوروں اور پروجیکٹ سے وابستہ دیگر افراد کی رہائش مقامہ آبادی سے دور ہونی چاہیئے • رہائشی مقامات پر نکاسی آب اور کوڑا نمٹائی کا مناسب انتظام موجود ہو	محتاط نگرانی	کنسلٹنٹ/ ٹھیکیدار	این-ٹی-ڈی-سی

ماحولیاتی انتظامی منصوبہ برائے بجلی گھر / ترسیلاتی تاریں (گرڈ سٹیشن /ٹرانسمیشن لائنز)					
نمبر شمار	متوقع ماحولیاتی اثرات	طریقہ ہائے تدارک	ذرائع تدارک	لاگو کنندہ محکمہ / ادارہ	نگرانی
دورانِ تعمیر					
10.	دوران تعمیر استعمال ہونے والی گاڑیوں سے فضائی آلودگی کے اثرات	• مذکورہ گاڑیوں اور سامان سے آلودگی پاکستان کے ادارہ ماحولیات کے متعین کردہ معیار کے مطابق ہو • آلودگی کی مکمل نگرانی کی جائے	محتاط نگرانی	کنسلٹنٹ / ٹھیکیدار	محکمہ ماحولیات
11.	گرد و غبار کی وجہ سے عمومی صحت پر اثرات	• کرش اور کنکریٹ پلانٹ آبادی سے دور ہو • گرد و غبار سے بچنے کے لیئے مواتر پانی کا چھڑکاؤ اور سامان کی گاڑیوں کو ڈھکنا وغیرہ	محتاط نگرانی	کنسلٹنٹ / ٹھیکیدار	محکمہ ماحولیات
12.	گاڑیوں، تعمیراتی کام سے ہونے والے شور کا جائزہ	• تمام تعمیراتی مشینری کا شور آلودگی پاکستان کے ادارہ ماحولیات کے متعین کردہ معیار کے مطابق ہو جبکہ تمام گاڑیوں میں شور کم کرنے کا آلہ نصب ہو • تمام مزدوروں کو شور سے بچاؤ کے آلات دیے جائیں	محتاط نگرانی	کنسلٹنٹ / ٹھیکیدار	محکمہ ماحولیات
13.	منصوبہ کے مختلف مراحل میں بارود کے اثرات کا جائزہ	• بارودی کام پاکستانی قانون کے مطابق ہو • نزدیکی باسیوں کو پہلے سے مطلع کیا جائے • متعلقہ مزدوروں کو ذاتی حفاظت اور بچاؤ کے آلات کی فراہمی کو یقینی بنایا جائے	محتاط منصوبہ بندی	کنسلٹنٹ / ٹھیکیدار	محکمہ ماحولیات
14.	تعمیراتی کاموں کے درخت اور دیگر نباتات پر ممکنہ منفی اثرات	• کوئی بھی پودا محکمہ جنگلات کی منظوری کے بغیر نا کاٹا جائے • کاٹے جانے والے درخت کا معاوضہ ادا کیا جائے اور نئے پودے لگائے جائیں	محتاط منصوبہ بندی	کنسلٹنٹ / ٹھیکیدار	محکمہ ماحولیات
15.	تعمیراتی کاموں کے جنگلی حیات پر ممکنہ منفی اثرات	مزدوروں کو جنگلی حیات کی حفاظت کی تربیت دینا، نیز شکار پر مکمل پابندی	محتاط منصوبہ بندی اور نگرانی	کنسلٹنٹ / ٹھیکیدار	محکمہ ماحولیات
16.	تعمیراتی کاموں کے ممکنہ حادثات	• کام کی جگہوں پر حفاظتی تختیاں نصب کرنا • مزدوروں کو ہیلمٹ، ماسک اور حفاظتی عینکیں، دستانے اور جوتے مہیا کرنا • ابتدائی طبی امداد کا انتظام اور مزدوروں کی تربیت • ٹریفک کا ڈھنگ انتظام کرنا نیز ذرایوروں کی حفاظتی تربیت • تمام احتیاطی تدابیر کی عام لوگوں اور مقامی آبادی میں تشہیر، جگہوں کی نشاندہی اور ممکنہ خطرات سے آگاہی	محتاط نگرانی	کنسلٹنٹ / ٹھیکیدار	محکمہ ماحولیات
17.	تعمیراتی کاموں کا عوام کے استعمال کے ذرائع کو ممکنہ نقصان	• عام عوام کے استعمال کے ذرائع، ترسیل آب و نکاسی آب کی نالیوں، ٹیلیفون لائن، بجلی کے پول بچانا لازم ہے۔ • اگر تبدیل کرنا ضروری ہو تو مقامی/رہائشی آبادی سے مشورہ کیا جائے	محتاط نگرانی	کنسلٹنٹ / ٹھیکیدار	محکمہ ماحولیات
بعد تعمیر (منصوبہ کے چلنے کی حالت میں)					
18.	زیادہ ڈھلوانی علاقے میں زمین کا کٹاؤ اور نباتات کی کمی	درختوں اور دیگر نباتات کی مکمل حفاظت ، نئے پودے لگانا	صوبہ کے محکمہ جنگلات کے تعاون سے	این-ٹی-ڈی-سی	این-ٹی-ڈی-سی

Annexure VI – Archaeological Chance Find Procedures

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 to high 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, including the province of Sindh. 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 GoS 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, GoS, 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:

- Workers will be trained in the location of heritage zones within the construction area and in the identification of potential items of heritage significance.
- Should any potential items be located, the site supervisor will be immediately contacted and work will be temporarily stopped in that area.
- If the site supervisor determines that the item is of potential significance, an officer from the department of Archaeology (DoA), GoS will be invited to inspect the site and work will be stopped until DoA has responded to this invitation.
- 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.
- 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.