Environmental Impact Assessment of
220 kV UG Transmission Line from Lalazar to Mauripur Grid Station & 132 kV UG Transmission line from Queens Road to Old Town Grid Station

Final Report
Environmental and Social Impact Assessment
of
220 kV UG Transmission Line from Lalazar to Mauripur Grid Station & 132 kV UG Transmission line from Queens Road to Old Town Grid Station

Final Report

November, 2015
EXECUTIVE SUMMARY

This report discusses the Environmental and Socio-economic Impact Assessment of the proposed linked projects for electricity power supply infrastructure. The project is distributed in two components which includes replacement of underground transmission lines.

The first component comprises of replacement of existing 220 kV Underground cables initiating from Lalazar Grid Station located in KPT Lalazar area to ICI Bridge PLDP tower located in West Wharf area. The total route length of the line will be 4 kms.

The second component comprises of replacement of existing 132 kV Underground cables initiating from Queens Road Grid Station located in Lalazar KPT area adjacent to Lalazar Grid Station to Old Town Grid Station located in Kharadar area. The total length of the line will be 4 kms.

The project is expected to fulfill the electricity requirements of the city by improving K-Electric’s existing transmission network.

NEED OF THE PROJECT

Since the installation of these transmission networks date back to more than 20 years, the durability and life of hardware of these lines is affected resulting in reduction of electricity supply. The 220 kV Underground cables initiating from Lalazar Grid Station to ICI Bridge PLDP is identified as faulty and needs immediate replacement to avoid unnecessary power supply interruption. Meanwhile, the 132 kV Underground cables initiating from Queens Road Grid Station to Old Town Grid Station are marked as the only supply lines that provide electricity to the Old Town area and are linked to further Grid Stations ahead. Since the lines are old and defected, it might end up into a major power failure of the area which does not have any other alternative power supply source. Therefore it immediately needs too to be replaced to avoid any major power breakdowns in one of the most important areas of the city. K-Electric has therefore decided to replace these lines to ensure undisturbed electricity supply and decreased energy loss of the provisioned areas.
PROPOONENT INTRODUCTION

K-Electric, commonly referred to as KE is a Pakistani vertically integrated electric company involved in generating, transmitting and distributing power to over 2.5 million customers in Karachi and in the nearby towns of Dhaubeji and Gharo in Sindh, and Hub, Uthal, Vinder and Bela in Balochistan. It employs over 10,000 people and covers 6,500 square kilometers with industrial, commercial, agricultural and residential areas falling under its network. K-Electric has its own generation capacity of 1,652 MW, predominantly from its major Thermal Power Plants (BQPS I, BQPS II and KPC) and two Gas Engines Power Plants (SITE & Korangi), inclusive of 450 MW that has been added owing to the initiatives of the new management and the company inaugurated an additional 560 MW project in 2012.

K - Electric being a prestigious and environmentally conscious organization wants to comply with all applicable laws and therefore intends to carry out EIA of its proposed power transmission projects before commencing civil contracts.

PROJECT AREA

COMPONENT A (220 kV UG Lalazar – ICI Bridge) 220 kV Oil-filled Underground Cables will be replaced by XLPE Cables from Lalazar Grid Station located in Lalazar KPT area leading under the KPT Bridge and towards the ICI PLDP tower located in West Wharf area.

COMPONENT B (132 kV UG Queens Road – Old Town) 132 kV Underground XLPE transmission line will be replaced from Queens Road Grid Station located in Lalazar KPT area leading under the KPT Bridge towards Customs House and Old Town Grid Station in Kharadar area.

PROJECT DESCRIPTION

The ESIA study includes two components of the transmission project which are described in following sections.

Component A

This component comprises of replacement of 220 kV Underground Oil Filled Cables from Lalazar Grid Station to ICI PLDP that are out dated and which will be replaced with 1600mm² XLPE Double Circuit Underground Cables. The route will be followed as;

- The line initiate from Lalazar Grid Station located adjacent to U.S. Consulate at Mai Kolachi Road and come out parallel to the sewage drain located next to Subh-e-Nau School on M.T. Khan Road
It will run parallel till Bahria Complex II and move inwards Lalazar Area.

The line will then go directly towards Beach Luxury Hotel and divert towards Port Grand.

From there it will run parallel to railway tracks and move into West Wharf area and lead to the ICI PLDP.

**Component B**

This component comprises of an alternative replacement of 132 kV Underground cables which are going to be 800mm² XLPE Underground Cables. The route will be as follows:

- It will initiate from Queens Road Grid Station located adjacent to Lalazar Grid Station and move directly onwards M.T. Khan Road till the K.P.T. Bridge.

- It will then divert inwards the Karachi Dry Port stop of Karachi Railways and exit out on M.A. Jinnah Road.

- It will then enter at Customs House area road and move towards the Ismaili Jamat Khana.

- It will then take a diversion and revert to the Old Town Grid Station.
Transmission Line Network map

Red: 220 kV UG Lalazar Grid Station to ICI Bridge PLDP
Green: 132 kV UG Queens Road Grid Station to Old Town Grid Station
LEGISLATIVE REQUIREMENT

The ESIA of the proposed K-Electric Project activity will be subjected to the pertinent legislative and regulatory requirements of the Government of Sindh including State laws. Legislation presents a synopsis of environmental policies, legislation and other guidelines that have relevance to the proposed project.

The proposed project falls under the project category of SCHEDULE II “Transmission lines (11kV and above) and distribution projects” as per the guidelines issued by the Environmental Protection Agency - Sindh (SEPA) under the Sindh Environmental Protection Act 2014 (SEPA 2014).

According to these guidelines, projects under this category require an EIA to be conducted. The Sindh Environmental Protection Act, 2014 (SEPA 2014) is the basic legislative tool empowering the provincial government to frame regulations for the protection of the environment. The SEPA 2014 is broadly applicable to air, water, soil, marine and noise pollution. Penalties have been prescribed for those contravening the provisions of the Act.

The two primary deliberations of the Act are the conduct of projects only after approval of environmental assessments from the relevant EPA and adherence with National Environmental Quality Standards (NEQS).

Under section 17 of SEPA 2014, No proponent of a project shall commence construction or operation unless he has filed with the EPA an IEE or EIA, and has obtained from the EPA approval in respect thereof.

PHYSICAL ENVIRONMENT

The project area lies under one of the densely populated towns of Karachi. The area is completely urbanized and no natural terrains are found. However, adjacent to the Lalazar area, Chenna Creek is present which carries domestic effluents and does not have a proper drainage system. No proper ground or surface water resources were found justifiable. Moreover, the outer edge of West Wharf area almost has touch of dockyards.

BIOLOGICAL ENVIRONMENT

Data for the ESIA was gathered from both primary and secondary sources. Baseline field survey was conducted in October to November 2015. No endangered or threatened species were found within the project areas. Since the areas represent urban environment within the city premises, minimal floral habitat was found that may need special attention, the project will be carefully executed to eliminate unnecessary damage to vegetation. No need of cutting or clearance of trees was envisaged during the surveys.
SOCIOECONOMIC ENVIRONMENT

The proposed project falls under two major administrative towns of Karachi namely, Sadar Town and KPT-Lalazar. Mostly are under the management of KPT and is considered as a commercial hub rather than a residential area.

The major landmarks which lie within the close proximity of the project area and situated parallel to the proposed project are Bahria Complex, Port Grand, EFU Building, PRC Towers, KPT Building and Ismaili Jamat Khana.

The proposed project area falls under one of the busiest and most important commercial hubs of the city. It has good business systems with respect to Government as well as Private institutions, adequate health facilities and security. The area is however, thickly populated and might face issues during commissioning of the project.

IMPACT ASSESSMENT & MITIGATIONS

The transmission line project is not an air, water polluting and resource intensive project. Installation of conventional underground cables typically involves permitting, working around traffic and other surface activity, trenching, laying cable and avoiding other underground utilities, such as gas pipelines and telecommunication cables.

Construction phase impacts are usually temporary and localized phenomenon, except the permanent changes that might be introduced in the local landscape and land use patterns along the Right-of-Way. Construction of underground transmission lines may have substantially greater impacts to soils and associated resources than construction of overhead lines. However, these impacts are given due consideration, wherever applicable. The mitigations for these impacts are summarized in the Environmental Management Plan.

The construction works would require excavation of the entire length of the line, resulting in large areas of disturbance from the excavation and associated activities, such as heavy equipment use and soil storage. Ecological impacts could be increased by the greater soil disturbance, as could impacts to archeological and cultural resources. During the operation phase, most of the construction phase impacts will get stabilized and the impacts will be restricted only to the operation and maintenance of the project.
CONCLUSION

The ESIA of the proposed transmission lines project has achieved the following goals:

- Identification of national and provincial environmental regulatory requirements that apply to the proposed project activities;

- Identification of the environmental features of the project area including the physical, biological and social disturbance and likely impact of the project on the environment;

- Recommendation of appropriate mitigation measures that K-Electric will incorporate and ensure as per this ESIA into the project to minimize the adverse environmental impacts.

"If the activities are undertaken as proposed and described in this report, and the recommended mitigation measures and environmental management plan is adopted, the project will not result in any long-term or significant impacts on the local community or the physical and biological environment of the project area rather it will prove to be beneficial in many ways and contribute to development in Karachi."

## Environmental Management Plan

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Impact</th>
<th>Mitigation</th>
<th>Monitoring Parameter</th>
<th>Location</th>
<th>Frequency of Monitoring</th>
<th>Responsibility</th>
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<tbody>
<tr>
<td><strong>Air</strong></td>
<td>Chronic health effects</td>
<td>Sprinkling of water</td>
<td>Particulate Matter</td>
<td>All project locations</td>
<td>Monthly</td>
<td>Contractor K-Electric</td>
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<td>Reduced visibility on roads</td>
<td>Tuning of construction vehicles &amp; machines</td>
<td>Smoke</td>
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<td>Dust masks for laborers</td>
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<td></td>
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<td>Monitoring of vehicular emission</td>
<td>SOx</td>
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<tr>
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<td>Monitoring of Ambient Air</td>
<td>NOx</td>
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<td><strong>Noise</strong></td>
<td>Stress</td>
<td>Avoid working at night</td>
<td>Noise levels</td>
<td>Project location close to residential areas</td>
<td>Monthly</td>
<td>Contractor K-Electric</td>
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<tr>
<td></td>
<td>Hypertension</td>
<td>Lubrication of construction vehicles</td>
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<td></td>
<td>Hearing loss</td>
<td>Ear plugs</td>
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<td>Headache</td>
<td>Monitoring of Ambient Noise</td>
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<td>Monitoring of noise (near construction machinery)</td>
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<td><strong>Land and soil</strong></td>
<td>Erosion due to excavation</td>
<td>Proper backfilling and stone pitching around the excavated site if required</td>
<td>Surface topography</td>
<td>All project locations</td>
<td>Continuous</td>
<td>Contractor K-Electric</td>
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<td></td>
<td>Formation of pits due to improper backfilling</td>
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<td><strong>Vegetation</strong></td>
<td>No cutting of trees is involved</td>
<td>In case of cutting of trees, one plant should be replaced by 1:3 for immature plants and 1:6 for mature plants</td>
<td>No of trees cleared or cut</td>
<td>All project locations</td>
<td>Continuous</td>
<td>K-Electric</td>
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<td></td>
<td></td>
<td>Ensure re-plantation by appropriate tree compensation ratio of same species</td>
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<td>Aspect</td>
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<td>Water</td>
<td>Wastage and misuse of water</td>
<td>Avoid unnecessary use of water</td>
<td>Record log of water usage</td>
<td>All project locations</td>
<td>Continuous</td>
<td>Contractor</td>
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<td></td>
<td></td>
<td>Prevent leakages</td>
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<td>Social Environment</td>
<td>Disturbance to routine activities</td>
<td>Specify time scale for construction activities</td>
<td>Review of complaint register</td>
<td>All project locations</td>
<td>Monthly</td>
<td>K-Electric</td>
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<td></td>
<td>Conflicts between laborers and local communities</td>
<td>Discussion with local people regarding conflicts if any</td>
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<td>Roads and networks</td>
<td>Traffic congestion leading to accidents</td>
<td>Diversion routes must be notified to maintain traffic flow</td>
<td>Signs and detours are being followed</td>
<td>Intersections of diversions</td>
<td>Monthly</td>
<td>Contractor</td>
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<td></td>
<td></td>
<td>Signs and reflectors must be boarded for driver’s visibility at night</td>
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<td>Health and Safety</td>
<td>Lack of awareness among general public about safety may lead to accidents</td>
<td>Safety symbols and instructions will be boarded at work sites</td>
<td>Record of Safety Talks</td>
<td>On all project sites</td>
<td>Monthly</td>
<td>Contractor</td>
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<td></td>
<td>Incompetent and untrained workers might cause harm to themselves and others</td>
<td>Trained personnel will be appointed for the specific work</td>
<td>Record of safety Incidents (Major &amp; Minor)</td>
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<td></td>
<td>Construction works may include many risks and hazards that may lead to injuries or even death</td>
<td>Appropriate PPEs must be used for technical work</td>
<td>Record of PPEs Visual Assessments</td>
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<td>Aspect</td>
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<td><strong>Operational Phase</strong></td>
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<td>Electric Shock</td>
<td>Lead to death or injury of employees or public in the area.</td>
<td>Cordon off the area Display warning signs</td>
<td>No trespassing allowed</td>
<td>Grid station and Bay towers</td>
<td>Regularly</td>
<td>K-Electric</td>
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<td></td>
<td></td>
<td>Install Earthing wires</td>
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<td>Electric Magnetic Field (EMF)</td>
<td>Human health impacts such as, neuropsychological disorders or cardiovascular diseases</td>
<td>Increase depth of cables to suppress the EMF levels Appropriate cabling with protective shields to suppress electron flux</td>
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This report discusses the Environmental and Socio-economic Impact Assessment of the proposed Replacement of Transmission Lines project of K-Electric at Karachi Port Trust (KPT) area of Karachi. The project is divided in two components:

The first component comprises of replacement of existing 220 kV Underground cables initiating from Lalazar Grid Station located in KPT Lalazar area to ICI Bridge PLDP tower located in West Wharf area. The total route length of the line will be 4 kms.

The second component comprises of replacement of existing 132 kV Underground cables initiating from Queens Road Grid Station located in Lalazar KPT area adjacent to Lalazar Grid Station to Old Town Grid Station located in Kharadar area. The total length of the line will be 4 kms.

The project is expected to fulfill the electricity requirements of the city by improving K-Electric’s existing transmission network. Furthermore, the project will eradicate the chances of electricity supply failure in near future in the provisioned areas.

The proposed project falls under the project category of Schedule II “Transmission Lines (11 kV and above) and distribution projects” as per the guidelines issued by the Sindh Environmental Protection Agency (SEPA) under the Sindh Environmental Protection Act 2014 (SEPA 2014). According to these guidelines, projects under this category require an EIA to be conducted.

1.2 PROPONENT INTRODUCTION

K-Electric, commonly referred to as KE is a Pakistani vertically integrated electric company involved in generating, transmitting and distributing power to over 2.5 million customers in Karachi and in the nearby towns of Dhabeji and Gharo in Sindh, and Hub, Uthal, Vinder and Bela in Balochistan. It employs over 10,000 people and covers 6,500 square kilometers with industrial, commercial, agricultural and residential areas falling under its network. K-Electric has its own generation capacity of 1,652 MW, predominantly from its major Thermal Power Plants (BQPS I, BQPS II and KPC) and two Gas Engines Power
Plants (SITE & Korangi), inclusive of 450 MW that has been added owing to the initiatives of the new management and the company inaugurated an additional 560 MW project in 2012.

K - Electric being a prestigious and environmentally conscious organization wants to comply with all applicable laws and therefore intends to carry out the environmental impact assessment of its transmission line projects.

1.3 NEED OF THE PROJECT

Since the installation of these transmission networks date back to more than 20 years, the durability and life of hardware of these lines is affected resulting in reduction of electricity supply. The 220 kV Underground cables initiating from Lalazar Grid Station to ICI Bridge PLDP is identified as faulty and needs immediate replacement to avoid unnecessary power supply interruption. Meanwhile, the 132 kV Underground cables initiating from Queens Road Grid Station to Old Town Grid Station are marked as the only supply lines that provide electricity to the Old Town area and are linked to further Grid Stations ahead. Since the lines are old and defected, it might end up into a major power failure of the area which does not have any other alternative power supply source. Therefore it immediately needs too to be replaced to avoid any major power breakdowns in one of the most important areas of the city. K-Electric has therefore decided to replace these lines to ensure undisturbed electricity supply and decreased energy loss of the provisioned areas.

1.4 PURPOSE OF THE STUDY

Purpose of this ESIA study is to evaluate the proposed extension project activities against Pakistan Environmental Protection Agency (Pak-EPA) standards, and against international environmental guidelines, such as those of the World Bank.

The specific objectives of this ESIA are to:

- Assess the existing environmental conditions in the project area, including the identification of environmentally sensitive areas and receptors;

- Assess the various activities to identify their potential impacts on environment, evaluate these impacts, and determine their significance;

- Propose appropriate mitigation measures that can be incorporated into the rehabilitation plans of the project to minimize damaging effects or lasting negative consequences identified by the environmental assessment;

- Assess the proposed activities and determine whether they comply with the relevant environmental regulations in Pakistan;

- Prepare an ESIA report for submission to the Sindh Environmental Protection Agency (SEPA).
1.5 PROJECT AREA

COMPONENT A (220 kV UG Lalazar – ICI Bridge) 220 kV Oil-filled Underground Cables will be replaced by XLPE Cables from Lalazar Grid Station located in Lalazar KPT area leading under the KPT Bridge and towards the ICI PLDP tower located in West Wharf area.

COMPONENT B (132 kV UG Queens Road – Old Town) 132 kV Underground XLPE transmission line will be replaced from Queens Road Grid Station located in Lalazar KPT area leading under the KPT Bridge towards Customs House and Old Town Grid Station in Kharadar area.

1.6 SCOPE OF THE ESIA

For the ESIA study, the scope of work is as under:

- Description of physical, environmental, socio-economical and cultural conditions in the project area;
- Project impact identification, prediction, and significance based on project activities.
- Identification and assessment of the workability of mitigation measures to offset or minimize negative project impacts on environment.

1.7 APPROACH AND METHODOLOGY

The ESIA was performed in five main phases, which are described below.

1.7.1 Scoping

The key activities of this phase included:

Project Data Compilation: A generic description of the proposed activities, within the project area relevant to environmental assessment, was compiled with the help of EPA Guidelines.

Literature Review: Secondary data on weather, soil, water resources, and wildlife vegetation was reviewed and compiled.

Legislative Review: Information on relevant legislation, regulations, guidelines, and standards was reviewed and compiled.

Identification of Potential Impacts: The information collected in the previous steps was reviewed, and potential environmental issues were identified.
1.7.2 Baseline Studies

Following the scoping exercise, the project area was surveyed to collect primary data. During the field visits, information was collected on ecologically important areas, ambient air quality, surface and groundwater resources, existing infrastructure, local communities, public services, and sites of archaeological or cultural importance. The following specific studies were conducted as part of the ESIA.

Vegetation: A botanist conducted vegetation study, which consisted of a thorough literature review and field data collection. As part of the vegetation study, random sampling was conducted and the area’s floral species were documented.

Vegetation communities were identified and vegetation cover determined.

Wildlife Study: A wildlife expert has conducted wildlife study, which consist of a thorough literature review and field data collection. During the fieldwork, the faunal species of the area were documented. The diversity of avian, large and small mammals, and reptile species was determined. Information was collected on the species found in the area.

Physical Environment: Environmental Assessment Specialist conducted physical environmental study including, ambient air, noise, water sampling, surface water resources and the groundwater resources of the areas. Specialists also carried out the impact of project on soil and water resources.

Socioeconomic Study: Team of experts including social and gender specialist conducted socioeconomic and cultural study in the project area.

The study team through participatory technique collected data from the men and women of the project area, and consulted communities and local leadership. The profile included livelihood, culture, leadership, gender issues, spiritual and temporal leadership, demographic information based on field data and published sources, the existing use of land resources, community structure, employment, distribution of income, goods and services, public health, local religious and cultural values, and local customs, aspirations, and attitudes.

1.7.3 Public Consultation

The socioeconomic and gender team also conducted a public consultation at various locations of the project areas. Data was collected by conducting of unstructured meetings and interviews with stakeholders. The scope of work included:

- Provision of basic information on the project to stakeholders;
- Identification of stakeholders’ concerns and apprehensions regarding the project;
- Identification of stakeholders’ expectations of the project;
- Summarizing the process and the outcome.
1.7.4 **Impact Assessment**

The environmental, socioeconomic and cultural, gender and project information collected in previous phases was used to assess the potential impacts of the proposed activities. The issues studied included potential project impacts on:

- Groundwater and surface water quality;
- Ambient air quality;
- Ecology of the area, including flora and fauna;
- Local communities.
- Wherever possible and applicable, the discussion covers the following aspects:
  - The present baseline conditions;
  - The change in environmental parameters likely to be effected by project related activities;
  - Identification of potential impacts;
  - Likelihood and significance of potential impacts;
  - Mitigation measures to reduce impacts to as low as possible;
  - Prediction of impacts, including all long-term and short-term, direct and indirect, and beneficial and adverse impacts;
  - Evaluation of the importance or significance of impacts (The significance of each impact has been judged on the basis of available local, national, and international standards. Where such standards were not available, the best practice elsewhere has been referred to);
    - Implementation of mitigation measures (i.e., environmental management);
    - Determination of residual impacts;
    - Identification of controls and monitoring of residual impacts.

1.7.5 **Documentation**

At the end of the assessment, a report will be prepared according to the relevant guidelines of the Pakistan Environmental Protection Agency. This report includes the findings of the assessment, project impacts, and mitigation measures to be implemented during the execution of the proposed activities.

Components of this Report will be:

- **Chapter: 1** Introduction
- **Chapter: 2** Project Description
- **Chapter: 3** Institutional, Legislation and policy framework
Chapter: 4  Physical Environment
Chapter: 5  Biological Environment
Chapter: 6  Socio-Economic and Cultural Environment
Chapter: 7  Public Consultation
Chapter: 8  Alternatives
Chapter: 9  Environmental Impacts Assessment & Environmental Management Plan
Chapter: 10 Conclusion
Electric power transmission is the bulk transfer of electrical energy between the point of generation and multiple substations near a populated area or load center. Transmission may be via overhead or underground lines, however, most transmission is done with overhead lines because they are less costly to construct and easier to maintain. Underground lines are generally restricted to urban areas.

This project is a rehabilitation project and requires replacement of old underground cables. Since the project area is an important commercial hub of the country and among the most developed regions of the city, underground cables were opted for electricity provision.

The ESIA study includes two components of the transmission project which are described in following sections.

Component A

This component comprises of replacement of 220 kV Underground Oil Filled Cables from Lalazar Grid Station to ICI PLDP that are out dated and which will be replaced with 1600mm² XLPE Double Circuit Underground Cables. The route will be followed as;

- The line initiate from Lalazar Grid Station located adjacent to U.S. Consulate at Mai Kolachi Road and come out parallel to the sewage drain located next to Subh-e-Nau School on M.T. Khan Road
- It will run parallel till Bahria Complex II and move inwards Lalazar Area.
- The line will then go directly towards Beach Luxury Hotel and divert towards Port Grand
- From there it will run parallel to railway tracks and move into West Wharf area and lead to the ICI PLDP

Component B

This component comprises of an alternative replacement of 132 kV Underground cables which are going to be 800mm² XLPE Underground Cables. The route will be as follows;

- It will initiate from Queens Road Grid Station located adjacent to Lalazar Grid Station and move directly onwards M.T. Khan Road till the K.P.T. Bridge.
- It will then divert inwards the Karachi Dry Port stop of Karachi Railways and exit out on M.A. Jinnah Road.

- It will then enter at Customs House area road and move towards the Ismaili Jamat Khana.

- It will then take a diversion and revert to the Old Town Grid Station.

The Proposed Transmission line routes can be seen in **Exhibit 2.1.**
Exhibit 2.1: Transmission Line Network maps

Red: 220 kV UG Lalazar Grid Station to ICI Bridge PLDP
Green: 132 kV UG Queens Road Grid Station to Old Town Grid Station
Route maps in Lalazar KPT area
Route maps in West Wharf and Kharadar areas
## 2.1 PROJECT SITE LOCATIONS

<table>
<thead>
<tr>
<th>Component</th>
<th>Subject</th>
<th>Description</th>
<th>Coordinates</th>
<th>View of Location</th>
</tr>
</thead>
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<tr>
<td>A-I</td>
<td>Lalazar Grid Station</td>
<td>Adjacent to Queens Road Grid Station</td>
<td>N 24°50'16.1” E 67°00'34.8”</td>
<td><img src="image1.jpg" alt="Image of Lalazar Grid Station" /></td>
</tr>
<tr>
<td>A-II</td>
<td>Subh-e-Nau School</td>
<td>Opposite U.S. Consulate</td>
<td>N 24°50'24.2” E 67°00'28.9”</td>
<td><img src="image2.jpg" alt="Image of Subh-e-Nau School" /></td>
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<td>Component</td>
<td>Subject</td>
<td>Description</td>
<td>Coordinates</td>
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<tr>
<td>A-III</td>
<td>Bahria Complex II</td>
<td>In Centre of M.T. Khan Road</td>
<td>N 24°50'39.3&quot; E 67°00'08.7&quot;</td>
<td><img src="image1.jpg" alt="View of Location" /></td>
</tr>
<tr>
<td>A-IV</td>
<td>Port Grand</td>
<td>Under KPT Bridge</td>
<td>N 24°50'42.4&quot; E 66°59'47.3&quot;</td>
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<td>A-V</td>
<td>ICI Bridge PLDP</td>
<td>Near ICI Bridge</td>
<td>N 24°51’17.0” E 66°59’06.9”</td>
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<tr>
<td>B-I</td>
<td>Queens Road Grid Station</td>
<td>Opposite U.S. Consulate</td>
<td>N 24°50’16.1” E 67°00’34.8”</td>
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<td>B-II</td>
<td>Karachi Dry Port</td>
<td>Railway Tracks crossing under KPT Bridge</td>
<td>N 24°50'47.7” E 66°59'36.1”</td>
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<td>B-III</td>
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<td>Customs House and KPT buildings at M.A. Jinnah Road</td>
<td>N 24°50'55.9” E 66°59'32.0”</td>
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<td>B-IV</td>
<td>Ismaili Jamat Khana</td>
<td>At road junction of G.A. Allana Road and Nawab Mahabat Khanji Road</td>
<td>N 24°51'04.5&quot; E 66°59'33.7&quot;</td>
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<tr>
<td>B-V</td>
<td>Old Town Grid Station</td>
<td>Near Ismaili Jamat Khana</td>
<td>N 24°51'11.8&quot; E 66°59'32.2&quot;</td>
<td></td>
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</tbody>
</table>
2.2 PROJECT SCHEDULE

As per bid document, tentatively 12 months’ time is allotted for project completion. A project schedule will be available after award of contracts.

2.3 UNDERGROUND TRANSMISSION LINE

Underground cables have different technical requirements than overhead lines and have different environmental impacts. Due to their different physical, environmental, and construction needs, underground transmission generally costs more and may be more complicated to construct than overhead lines.

2.3.1 Types of Underground Transmission cables

There are two main types of underground transmission lines currently in use. One is constructed in a pipe with fluid or gas pumped or circulated through and around the cable in order to manage heat and insulate the cables. The other is a solid dielectric cable which requires no fluids or gas and is a more recent technological advancement. The common types of underground cable construction include:

i. High-pressure, fluid-filled pipe (HPFF)
ii. High-pressure, gas-filled pipe (HPGF)
iii. Self-contained fluid-filled (SCFF)
iv. Solid cable, cross-linked polyethylene (XLPE)

K-Electric will use XLPE cable type which is the abbreviated designation of “Cross Linked Polyethylene”. Cross linked polyethylene is produced from polyethylene under high pressure with organic peroxides as additives.
Following are some features of XLPE cables:

1. Capability of carrying large currents: The excellent resistance to thermal deformation and the excellent ageing property permit to carry large current under normal (90°C), emergency (130°C) or short circuit (250°C) conditions.

2. Ease of Installation: Lighter in weight and smaller radius allows ease of installation at quicker pace.

3. Free from Limitation and Maintenance: Ease of access allows no special consideration for route profile even; no height specific problems and no maintenance works are required as compared to oil filled cables.

### 2.3.2 Construction of Underground Transmission

Installation of an underground transmission cable generally involves the following sequence of events:

1. **ROW Clearing**
2. **Trenching/Excavation**
3. **Culvert/Duct Bank Preparation**
4. **Dismantling/Laying of Cable**
5. **Backfilling**
6. **Site restoration**

Many of these activities are conducted simultaneously so as to minimize the interference with street traffic.

Technical Provisions for Underground Cable laying is attached as Annexure-1. Moreover, Standard Operating Procedure (S.O.P) for supervision of erection, testing and commissioning (ETC), Checklist for excavation works, Checklist for laying of XLPE Underground cable are attached as Annexures-2, 3 and 4 respectively.
2.3.3 Horizontal Directional Drilling (HDD)

Horizontal directional drilling (HDD) is an innovative “trenchless” construction procedure. It has been in use for a dozen years to make trenchless installations of cable, conduit and duct in areas where surface improvements or crowded utility easements make excavation impractical or impossible.

HDD has close ties with the electrical industry. As HDD equipment evolved, it is also used to place larger-diameter power cable and conduit for copper, coaxial and fiber optic communications cable. It is used for crossing waterways, roadways, shore approaches, congested areas, environmentally sensitive areas and any area where other methods are more expensive.

Directional boring is used in place of other techniques for the following reasons:

- Less traffic disruption
- Lower cost
- Deeper installation possible
- Longer installation possible
- No access pit required
- Shorter completion times
- Directional capabilities
- Safer for the environment.

Directional drilling methods utilize steerable soil drilling systems to install both small and large-diameter lines. In most cases, HDD is a two-stage process. Stage 1 involves drilling a pilot hole approximately 25 to 125 mm (1 to 5 in) in diameter along the proposed design centerline. In stage 2, the pilot hole is enlarged to the desired diameter to accommodate the pipeline. The pilot hole is drilled with a surface-launched rig with an inclined carriage, typically adjusted at an angle of 8 to 18 degrees with the ground for entrance and 8 to 12 degrees for exit angle. The preferred minimum radius in feet for steel pipe is typically 100 times the diameter of pipe in inch. For plastic pipe, the multiplication factor is 40, i.e., 40 times of diameter of pipe in inch.

Most systems adopt either fluid-assisted drilling or a high pressure fluid jetting method to create or enlarge the bore hole. In a few instances, some mini-HDD systems utilize dry bore systems (with compressed air) in hard, dry soils and calcified or soft rock formations.

The progress of the pilot hole is monitored by a specially designed surveying system, either a walkover system or an electromagnetic down-hole navigational system. In a walkover system, the drill head is equipped with a sonde (also called a beacon) transmitter behind the drill bit. The sonde is powered by battery and emits signals continuously. These signals can be picked up on the ground with a hand-
held receiver. The receiver provides data on the position, temperature, depth, and orientation of the drill bit. An alternative detection system, the electromagnetic down-hole navigational system can be used in conjunction with a series of four electrical cables positioned directly above the desired path and secured in place. The cables, which can be laid directly on top of the street or highway, do not interfere with traffic flow. The cables transmit an electromagnetic signal that is picked up the navigational instruments in the drill head. These instruments determine the position of the drill head relative to the center of the cables and relay this information continuously to a computer on the operator's console. In case of deviations from the desired path, the operator can make necessary adjustments (Iseley and Gokhale 1997).

After the drill head (or pilot string and washover pipe) exits at the desired location, reaming devices are attached for the pullback operation. This stage involves enlarging the pilot hole to the desired diameter to accommodate the pipeline. The utility pipe is attached to the reamer, with a swivel to ensure that the rotation (torque) applied to the reamer is not transmitted to the utility. The reamer enlarges the bore hole to the required size, and the utility is installed. For large diameter (greater than 500 mm (20 in.)), an intermediate prereaming may be required before pulling the utility into place. Prior to the pullback operation, the pipeline is usually assembled to its full length and tested.

The drilling process in HDD can be described as follows:

1. **Site preparation**

   The construction site is prepared before the main drilling operation. A drilling rig is set up at the proper location. Slurry is prepared to stabilize the borehole and to lubricate the surface of borehole. A transmitter is inserted into the housing provided on the pilot drilling string near the drill bit. Other equipment and facilities such as generators, pumps and storages are prepared at this stage.

2. **Pilot hole drilling**

   Drilling the pilot hole can be the most important phase of a HDD project, because it determines the ultimate position of the installed pipe. A small diameter (25 to 125 mm (1 to 5 in.)) drilling string penetrates the ground at the prescribed entry point
at a predetermined angle routinely between 8 – 18 degrees. The drilling continues
under and across the obstacle along a design profile.

3. Prerreaming

In general, the final size of the bore should be at least 50% larger than the outside
diameter of the product pipe. This overcut is necessary to allow for an annular void
for the return of drilling fluids and spoils and to allow for the bend radius of the
pipeline. To create a hole that accommodates the required size of pipe, prerreaming
is necessary.

Typically, the reamer is attached to the drill string at the pipe side and pulled back
into the pilot hole. Large quantities of slurry are pumped into the hole to maintain
the borehole and to flush out the soil cuttings (DCCA 1994). The type of reamer
varies based on the soil type. A blade reamer is used for soft soils, a barrel reamer
for mixed soils, and a rock reamer with tungsten carbide inserts is used for rock
formations.

4. Pullback

Once the prerreaming is completed, the pipe or conduit can be pulled back into the
reamed hole filled with drilling fluid. The pipe is prefabricated and tested at the
pipe side. If the pipe is made of steel, it is recommended that the pipe be placed on
rollers to reduce the friction and to protect pipe coating.

The drill pipe is connected to the product pipe using a pull head or pulling eye and
a swivel. The swivel is a device used to prevent the rotation of the pipeline during
pullback. A reamer is also located between the pull head and the drill string to
ensure that the hole remains open and to allow lubricating fluid to be pumped into
the hole during the pullback. The pullback operation will continue until the pipe or
conduit surface at the drill rig. The pull head is disconnected, the drill rig removed,
and clean-up and tie-ins are started. For small diameter pipes, the prerreaming
process and pullback process can be performed at the same time.

2.4 ROW CLEARANCES

When designing the Right-of-Way (ROW), K-Electric has complete in-house
procedures to consult and obtain clearances from Municipal and District
Government bodies, City Traffic Police and Utilities Service Provider bodies (such as
SSGC, PTCL, KW&SB etc.) to avoid any disturbance or disruption of utility services
in the city. Furthermore, during commissioning phase of the project, K-Electric’s
supervisors will maintain their coordination with the relevant bodies to ensure
smooth project completion.
2.5 HSEQ POLICY

K-Electric has a comprehensive Health, Safety and Environment policy as well as a protocol developed for third-party contractors and all parties involved in construction works of grid stations and transmission lines.

The ‘HSEQ Policy’ and ‘Contractors and Suppliers HSEQ Management Procedure’ are attached as Annexure -5 and 6 respectively.
The ESIA of the proposed project will be subjected to the pertinent legislative and regulatory requirements of the Government of Pakistan including State laws. This chapter presents a synopsis of environmental policies, legislation and other guidelines that have relevance to the proposed project.

3.1 NATIONAL ENVIRONMENTAL POLICY, LEGISLATION AND GUIDELINES

The enactment of comprehensive legislation on the environment, covering multiple areas of concern, is a relatively new and ongoing phenomenon in Pakistan. Whereas, a basic policy and legislative framework for the protection of the environment and overall biodiversity in the country is now in place, detailed rules, regulations and guidelines required for the implementation of the policies and enforcement of legislation are still in various stages of formulation and discussion. The following section presents a brief overview of the existing national policies, legislation and guidelines.

3.1.1 National Conservation Strategy (NCS)

The National Conservation Strategy (NCS) is the primary Policy document of the Government of Pakistan on national environmental issues. The Policy was approved by the Federal Cabinet in March 1992. The Strategy also attained recognition by international donor agencies, principally the World Bank. 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 in order to preserve the country’s environment.

A midterm review of the achievements of NCS in 2000 concluded that achievements under NCS have been primarily awareness raising and institutional building rather than actual improvement to environment and natural resources and that NCS was not designed and is not adequately focused as a national sustainable development strategy (GoP, November 2000). The need therefore arose for a more focused National Environmental Action Plan (NEAP) required to bring about actual improvements in the state of the national environment with greater emphasis on poverty reduction and economic development in addition to environmental sustainability.
The National Environmental Action Plan was approved by the Pakistan Environmental Protection Council under the chairmanship of the President/Chief Executive of Pakistan in February 2001. NEAP now constitutes the national environmental agenda and its core objective is to initiate actions that safeguard public health, promote sustainable livelihoods, and enhance the quality of life of the people of Pakistan.

A National Environmental Policy has been approved by the Federal Cabinet in its meeting held during June 2005. This policy has already been endorsed by the Pakistan Environmental Protection Council during 2004. The new policy has total 171 guidelines on sectoral and cross-sectoral issues. The objectives of new policy include assurance of sustainable development and safeguard of the natural wealth of country. The following are the approved Sectoral Guidelines:

- Water Supply and Management;
- Air Quality and Noise;
- Waste Management;
- Forestry;
- Biodiversity and Protected Areas;
- Climate Change and Ozone Depletion;
- Energy Efficiency and Renewable;
- Agriculture and Livestock;
- Multilateral Environmental Agreements.

3.1.2 Sindh Environmental Protection Act 2014

The Sindh Environmental Protection Act, 2014 (SEPA 2014) is the basic legislative tool empowering the government to frame regulations for the protection of the environment. The SEPA 2014 is broadly applicable to air, water, soil, marine and noise pollution. Penalties have been prescribed for those contravening the provisions of the Act.

The two primary deliberations of the Act are the conduct of projects only after approval of environmental assessments from the Sindh EPA and adherence with National Environmental Quality Standards (NEQS).

3.1.3 Approval from Sindh Environment Protection Agency

As per the 2014 Regulations, Proponent will submit an EIA report for their project activities to EPA Sindh (Environment Protection Agency Sindh), and seek approval on the same from the agency. Ten hard copies and 2 soft copies of the EIA report will be submitted to SEPA. It will then grant its decision on the EIA as per the rules and procedures set out in the 2014 Regulations. The following rules will apply:
- A fee is payable to SEPA for review of the EIA;
- The EIA submission is to be accompanied by an application in the format prescribed in Schedule V of the 2014 Regulations;
- SEPA is bound to conduct a preliminary scrutiny and reply within four weeks of the submission of the report a) confirming completeness, or b) asking for additional information, if needed;
- K-Electric will publish a public notice in any English or Urdu national newspaper and in a local newspaper of general circulation in the area affected by the project. The public notice will mention the following:
  o The type of project;
  o The location of the project;
  o The name and address of the proponent;
  o The places at which the EIA can be accessed;
  o The date, time and place for public hearing of any comments on the project or its EIA;
- The date set for public hearing will not be earlier than fifteen (15) days from the date of publication of the public notice;
- In the review process SEPA may consult a Committee of Experts, which maybe constituted on the request of the DG SEPA;
- On completion of the review process, the decision of SEPA will be communicated to the proponent in the form prescribed in Schedule V;
- Where an EIA is approved, SEPA can impose additional controls as part of the conditions of approval;
- SEPA is required to make every effort to complete the EIA review process within four months;
- The approval will remain valid for the project duration mentioned in the EIA but on the condition that the project commences within a period of three years from the date of approval. If the project is initiated after three years from approval date, the proponent will have to apply for an extension in the validity period. The SEPA on receiving such request grant extension (not exceeding 3 years at a time) or require the proponent to submit a fresh EIA if in the opinion of SEPA changes in baseline conditions or the project so warrant;
- After receiving approval from SEPA the proponent will acknowledge acceptance of the conditions of approval by executing an undertaking in the form prescribed in Schedule VI of the 2014 Regulations;
- The 2014 Regulations also require proponents to obtain from SEPA, after completion of the project, a confirmation that the requirements of the EIA and the conditions of approval have been duly complied with;
• The SEPA in granting the confirmation of compliance may impose any additional control regarding the environmental management of the project or the operation, as it deems necessary.

3.1.4 Sindh Environmental Protection Agency Review of IEE and EIA Regulations, 2014

The Sindh Environmental Protection Agency Review of IEE and EIA Regulations, 2014 (The 2014 Regulations) promulgated under SEPA 2014 were enforced on December 2014. The 2014 Regulations define the applicability and procedures for preparation, submission and review of IEEs and EIAs. These Regulations also give legal status to the Pakistan Environmental Assessment Procedures prepared by the Sindh EPA in 2014.

The Regulation classifies projects based on expected degree of adverse environmental impacts and lists them in three separate schedules. Schedule I lists projects that may not have significant environmental impacts and therefore require an IEE. Schedule II lists projects of potentially significant environmental impacts requiring preparation of an EIA. The Regulations also require that all projects located in environmentally sensitive areas require preparation of an EIA.

This project falls under the following category:

Schedule II (EIA):

Energy

• Transmission lines (11 KV and above) and distribution projects

3.1.5 The National Environmental Quality Standards

During the construction and post development phase of the project NEQS will apply to all effluents, gaseous emissions and Noise generation. NEQS for municipal and industrial effluents, selected gaseous pollutants from industrial sources and motor vehicle exhaust and noise are provided in Exhibit 3.1, Exhibit 3.2, Exhibit 3.3 & Exhibit 3.4.

3.1.6 Land Acquisition Act, 1894

The Land Acquisition Act (LAA) of 1894 amended from time to time has been the defacto policy governing land acquisition, resettlement and compensation in the country. The LAA is the most commonly used law for acquisition of land and other properties for development projects. It comprises of 55 sections pertaining to area notifications and surveys, acquisition, compensation and apportionment awards and disputes resolution, penalties and exemptions.
3.1.7  **Pakistan Penal Code (1860)**

The Pakistan Penal Code (1860) 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.

3.1.8  **The Antiquities Act, 1975**

The Antiquities Act of 1975 ensures the protection of cultural resources of Pakistan. The Act is designed to protect ‘antiquities’ from destruction, theft, negligence, unlawful excavation, trade, and export. Antiquities have been defined in the Act as ancient products of human activity, historical sites, or sites of anthropological or cultural interest, national monuments, etc. The law prohibits new construction in the proximity of a protected antiquity and empowers the Government of Pakistan to prohibit excavation in any area that may contain articles of archaeological significance.

Under the Act, the project proponents are obligated to:

- Ensure that no activity is undertaken in the proximity of a protected antiquity;
- Report to the Department of Archeology, Government of Pakistan, any archeological discovery made during the course of a project.

3.1.9  **The Factories Act, 1934**

The clauses relevant to the project are those that concern to health, safety and welfare of workers, disposal of solid waste and effluent and damage to private and public property. The Factories Act also provides regulation for handling and disposal of toxic and hazardous materials.

3.1.10  **Electricity Act, 1910**

The Act provides a legal base for power distribution. A licensee under this Act is enabled to operate supply of electricity. This Act oblige licensee to pay compensation for any damages caused during the constructions and maintenance of any power distribution facilities.

3.1.11  **Hazardous Waste**

The Sindh Hazardous Substances Rules, 2014 are a set of rules derived from the Sindh Environmental Act, 2014 and are first of the very specific hazardous substances regulations brought into force in 2014 after the initial draft set of rules devised in 2003. They represent specific regulations with aspect of handling, storage and disposal.
of hazardous substances and issuing an approving license to the user or facility. The Schedule-I of the Rules enlists the hazardous substances that are under the scrutiny of the Sindh-EPA.

Under its licensing terms, the Rules highlight particular components as follows:

- Employment of Qualified technical personnel;
- Packing and labelling;
- Conditions of Premises;
- Safety precautions;
- Trainings;
- A comprehensive safety plan;
- Waste management Plan and
- Transporting of hazardous substances.

### 3.1.12 Sindh Wildlife Protection Ordinance 1972

The Sindh Wildlife Ordinance 1972 empowers the government to declare certain areas reserved for the protection of wildlife and to control activities within these areas. It also provides protection to endangered species of wildlife. The Project area does not lie with in or near any protected area; hence no provision of this law is applicable.

### 3.1.13 Sindh Forest Act (1927)

The act empowers the provincial forest departments to declare any forest area as reserved or protected. The Act also 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. The project area is located outside any reserved or protected forest area therefore the project will not contravene with any provisions of the Act.

### 3.1.14 Cutting of Trees (Prohibition) Act, 1975

This Act prohibits cutting or chopping of trees without permission of the Forest Department.

### 3.1.15 Explosives Act, 1884

Under the Explosives Act, 1884, the Project contractors are bound by regulations on handling, transportation and using explosives during quarrying, blasting, and other purposes.
3.1.16 **Highways Safety Ordinance, 2000**

This ordinance includes provisions for the licensing and registration of vehicles and construction equipment; maintenance of road vehicles; traffic control, offences, penalties and procedures; and the establishment of a police force for motorways and national highways charged with regulating and controlling traffic on the national highways, and keeping the highways clear of encroachments.

3.2 **NATIONAL AND INTERNATIONAL GUIDELINES OR STANDARDS**

3.2.1 **The Pakistan Environmental Assessment Procedures, 1997**

The Pakistan Environmental Protection Agency prepared the Pakistan Environmental Assessment Procedures in 1997. They are based on much of the existing work done by international donor agencies and Non-Governmental Organizations (NGO’s). The package of regulations prepared by PEPA includes:

- Policy and Procedures for Filing, Review and Approval of Environmental Assessments;
- Guidelines for the Preparation and Review of Environmental Reports;
- Guidelines for Public Consultation;
- Guidelines for Sensitive and Critical Areas; and
- Sectoral Guidelines for various types of projects.

3.2.2 **World Bank Guidelines on Environment**

The principal World Bank publications that contain environmental guidelines are listed below.


The above two publications provide general guidelines for the conduct of EIA’s, and address the EIA practitioners themselves as well as project designers. While the Sourcebook in particular has been designed with Bank projects in mind, and is especially relevant for the impact assessment of large-scale infrastructure projects, it contains a wealth of useful information, for environmentalists and project proponents.
The Sourcebook identifies a number of areas of concern, which should be addressed during impact assessment. It sets out guidelines for the determination of impacts, provides a checklist of tools to identify possible biodiversity issues and suggests possible mitigation measures. Possible development project impacts on wild lands, wetlands, forests etc. are also identified and mitigation measures suggested.

The World Bank Guidelines for noise are provided in Exhibit 3.5. The indicative IFC guideline values applicable to sanitary wastewater discharges are shown in Exhibit 3.6.

3.2.3 **OSHA Standards Health Safety**

The Occupational Safety and Health Administration (OSHA) are issuing safety and health program management guidelines for use by employers to prevent occupational injuries and illnesses. The Occupational Safety and Health Act of 1970 (OSHA) representatives have noted a strong correlation between the application of sound management practices in the operation of safety and health programs and a low incidence of occupational injuries and illnesses. Where effective safety and health management is practiced, injury and illness rates are significantly less than rates at comparable worksites where safety and health management is weak or non-existent.

The Occupational Safety and Health Administration (OSHA) have concluded that effective management of worker safety and health protection is a decisive factor in reducing the extent and the severity of work-related injuries and illnesses. Effective management addresses all work-related hazards, including those potential hazards which could result from a change in worksite conditions or practices. It addresses hazards whether or not they are regulated by government standards.
### Exhibit: 3.1 NEQS for Municipal and Industrial Effluents

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Into Inland Water (mg/l)</th>
<th>Into Sewage Treatment (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature or temperature increase $^c$</td>
<td>$\leq$3°C</td>
<td>$\leq$3°C</td>
</tr>
<tr>
<td>pH</td>
<td>6-9</td>
<td>6-9</td>
</tr>
<tr>
<td>Biochemical Oxygen Demand (BOD5) at 20°C $^d$</td>
<td>80</td>
<td>250</td>
</tr>
<tr>
<td>Chemical Oxygen Demand (COD) $^d$</td>
<td>150</td>
<td>400</td>
</tr>
<tr>
<td>Total Suspended Solids (TSS)</td>
<td>200</td>
<td>400</td>
</tr>
<tr>
<td>Total Dissolved Solids (TDS)</td>
<td>3,500</td>
<td>3,500</td>
</tr>
<tr>
<td>Grease and oil</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Phenolic compounds (as phenol)</td>
<td>0.1</td>
<td>0.3</td>
</tr>
<tr>
<td>Chloride (as Cl$^-$)</td>
<td>1,000</td>
<td>1,000</td>
</tr>
<tr>
<td>Fluoride (as F)</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Total cyanide (as CN$^-$)</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>An-ionic detergents (as MBAS) $^e$</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Sulphate (SO$^4$)</td>
<td>600</td>
<td>1000</td>
</tr>
<tr>
<td>Sulphide (S$^-$)</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Ammonia (NH$_3$)</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>Pesticides $^f$</td>
<td>0.15</td>
<td>0.15</td>
</tr>
<tr>
<td>Cadmium $^g$</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Chromium (trivalent &amp; hexavalent) $^g$</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Copper $^g$</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Lead $^g$</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Mercury $^g$</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Selenium $^g$</td>
<td>0.5</td>
<td>0.5</td>
</tr>
</tbody>
</table>
### Parameters

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Into Inland Water (mg/l)</th>
<th>Into Sewage Treatment (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickel&lt;sup&gt;g&lt;/sup&gt;</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Silver&lt;sup&gt;g&lt;/sup&gt;</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Total Toxic metals</td>
<td>2.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Zinc</td>
<td>5.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Arsenic&lt;sup&gt;g&lt;/sup&gt;</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Barium&lt;sup&gt;g&lt;/sup&gt;</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Iron</td>
<td>8.0</td>
<td>8.0</td>
</tr>
<tr>
<td>Manganese</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Boron&lt;sup&gt;g&lt;/sup&gt;</td>
<td>6.0</td>
<td>6.0</td>
</tr>
<tr>
<td>Chlorine</td>
<td>1.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

### Notes

- **a** All values are in mg/l, unless otherwise defined
- **b** Applicable only when and where sewage treatment is operational and BOD5=80 mg/L is achieved by the sewage treatment system
- **c** The effluent should not result in temperature increase of more than 3°C at the edge of zone where initial mixing and dilution take place in the receiving body. In case zone is defined, use 100 meters from the point of discharge
- **d** Assuming minimum dilution 1:10 on discharge, lower ratio would attract progressively stringent standards to be determined by the Federal Environmental Protection Agency. By 1:10 dilution means, for example that for each one cubic meter of treated effluent, the recipient water body should have 10 cubic meter of water for dilution of this effluent
- **e** Modified Benzene Alkyl Sulphate; assuming surfactant as biodegradable
- **f** Pesticides include herbicide, fungicides and insecticides
- **g** Subject to the total toxic metals discharge should not exceed level of total toxic metals
**Exhibit 3.2:** NEQS for Selected Gaseous Pollutants from Industrial Sources

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Source of emission</th>
<th>Standard (mg/Nm$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoke</td>
<td>Any</td>
<td>40% or 2 Ringlemann scale or equivalent smoke number</td>
</tr>
<tr>
<td>Particulate matter$^b$</td>
<td>Boilers and furnaces:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oil fired</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>Coal fired</td>
<td>500</td>
</tr>
<tr>
<td></td>
<td>Cement kilns</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>Grinding, crushing, clinker coolers and related processes, metallurgical processes, converter blast furnaces and cupolas</td>
<td>500</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
<td>Any</td>
<td>400</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Any</td>
<td>150</td>
</tr>
<tr>
<td>Hydrogen fluoride</td>
<td>Any</td>
<td>150</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>Any</td>
<td>10</td>
</tr>
<tr>
<td>Sulfur oxides$^c$</td>
<td>Sulfuric acid/Sulfonic acid plants</td>
<td>5,000</td>
</tr>
<tr>
<td></td>
<td>Other plants except power plants operating on oil and coal</td>
<td>1,700</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>Any</td>
<td>800</td>
</tr>
<tr>
<td>Lead</td>
<td>Any</td>
<td>50</td>
</tr>
<tr>
<td>Mercury</td>
<td>Any</td>
<td>10</td>
</tr>
<tr>
<td>Cadmium</td>
<td>Any</td>
<td>20</td>
</tr>
<tr>
<td>Arsenic</td>
<td>Any</td>
<td>20</td>
</tr>
<tr>
<td>Copper</td>
<td>Any</td>
<td>50</td>
</tr>
<tr>
<td>Parameter</td>
<td>Source of emission</td>
<td>Standard(mg/Nm$^3$)</td>
</tr>
<tr>
<td>---------------------------</td>
<td>---------------------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Antimony</td>
<td>Any</td>
<td>20</td>
</tr>
<tr>
<td>Zinc</td>
<td>Any</td>
<td>200</td>
</tr>
<tr>
<td>Oxides of nitrogen$^d$</td>
<td>Nitric acid manufacturing unit</td>
<td>3,000</td>
</tr>
<tr>
<td></td>
<td>Other plants except power plants operating on oil or coal:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oil Fired</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>Coal fired</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td>Cement kilns</td>
<td>1,200</td>
</tr>
</tbody>
</table>

**Notes:**

a All values are in mg/Nm3, unless otherwise defined
b Based on the assumption that the size of the particulates is 10 micron or more
c Based on 1% sulphur content in fuel oil. Higher content of sulphur will cause standards to be pro-rated
d In respect of the emissions of the sulfur dioxide and nitrogen oxides, the power plants operating on oil or coal as fuel shall, in addition to NEQS specified above, comply with the following standards
**Exhibit 3.3:** NEQS for Motor Vehicle Exhaust and Noise

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Standard</th>
<th>Measuring Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoke</td>
<td>40% or 2 on the Ringlemann scale during engine acceleration mode</td>
<td>To be compared with Ringlemann Chart at a distance of 6 meters or more</td>
</tr>
<tr>
<td>Carbon Monoxide</td>
<td>New vehicles: 4.5% Used vehicles: 6%</td>
<td>Under idling conditions, non-dispersive infrared detection through gas analyzer</td>
</tr>
<tr>
<td>Noise</td>
<td>75 dB (A)</td>
<td>Sound-meter at 7.5 meters from the source</td>
</tr>
</tbody>
</table>

**Exhibit 3.4:** NEQS for Noise

<table>
<thead>
<tr>
<th>S. no</th>
<th>Category of Area/Zone</th>
<th>Effective from 1st Jan, 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Limits in dB</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Day Time</td>
</tr>
<tr>
<td>1</td>
<td>Residential Area</td>
<td>55</td>
</tr>
<tr>
<td>2</td>
<td>Commercial Area</td>
<td>65</td>
</tr>
<tr>
<td>3</td>
<td>Industrial Area</td>
<td>75</td>
</tr>
<tr>
<td>4</td>
<td>Silence Area</td>
<td>50</td>
</tr>
</tbody>
</table>

**Note:**

1. Day Time hours: 6.00am to 10.00pm
2. Night Time hours: 10.00pm to 6.00am
3. Silence Zone: zones which are declared as such by the competent authority. An area comprising not less than 100 meters around hospitals, educational institutions and courts.
4. Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.

**dB:** Time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.
The existing physical environmental conditions of the project area are described in this section. Much of the information on topography and land use, geophysical, climate and water resources was gained from published literature and previously conducted studies. The information given in the sections on air, sound and water quality is the result of detailed field surveys conducted specifically for this ESIA.

**4.1 TOPOGRAPHY AND LAND USE**

Karachi is the largest and the fastest growing mega city of Pakistan with a population of over 18 million with the annual growth of 5% (Pakistan Economic Survey 2013-14). The city comprises of six districts namely; Karachi East, Karachi West, Karachi Central, Karachi South, District Malir and District Korangi (KMC, 2012). However, detailed and complete picture of land use and control patterns within the city is presented in Figure 1.

![Figure 1: Land Control in Karachi (Source: Karachi strategic development plan 2020)](image)

Note * CDGK in figure one represents cumulative land control by districts in Karachi

Moreover, the most recent data for existing land use patterns within the city is presented below in Figure: 2 and the spread of land cover cluster is also available in Table: 1 placed below Figure: 2.
**Table 1: Spread of Land Cover Clusters of Karachi Division**

<table>
<thead>
<tr>
<th>Group</th>
<th>Category</th>
<th>Area (mile²)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic</td>
<td>Industrial</td>
<td>25.89</td>
<td>7.42</td>
</tr>
<tr>
<td></td>
<td>Agriculture</td>
<td>19.67</td>
<td>5.63</td>
</tr>
<tr>
<td></td>
<td>New Industry</td>
<td>18.55</td>
<td>5.31</td>
</tr>
<tr>
<td></td>
<td>Commercial</td>
<td>4.13</td>
<td>1.18</td>
</tr>
<tr>
<td></td>
<td>New Commercial Centers</td>
<td>1.89</td>
<td>0.54</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>70.13</strong></td>
<td><strong>20.08</strong></td>
</tr>
<tr>
<td></td>
<td>Recreational</td>
<td>5.41</td>
<td>1.55</td>
</tr>
<tr>
<td></td>
<td>Transport Facilities</td>
<td>5.22</td>
<td>1.49</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>Utilities</td>
<td>3.09</td>
<td>0.89</td>
</tr>
<tr>
<td></td>
<td>Education</td>
<td>2.98</td>
<td>0.85</td>
</tr>
<tr>
<td></td>
<td>Burial Grounds</td>
<td>1.24</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>17.93</strong></td>
<td><strong>5.13</strong></td>
</tr>
<tr>
<td>Housing</td>
<td>Planned Residential</td>
<td>63.25</td>
<td>18.12</td>
</tr>
<tr>
<td></td>
<td>Schemes to infill</td>
<td>38.18</td>
<td>10.94</td>
</tr>
<tr>
<td></td>
<td>Low Income Settlements</td>
<td>31.96</td>
<td>9.15</td>
</tr>
<tr>
<td></td>
<td>Unplanned Residential</td>
<td>27.09</td>
<td>7.76</td>
</tr>
<tr>
<td></td>
<td>Densification Areas</td>
<td>18.47</td>
<td>5.29</td>
</tr>
<tr>
<td></td>
<td>Urban Renewal</td>
<td>4.33</td>
<td>1.24</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>183.27</strong></td>
<td><strong>52.5</strong></td>
</tr>
<tr>
<td>Special Purpose</td>
<td>Military Areas</td>
<td>46.87</td>
<td>13.43</td>
</tr>
<tr>
<td></td>
<td>Vacant Undeveloped</td>
<td>6.45</td>
<td>1.85</td>
</tr>
<tr>
<td></td>
<td>Vacant Areas</td>
<td>5.53</td>
<td>1.58</td>
</tr>
<tr>
<td></td>
<td>Urban Renewal</td>
<td>0.73</td>
<td>0.21</td>
</tr>
<tr>
<td></td>
<td>Flood Plain</td>
<td>18.20</td>
<td>5.21</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>77.78</strong></td>
<td><strong>22.28</strong></td>
</tr>
</tbody>
</table>

*Source: Karachi Development Authority*
Karachi may be broadly divided into two parts; the hilly areas in the north and west and an undulating plain and coastal area in the south-east. The hills in Karachi are the off-shoots of the Kirthar Range. The highest point of these hills in Karachi is about 528m in the extreme north. All these hills are devoid of vegetation and have wide intervening plains, dry river beds and water channels. Karachi has a long coastline in the south. The famous sea beaches include Hawks Bay, Paradise Point, Sands Pit, and Clifton. Chenna Creek and Korangi Creek provide excellent calm water channels for rowing and other water activities. Away from the shoreline are small islands including Shamsh Pir, Baba Bhit, Bunker, Salehabad and Manora.

Topographical map of the project areas is attached as Exhibit 4.1 which clearly represents the land elevations of the project area.

**Exhibit 4.1: Land Elevation of Lalazar-KPT and Kharadar Area**

![Exhibit 4.1: Land Elevation of Lalazar-KPT and Kharadar Area](en-gb.topographic-map.com)
4.2 GEOLOGY

Geology of the local area is underlain a lower Indus basin described as Indus river alluvial early Eocene early deposition of sediments includes silt, sandstone, conglomerate, limestone with low compact and cementing materials. Surface feature describe as syncline delta and valley region and anticline ridges exposed. As stratigraphic description, there are two formations Gazij and Manchar formation dip gently northeast to southeast in offshore (HEC). The coastal region is found to be of tertiary and post-tertiary origin. Blatter et al (1929) dates it as recent as Eocene. The region has been formed by the upheaval of land from the Tethys Sea, which once extended up to the northern border of Pakistan but, gradually withdrew with the rising of the Himalayas. The underlying rocks are mostly of marine origin, highly folded, faulted and fissured everywhere. (Sidra et al, 2010 Situation Analysis of Sindh Coast Issues and Options)

The exposed geological material in the area is generally silty sand, sandy gravel and silty clay which is either product of in-situ weathering or deposited by the action of gravity and water. Below this over burden of silty sandy gravel soil, alternating layer of sedimentary rock comprising of sandstone, shell mudstone, siltstone and limestone are present. The rock formation of this area is from Nari Formation of Oligocene age and partially from Gaj Formation of Miocene age. The Nari Formation consists mainly of sandstone, siltstone and shale with subordinate limestone while the Gaj Formation consists of shale with subordinate limestone. Both of these Formations were deposited in shallow marine environment. The shallow marine dispositional conditions in evidenced in the area by the presence of reefal limestone in different members of the Nari and Gaj formations and by the presence of well-developed cross bedding and ripple marks in some rocks of Nari and Gaj formation.
4.3 CLIMATE

Shamshad (1956) has classified the climate of Pakistan based on the country’s characteristic seasons. Taking into account topography, proximity to the sea, rainfall, temperature, and winds, he has divided Pakistan into eleven climatic zones. Under his scheme, the climate of the project area is classified as ‘subtropical double season hot land.’ The characteristic features of this climatic zone are low rainfall (less than 250 mm per annum), the absence of a well-defined rainy season, and high temperatures that increase from east to west.

Yearly mean maximum and minimum temperatures are provided in Exhibit 4.2.

Exhibit 4.2: Mean Maximum and Minimum Temperature of the project area

<table>
<thead>
<tr>
<th>Year</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>July</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
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<td>23</td>
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<td>28</td>
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<td>22</td>
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<td>19</td>
<td>21</td>
<td>26</td>
<td>28</td>
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<td>28</td>
<td>30</td>
<td>30</td>
<td>26</td>
<td>20</td>
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<td>30</td>
<td>29</td>
<td>26</td>
<td>20</td>
</tr>
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<td>30</td>
<td>30</td>
<td>30</td>
<td>29</td>
<td>30</td>
<td>29</td>
<td>25</td>
<td>21</td>
</tr>
<tr>
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<td>21</td>
<td>23</td>
<td>27</td>
<td>30</td>
<td>32</td>
<td>32</td>
<td>30</td>
<td>30</td>
<td>30</td>
<td>29</td>
<td>24</td>
<td>20</td>
</tr>
<tr>
<td>2010</td>
<td>20</td>
<td>22</td>
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<td>30</td>
<td>32</td>
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<td>29</td>
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<td>19</td>
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<td>29</td>
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<td>2012</td>
<td>18</td>
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<td>30</td>
<td>30</td>
<td>29</td>
<td>28</td>
<td>25</td>
<td>21</td>
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<tr>
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<td>26</td>
<td>25</td>
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<td>32</td>
<td>31</td>
<td>30</td>
<td>30</td>
<td>29</td>
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<td>21</td>
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<tr>
<td>Annual Average</td>
<td>19.0</td>
<td>21.6</td>
<td>26.3</td>
<td>29.1</td>
<td>30.8</td>
<td>31.7</td>
<td>30.7</td>
<td>29.6</td>
<td>29.6</td>
<td>29.0</td>
<td>25.9</td>
<td>20.4</td>
</tr>
</tbody>
</table>

Source: Jinnah International Airport
4.4 RAINFALL

The probability that precipitation will be observed at this location varies throughout the year. Over the entire year, the most common forms of precipitation are thunderstorms, drizzle, and moderate rain. Thunderstorms are the most severe precipitation observed during 38% of those days with precipitation. They are most likely around August 12, when it is observed during 12% of all days. Drizzle is the most common precipitation observed during 34% of those days with precipitation. It is most likely around July 30, when it is observed during 14% of all days.

Moderate rain is the most common precipitation observed during 22% of those days with precipitation. It is most likely around July 28, when it is observed during 8% of all days. During the warm season, which lasts from March 25 to July 13, there is a 8% average chance that precipitation will be observed at some point during a given day. When precipitation does occur it is most often in the form of thunderstorms (40% of days with precipitation have at worst thunderstorms), drizzle (36%), moderate rain (19%), and light rain (5%).

During the cold season, which lasts from December 18 to February 7, there is a 5% average chance that precipitation will be observed at some point during a given day. When precipitation does occur it is most often in the form of thunderstorms (43% of days with precipitation have at worst thunderstorms), moderate rain (28%), drizzle (18%), and light rain (9%). The mean monthly precipitation for Karachi South District can be seen in Exhibit 4.3.

Exhibit 4.3: Maximum Precipitation (%)

<table>
<thead>
<tr>
<th></th>
<th>Jan 1</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr 27</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug 4</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct 1</th>
<th>Nov</th>
<th>Dec 31</th>
</tr>
</thead>
<tbody>
<tr>
<td>thunderstorms</td>
<td>5%</td>
<td>2%</td>
<td>12%</td>
<td>35%</td>
<td>35%</td>
<td>35%</td>
<td>35%</td>
<td>35%</td>
<td>35%</td>
<td>35%</td>
<td>35%</td>
<td>35%</td>
<td>5%</td>
</tr>
<tr>
<td>drizzle</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
</tr>
<tr>
<td>moderate rain</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
<td>5%</td>
</tr>
</tbody>
</table>

Source: Jinnah International Airport
4.5 RELATIVE HUMIDITY

The relative humidity typically ranges from 25% (dry) to 91% (very humid) over the course of the year, rarely dropping below 10% (very dry) and reaching as high as 100% (very humid).

The air is driest around February 9, at which time the relative humidity drops below 33% (comfortable) three days out of four; it is most humid around August 2, exceeding 83% (humid) three days out of four. The mean monthly relative humidity for Karachi South district is shown graphically in Exhibit 4.4.

Exhibit 4.4: Relative Humidity

Source: Jinnah International Airport

4.6 WIND SPEED AND DIRECTION

The project area lies in region where wind blows throughout the year with highest velocities during the summer months, when the direction is south-west to west. During winter the wind blows from north to northeast, shifting southwest to west in the evening hours. The wind usually carries sand and salt resulting in severe corrosion and erosion. The wind direction and speed between the two monsoon seasons viz. summer and winter are rather unsettled and large variations are noted both with respect to speed and direction. Winds too, are dry and have a desiccating effect during May & June. In July and August, winds contain moisture and have a beneficial effect on the plant life.
Over the course of the year, typical wind speeds vary from 0 mph to 19 mph (calm to fresh breeze), rarely exceeding 29 mph (strong breeze). The highest average wind speed of 13 mph (moderate breeze) occurs around May 18, at which time the average daily maximum wind speed is 18 mph (fresh breeze).

The lowest average wind speed of 5 mph (light breeze) occurs around November 16, at which time the average daily maximum wind speed is 10 mph (gentle breeze). The wind is most often out of the west (31% of the time) and south west (23% of the time). The wind is least often out of the south east (1% of the time), south (2% of the time), east (3% of the time), north west (5% of the time), and north (5% of the time). Exhibit 4.5 shows the wind speed and direction of the project area.

Exhibit 4.5: Wind Speed and Wind Direction

Statistics based on observations taken between 04/2009 - 10/2014 daily from 7am to 7pm local time.
4.7 WATER RESOURCES

This section details the water resources of the proposed project area, which lies in district Malir. Both, surface and ground water resources have been summarized in this section of the report. Data was obtained from secondary sources and through field observation and data collection (ESIA field survey).

4.7.1 Surface Water Resources

There is no significant natural freshwater source in the project area. The Indus River about 120km to the east of Karachi city and the Hub River, a perennial stream that originates in Balochistan and marks the boundary between Karachi Division and Balochistan are the sources of fresh water in Karachi.

The Lyari and Malir Rivers that passes through the city do not have any natural flow, except during the monsoons. The Lyari River falls in Kemari and Malir River falls in Gizri Creek. Malir River is ephemeral and is constituted from two major tributaries, i.e. Mol and Khadeji as well as some minor tributaries. Khadeji is a perennial stream that originates at Khadeji falls and gains flow as it travels across the Malir Basin.

The current water demand amounts to approximately 752 MGD (2005); against this demand the capacity of the supply system is 646 MGD, giving rise to a shortfall of 106 MGD in bulk supply. However, the amount of water supplied to the consumers by the service remains short by about 35 percent due to losses in transmission from leakages, friction and large scale unauthorized diversion or thefts. About 60percent of the households are connected to the supply network. Under the present conditions, water supply is irregular and inequitable. Water is supplied only for a few hours, generally four hours daily and that too at a very low pressure. Inequitable distribution marks the supply system as some areas receive more water, and some too little to meet their needs. There are some areas which are not connected to the system and get water on payment through tankers. There is also a serious concern about water quality. The existing filtration facilities are not enough to subject all supplies to clarifier process; about 60 percent of water is filtered and the rest is only disinfected through chlorination. Some contamination may also occur in transmission to the end consumers (KSDP 2020, 2007). However, the existing water supply network is presented below in Figure 3.
4.8 SURFACE WATER DRAINAGE

The drainage pattern of Karachi is dominated by dendritic. The surface drainage of Karachi City is divided in four parts based upon surface runoff and streams flow.

- Malir River Basin
- Lyari River Basin
- Budnai Basin
- Coastal Basin

The Malir River basin and the Lyari River basin are two main basins which contribute about 80 percent of the surface runoff. The Budnai basin and the coastal basin are minor basins. All basins collect surface runoff through hundreds of small and large channels which finally drain into sea. The drainage system of Karachi city is shown in Exhibit 4.6.
4.8.1 Groundwater Resources

Groundwater resources in Karachi Division are limited. The aquifers close to the coastal belt are mostly saline and unusable for domestic purposes. The aquifers near the Hub River bed are well developed and are source of water for agriculture and other domestic purposes. Generally, the aquifers in the project area are estimated to lie at depths of 50 m to 100 m. Since the area is intensely urbanized and groundwater resources are depleted in the region, no sampling was conducted due to unavailability of proper groundwater well.

4.9 Ambient Air & Noise Quality

According to world population review in 2014, Karachi has the 7th largest urban agglomeration and the largest city in the Muslim world that suggests that Karachi has experienced tremendous growth in the last two decades. Air and Noise sampling plan is presented below in Exhibit 4.7 and results in Exhibit 4.8 respectively.
**Exhibit 4.7:** Air and Noise Sampling Plan

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**Exhibit 4.8:** Air and Noise Quality Monitoring Results

<table>
<thead>
<tr>
<th>Sampling Location</th>
<th>Parameters</th>
<th>Units</th>
<th>NEQS Limits</th>
<th>Concentrations</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Point-1 Lalazar Grid Station</td>
<td><em>Carbon monoxide (CO)</em></td>
<td>mg/m³</td>
<td>10</td>
<td>01</td>
<td>EVM-7</td>
</tr>
<tr>
<td></td>
<td><em>Particulate Matter (PM₁₀)</em></td>
<td>µg/m³</td>
<td>150</td>
<td>243</td>
<td>EVM-7</td>
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<tr>
<td></td>
<td><em>Noise</em></td>
<td>dB(A)</td>
<td>85</td>
<td>67</td>
<td>Noise Meter</td>
</tr>
<tr>
<td>Point-2 Jang Press</td>
<td><em>Carbon monoxide (CO)</em></td>
<td>mg/m³</td>
<td>10</td>
<td>02</td>
<td>EVM-7</td>
</tr>
<tr>
<td></td>
<td><em>Particulate Matter (PM₁₀)</em></td>
<td>µg/m³</td>
<td>150</td>
<td>359</td>
<td>EVM-7</td>
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<td></td>
<td><em>Noise</em></td>
<td>dB(A)</td>
<td>85</td>
<td>63.3</td>
<td>Noise Meter</td>
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<tr>
<td>Point-3 Subh-e-Nau School</td>
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<td>mg/m³</td>
<td>10</td>
<td>02</td>
<td>EVM-7</td>
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<td><em>Particulate Matter (PM₁₀)</em></td>
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<td>234</td>
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<td>06</td>
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<tr>
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<td><em>Particulate Matter (PM₁₀)</em></td>
<td>µg/m³</td>
<td>150</td>
<td>150</td>
<td>EVM-7</td>
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<td></td>
<td><em>Noise</em></td>
<td>dB(A)</td>
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<td>Sampling Location</td>
<td>Parameters</td>
<td>Units</td>
<td>NEQS Limits</td>
<td>Concentrations</td>
<td>Method</td>
</tr>
<tr>
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<td>--------------------------</td>
<td>-----------</td>
<td>-------------</td>
<td>---------------</td>
<td>--------------</td>
</tr>
<tr>
<td>Point-5 Lalazar Residential turning</td>
<td>Carbon monoxide (CO)</td>
<td>mg/m³</td>
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<td>02</td>
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<td></td>
<td>Particulate Matter (PM₁₀)</td>
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<tr>
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<td>04</td>
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<td></td>
<td>Particulate Matter (PM₁₀)</td>
<td>µg/m³</td>
<td>150</td>
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<td>dB(A)</td>
<td>85</td>
<td>65.5</td>
<td>Noise Meter</td>
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<tr>
<td>Point-7 West Wharf Road</td>
<td>Carbon monoxide (CO)</td>
<td>mg/m³</td>
<td>10</td>
<td>11</td>
<td>EVM-7</td>
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<tr>
<td></td>
<td>Particulate Matter (PM₁₀)</td>
<td>µg/m³</td>
<td>150</td>
<td>180</td>
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<td>Noise</td>
<td>dB(A)</td>
<td>85</td>
<td>73.6</td>
<td>Noise Meter</td>
</tr>
<tr>
<td>Point-8 ICI Bridge</td>
<td>Carbon monoxide (CO)</td>
<td>mg/m³</td>
<td>10</td>
<td>04</td>
<td>EVM-7</td>
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<td>Particulate Matter (PM₁₀)</td>
<td>µg/m³</td>
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<td>158</td>
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<tr>
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<td>Noise</td>
<td>dB(A)</td>
<td>85</td>
<td>77.8</td>
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<tr>
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<td>Carbon monoxide (CO)</td>
<td>mg/m³</td>
<td>10</td>
<td>04</td>
<td>EVM-7</td>
</tr>
<tr>
<td></td>
<td>Particulate Matter (PM₁₀)</td>
<td>µg/m³</td>
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<td>192</td>
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<td></td>
<td>Noise</td>
<td>dB(A)</td>
<td>85</td>
<td>67.8</td>
<td>Noise Meter</td>
</tr>
<tr>
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<td>Carbon monoxide (CO)</td>
<td>mg/m³</td>
<td>10</td>
<td>04</td>
<td>EVM-7</td>
</tr>
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<td></td>
<td>Particulate Matter (PM₁₀)</td>
<td>µg/m³</td>
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<td>231</td>
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</tr>
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<td>85</td>
<td>72.9</td>
<td>Noise Meter</td>
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<td>Point-11 Custom House</td>
<td>Carbon monoxide (CO)</td>
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<td>10</td>
<td>02</td>
<td>EVM-7</td>
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<td></td>
<td>Particulate Matter (PM₁₀)</td>
<td>µg/m³</td>
<td>150</td>
<td>358</td>
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<td></td>
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<tr>
<td>Point-12 KPT Bridge</td>
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<td>10</td>
<td>09</td>
<td>EVM-7</td>
</tr>
<tr>
<td></td>
<td>Particulate Matter (PM₁₀)</td>
<td>µg/m³</td>
<td>150</td>
<td>323</td>
<td>EVM-7</td>
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<tr>
<td></td>
<td>Noise</td>
<td>dB(A)</td>
<td>85</td>
<td>74.8</td>
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<tr>
<td>Point-13 Bahria Complex I</td>
<td>Carbon monoxide (CO)</td>
<td>mg/m³</td>
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<td>05</td>
<td>EVM-7</td>
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<td></td>
<td>Particulate Matter (PM₁₀)</td>
<td>µg/m³</td>
<td>150</td>
<td>134</td>
<td>EVM-7</td>
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<tr>
<td></td>
<td>Noise</td>
<td>dB(A)</td>
<td>85</td>
<td>81.6</td>
<td>Noise Meter</td>
</tr>
</tbody>
</table>
4.10 FLOODING

Urban flooding is caused by heavy rainfall overwhelming drainage capacity. Cities have been growing with alarming rate. This problem is important both in Developed and under developed cities like other mega cities of the world flooding has become a serious hazard in the mega cities of Pakistan e.g. Karachi, Lahore, Rawalpindi, Hyderabad etc. The meteorological data of rainfall and hydrological data of surface runoff reveal that occurrence of flood is not the new phenomenon in Karachi. The severe flood occurred in the city, the history of that events and its flow in Malir River were recorded which are shown in Exhibit 4.9.

Exhibit 4.9: History of severe floods in Karachi

<table>
<thead>
<tr>
<th>Year</th>
<th>Rainfall (mm)</th>
<th>Surface Runoff (000 cubic metres) in Malir River</th>
</tr>
</thead>
<tbody>
<tr>
<td>1930</td>
<td>408.3</td>
<td>209166</td>
</tr>
<tr>
<td>1944</td>
<td>676.3</td>
<td>391997</td>
</tr>
<tr>
<td>1956</td>
<td>414.2</td>
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<tr>
<td>1959</td>
<td>688.8</td>
<td>330385</td>
</tr>
<tr>
<td>1961</td>
<td>621.8</td>
<td>267201</td>
</tr>
<tr>
<td>1967</td>
<td>713.0</td>
<td>348451</td>
</tr>
<tr>
<td>1970</td>
<td>475.0</td>
<td>172800</td>
</tr>
<tr>
<td>1977</td>
<td>489.0</td>
<td>123708</td>
</tr>
<tr>
<td>1994</td>
<td>481.0</td>
<td>124178</td>
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<tr>
<td>2007</td>
<td>465.6</td>
<td>118710</td>
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</tbody>
</table>

Source: Pakistan Meteorological Department and WAPDA

Causes of Flood in Karachi City

The primary cause of flooding in Karachi city is torrential rainfall due to tropical storm and monsoon which saturate soil and create huge surface runoff. Floods in urban conditions are flashy in nature and occur both on built up surfaces like roads and streets, parking lots, yards, parks etc. and creeks of urban areas like the Lyari, the Gizri, and the Korangi creek.

Although the climate of Karachi is arid and rainfall is low and highly variable but whenever torrential rain comes and heavy rainfall occurs within a short duration surface runoff intensify. This is because rate of water percolation into soil is lower than the amount of rain water falls on the surface. The Annual total rainfall and surface runoff in Malir River from 1929 to 2008 is shown in Exhibit 4.10 respectively.
Exhibit 4.10: Annual total rainfall and surface runoff in Malir River (1929-2008)

<table>
<thead>
<tr>
<th>Year</th>
<th>Rainfall (mm)</th>
<th>Annual Runoff (000 cubic metre)</th>
<th>Year</th>
<th>Rainfall (mm)</th>
<th>Annual Runoff (000 cubic metre)</th>
<th>Year</th>
<th>Rainfall (mm)</th>
<th>Annual Runoff (000 cubic metre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1929</td>
<td>104.9</td>
<td>8571</td>
<td>1956</td>
<td>414.2</td>
<td>104164</td>
<td>1983</td>
<td>282.1</td>
<td>39874</td>
</tr>
<tr>
<td>1930</td>
<td>408.3</td>
<td>209166</td>
<td>1957</td>
<td>412.1</td>
<td>1443</td>
<td>1984</td>
<td>270</td>
<td>165715</td>
</tr>
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<td>1931</td>
<td>18.5</td>
<td>2670</td>
<td>1958</td>
<td>226.1</td>
<td>54233</td>
<td>1985</td>
<td>154.6</td>
<td>20805</td>
</tr>
<tr>
<td>1932</td>
<td>324.6</td>
<td>176705</td>
<td>1959</td>
<td>688.8</td>
<td>330385</td>
<td>1986</td>
<td>91.6</td>
<td>32132</td>
</tr>
<tr>
<td>1933</td>
<td>511</td>
<td>299817</td>
<td>1960</td>
<td>129.5</td>
<td>11042</td>
<td>1987</td>
<td>0</td>
<td>86</td>
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<tr>
<td>1934</td>
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<td>84646</td>
<td>1961</td>
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<td>1988</td>
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<td>1935</td>
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<td>1962</td>
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<td>1989</td>
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<td>1936</td>
<td>107.2</td>
<td>19742</td>
<td>1963</td>
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<td>6817</td>
<td>1990</td>
<td>137.4</td>
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<tr>
<td>1937</td>
<td>297.8</td>
<td>111119</td>
<td>1964</td>
<td>138.9</td>
<td>30819</td>
<td>1991</td>
<td>24.5</td>
<td>2690</td>
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<tr>
<td>1938</td>
<td>120.2</td>
<td>206558</td>
<td>1965</td>
<td>129.5</td>
<td>40971</td>
<td>1992</td>
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<td>1939</td>
<td>115.4</td>
<td>2238</td>
<td>1966</td>
<td>70.1</td>
<td>17626</td>
<td>1993</td>
<td>35.5</td>
<td>3290</td>
</tr>
<tr>
<td>1940</td>
<td>275.5</td>
<td>17885</td>
<td>1967</td>
<td>713</td>
<td>348451</td>
<td>1994</td>
<td>481.5</td>
<td>229266</td>
</tr>
<tr>
<td>1941</td>
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<td>3404</td>
<td>1968</td>
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<td>1995</td>
<td>259.8</td>
<td>15885</td>
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<tr>
<td>1942</td>
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<td>146500</td>
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<td>39.4</td>
<td>6713</td>
<td>1996</td>
<td>99</td>
<td>7892</td>
</tr>
<tr>
<td>1943</td>
<td>74.4</td>
<td>6791</td>
<td>1970</td>
<td>475</td>
<td>172800</td>
<td>1997</td>
<td>150.1</td>
<td>42043</td>
</tr>
<tr>
<td>1944</td>
<td>676.3</td>
<td>391997</td>
<td>1971</td>
<td>68.6</td>
<td>8096</td>
<td>1998</td>
<td>82.4</td>
<td>15453</td>
</tr>
<tr>
<td>1945</td>
<td>165.9</td>
<td>46043</td>
<td>1972</td>
<td>44.2</td>
<td>2998</td>
<td>1999</td>
<td>14.5</td>
<td>373</td>
</tr>
<tr>
<td>1946</td>
<td>99.6</td>
<td>17453</td>
<td>1973</td>
<td>213.4</td>
<td>93649</td>
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<td>46.9</td>
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</tr>
<tr>
<td>1947</td>
<td>59.2</td>
<td>7776</td>
<td>1974</td>
<td>7.2</td>
<td>1365</td>
<td>2001</td>
<td>100.4</td>
<td>8520</td>
</tr>
<tr>
<td>1948</td>
<td>142</td>
<td>3845</td>
<td>1975</td>
<td>163.8</td>
<td>21444</td>
<td>2002</td>
<td>55.8</td>
<td>6877</td>
</tr>
<tr>
<td>1949</td>
<td>323.6</td>
<td>151416</td>
<td>1976</td>
<td>406.1</td>
<td>55581</td>
<td>2003</td>
<td>324.9</td>
<td>175702</td>
</tr>
<tr>
<td>1950</td>
<td>85.9</td>
<td>21384</td>
<td>1977</td>
<td>489</td>
<td>123708</td>
<td>2004</td>
<td>65.9</td>
<td>5220</td>
</tr>
<tr>
<td>1951</td>
<td>77.1</td>
<td>5522</td>
<td>1978</td>
<td>206.3</td>
<td>196957</td>
<td>2005</td>
<td>97.2</td>
<td>7200</td>
</tr>
<tr>
<td>1952</td>
<td>224.3</td>
<td>73310</td>
<td>1979</td>
<td>361</td>
<td>18179</td>
<td>2006</td>
<td>301.1</td>
<td>51212</td>
</tr>
<tr>
<td>1953</td>
<td>262.1</td>
<td>112018</td>
<td>1980</td>
<td>193.8</td>
<td>5599</td>
<td>2007</td>
<td>465.6</td>
<td>225122</td>
</tr>
<tr>
<td>1954</td>
<td>289.6</td>
<td>77484</td>
<td>1981</td>
<td>185.6</td>
<td>43952</td>
<td>2008</td>
<td>121.6</td>
<td>3238</td>
</tr>
<tr>
<td>1955</td>
<td>155.8</td>
<td>34240</td>
<td>1982</td>
<td>161.2</td>
<td>15543</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: WAPDA & Pakistan Meteorological department

Heavy shower takes place in the city either due to the affects of tropical storms usually in June which rarely attack the coastal areas but they bring heavy shower for a short period cause flooding. Just like on June 6, 2010 due to the tropical storm Karachi received 130 mm rain within a day caused huge surface runoff. The heavy monsoon rain mostly occurs in July and August is the main cause of flooding in the city. However its chance of occurrence is estimated about 3 to 5 years.

4.11 EARTHQUAKES

The Indo-Australian plate upon which Pakistan, India and Nepal lie, is continuously moving northward, colliding with and sub-ducting under the Eurasian plate, thus forming the Himalayan mountains, and triggering earthquakes in the process. The city of Karachi is located on the edge of the high hazard zone II. Exhibit 4.11 shows seismic zoning map of Pakistan. The history reveals that:

- The areas comprising Pakistan have suffered four major earthquakes in the 20th century including the great Quetta earthquake of 1935, the 1945 earthquake off the coast of Makran, the 1976 earthquake in the Northern
areas, and the October 2005 Kashmir earthquake. In between these major events, the Northern areas and Kashmir have experienced many small quakes with localized impact. No appreciable earthquakes have been recorded in Karachi during the recent past. However, on September 24, 2013, a tremendous earthquake struck the Awaran District in the western Balochistan Province of Pakistan. The quake’s epicenter was near the Awaran District, but others districts of Balochistan Turbat, Panjgur, Chaghai, Khuzdar and Gwadar were also affected. According to the reports, tremors from the earthquake, which registered 7.8 on the Richter scale, were also felt in Quetta, Hub, Kharan, JhalMagsi, Qalat, Sibi, Mastung, Jafferabad and Karachi Pakistan and as far away as UAE.

- The recently developed (post October 2005 earthquake) seismic zone map of Pakistan has divided the country into four seismic zones ranging in term of major, moderate, minor and negligible zones with respect to ground acceleration values. Under this zoning Karachi Division has been identified on the edge of moderate to high hazard zone. This zone has minor to moderate damaging affect.

- The proposed project is located in the seismic tectonic region of the Kirthar Ranges, where a moderate level of seismic activity is believed to exist, but large magnitude earthquakes are rare. Tectonic Plates/Seismic Zoning Map of Pakistan can be seen in Exhibit 4.12.

Exhibit 4.11: Karachi lies on Seismic Zone II & III

Source: (NDRMFP, 2007)
Exhibit 4.12: Fault line impacts in South Sindh and Balochistan region

SOUTH SINDH / BALUCHISTAN
Earthquakes (1905-2004)

4.11.1 Tsunamis

The coastal areas of Karachi might experience the effect of Tsunamis as the coast line of Pakistan has had this natural hazard in the recent past. An earthquake of magnitude 8.3 generated a destructive tsunami wave in the Northern Arabian Sea and the Indian Ocean on 28th November, 1945, producing 12 m to 15 m high sea waves that killed at least 4,000 people in Pasni and adjoining areas. The tsunami hit as far as Mumbai in India. Karachi, about 450 km from the epicenter, experienced 2 m high sea waves which affected harbor facilities. Hence, the occurrence of another tsunami in the future cannot be ruled out.

The fact that cities like Karachi lie close to potential epicentres for large submarine earthquakes, demands attention for enhancement of local capacities for disaster risk reduction, early warning and response in order to reduce losses from tsunami events.

Recent studies show that Subduction of Oman oceanic lithosphere northward beneath the Iranian micro-plate and a tri-junction of tectonic plates at Somiani Bay can be a potential source of future tsunami that can be a major threat to the coastal cities of Pakistan such as Karachi, Gawadar, Pasni, Ormara etc.
4.11.2 Tropical Storms and Cyclones

Tropical cyclones also occur periodically in the coastal areas. Coastal belt of Pakistan (especially in Sindh) is highly vulnerable to cyclones and associated storm surges. Fourteen cyclones were recorded between 1971 and 2001 (NDRMFP, 2007). Seldom have these cyclones had high intensities. The cyclone of 1999 in Thatta and Badin districts wiped out 73 settlements and killed 168 people and 11,000 cattle. Nearly 0.6 million people were affected. It destroyed 1800 small and big boats and partially damaged 642 boats, causing a loss of Rs. 380 million. Losses to infrastructure were estimated at Rs. 750 million. Climate change may increase the frequency and intensity of storms and could cause changes in their tracks. Although the frequency of cyclones along Pakistani coast is low, yet they cause considerable damage, when they occur. Hence the possible occurrence of a future cyclone with severe consequences is quite rare but cannot be ruled out (NDRMFP, 2007).
The Environmental baseline and biological environment of the project area was evaluated by both primary and secondary means. Surveys were conducted from October to November 2015. Sampling locations for the identification of floral and faunal assemblages were carefully selected so that the maximum number of species could be observed and significant ecological baseline was generated for the project area. The summary of biodiversity found during the site visit is as under, however detailed sampling methodologies and findings are also incorporated as an essential component of this chapter.

**Exhibit 5.1: Summary of Biodiversity of the project area**

<table>
<thead>
<tr>
<th>Assemblages</th>
<th>Number of Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flora</td>
<td>14</td>
</tr>
<tr>
<td>Avifauna</td>
<td>09</td>
</tr>
<tr>
<td>Mammalian Fauna</td>
<td>03</td>
</tr>
<tr>
<td>Herpito Fauna</td>
<td>02</td>
</tr>
</tbody>
</table>

### 5.1 HABITATION

In general, Karachi is categorized as an urban environment having environmental conditions like a semi-arid desert. The natural faunal and floral species and ecosystems are less significant and less in number because of extreme environmental stressors out of which significant source of stress on natural ecosystems includes environmental pollution associated with anthropogenic activities thus escalating degradation of floral and faunal ecosystems. However, during surveys and assessments it was observed that biodiversity of the project area was insignificant due to unavailability of fresh water resources. Most species found were urbanized species and most of them are considered as Pollution Indicators. Neither species of flora and fauna was threatened, vulnerable, critically endangered or near to extinction according to IUCN red list or protected under CITES and or SIND WILDLIFE ORDINANCE etc.

### 5.2 FLORA OF THE PROJECT AREA

The project area is adjacent to the coast and so-called Chenna Creek which is now contaminated with domestic effluents. Untreated effluent discharges into the sea through the creek. However the tidal influx from sea somehow dilutes the
wastewater and reduces the impacts of pollution hence the species dependent on creeks/estuaries such as, Mangroves are striving to adapt to the existing environment. The current scenario reflects that the Mangroves are in deplorable condition now. While on the other hand it was observed that, the project area sustains few halophytes and other terrestrial grasses. The frequency of the vegetation was observed to be low and less significant. The detailed description and list of identified species across the project area is incorporated below. The detailed description, list of identified species and methodology adopted for sampling are discussed in details below.

5.2.1 Halophytes of the Project area

Brief description:

Halophytes are such plant species, which are adapted to growing in saline conditions, as in a salt marsh. The species have developed different adaptation strategies in order to survive in very high salt and low salt content availability in soil. The species are distinguished based on salt demand and tolerance and are characterized as obligate i.e. they need some salt for survival and facultative i.e. can survive in fresh water conditions. However the frequency of the species observed was quit low.

Exhibit 5.2: List of Identified Floral species of the project area

<table>
<thead>
<tr>
<th>Plant Species</th>
<th>Family</th>
<th>Local Name</th>
<th>Life form</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Suaeda monoica</em></td>
<td>Chenopodiaceae</td>
<td>seablite</td>
<td></td>
</tr>
<tr>
<td><em>Atriplex Stocksii</em></td>
<td>Chenopodiaceae</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Artherocnemum indicum</em></td>
<td>Chenopodiaceae</td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Artherocnemum macrostachyum</em></td>
<td>Chenopodiaceae</td>
<td>Glaucous glasswort,qulaam</td>
<td></td>
</tr>
<tr>
<td><em>Cressa creitica</em></td>
<td>Convolvulaceae</td>
<td>alkaliweeds</td>
<td></td>
</tr>
</tbody>
</table>

Figure 1: _Capparis decidua_

Figure 1: _Prosopis Juliflora_
### Plant Species

<table>
<thead>
<tr>
<th>Plant Species</th>
<th>Family</th>
<th>Local Name</th>
<th>Life form</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Ipomea pescaprae</em></td>
<td><em>Convolvulaceae</em></td>
<td><em>Goat's foot vine</em></td>
<td>x</td>
</tr>
<tr>
<td><em>Capparis decidua</em></td>
<td><em>Capparidaceae</em></td>
<td><em>Karir or karli</em></td>
<td>x</td>
</tr>
<tr>
<td><em>Prosopis juliflora</em></td>
<td><em>Mimosaceae</em></td>
<td><em>vanni-andara</em></td>
<td>x</td>
</tr>
<tr>
<td><em>Parkinsonia aculata</em></td>
<td><em>Mimosaceae</em></td>
<td><em>jelly bean tree</em></td>
<td>x</td>
</tr>
<tr>
<td><em>Salvadora oleides</em></td>
<td><em>Salvadoraceae</em></td>
<td><em>khari jaal</em></td>
<td>x</td>
</tr>
<tr>
<td><em>Avicina Marina</em></td>
<td><em>Acanthaceae</em></td>
<td><em>Timar</em></td>
<td>x</td>
</tr>
</tbody>
</table>

### Sampling Methodology

In order to study the dominant vegetation/floral species of the project area standard quadrat sampling method was used in which different sized quadrats by means of measuring tape were made, the quadrat size ranged between 2-20 meter.

#### 5.2.2.1 The Dominant Vegetation

The dominant floral species of the project area is *Prosopis juliflora* which is one of the wild species in Sindh, rest of the species contributed less in vegetation cover of the project area.

### 5.3 FAUNA OF THE PROJECT AREA

Project site is located in urban setup, therefore low frequency of faunal species was observed in the project area. However, it is important to note that beside the shore birds, egrets, herons, gulls and terns were commonly observed near the coastline. The increase in pollution level across the city exhibited a catastrophic impact on to the significant avifaunal species of the project area. Since the project is located in urban setup the Mammalian fauna and Herpito faunal diversity is already low and less significant however, the observed mammals included Small Indian Mongoose, Roof Rat etc. Detailed sampling protocol and method is presented below after brief description of the species and list of identified avifauna, mammals and reptile species of the project area.
5.3.1 Avifauna of the project area

Since the project is located in urban setup, therefore the species identified in the project area are of less ecological importance. However few birds such as Reef Heron, Little and Cattle Egret were of ecological importance. The detailed sampling methodology and list of identified species during the ecological/baseline survey is presented below.

5.3.2 Sampling methodology:

In order to study the avifaunal diversity of the project area individual count technique was used during field surveys and the identified species were immediately recorded and reported accordingly. The detailed list of identified avifaunal species is presented below in table 2 and pictorial profile of the avifauna is presented in table 3 respectively.

Exhibit 5.3: Avifauna (Birds) of the project area

<table>
<thead>
<tr>
<th>S. No</th>
<th>English Name and Scientific Name</th>
<th>Occurrence</th>
<th>Protection Status</th>
<th>Population Total Count</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Resident</td>
<td>Migratory</td>
<td>Common</td>
</tr>
<tr>
<td>1</td>
<td>Blue Rock Pigeon (Columba livia)</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>House Crow (Corvus splendens)</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Reef Heron (Egretta sacra)</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Grey Heron (Ardea cinerea)</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Little Egret (Egretta garzetta)</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Cattle Egret (Bubulcus ibis)</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>House Sparrow (Passer domesticus)</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Common Myna (Acridotheres tristis)</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Little Cormorant (Phalacrocorax niger)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Pariah Kite (Milvus migrans go vind a)</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Brahminy Kite (Haliastur indus indus)</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Osprey (Pandion haliaetus haliaetus)</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Red wattled Lapwing (Vanellus indicus)</td>
<td>x</td>
<td>x</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Great Blackheaded Gull (Larus ichthyaetus)</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Blackheaded Gull (Larus ridibundus)</td>
<td>x</td>
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</table>
## Environmental Baseline: Biological Environment

<table>
<thead>
<tr>
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<th>Occurrence</th>
<th>Protection Status</th>
<th>Population Total Count</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Resident</td>
<td>Migatory</td>
<td>Common</td>
</tr>
<tr>
<td>16</td>
<td>Slenderbilled Gull (Larus genei)</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Herrin Gull (Larus argentatus)</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Caspian Tern (Hydroprogenei caspia)</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Sandwich Tern (Thalassens sandcenses)</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Common Tern (Stern hirundo)</td>
<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Little Tern (Stern albibrons)</td>
<td>x</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Exhibit 5.4:** Pictorial Profile of Avifauna of the project area

- **Cattle Egret**
- **Reef Heron**
- **Little Egret**
- **Grey Heron**
- **House Sparrow**
- **Common Myna**
5.3.3 Mammalian fauna of the project area

The project area sustains few insignificant mammals such as: Five striped palm squirrel, Roof rat and House mouse are the common species of the area while small Indian mongoose is less common. None of the species recorded is protected, threatened or included in the CITES appendices. List of Mammals recorded in the project area is incorporated after the sampling methodology.

5.3.4 Aquatic Fauna

The fish fauna of the coastal area can be divided into permanently resident and visiting species. The visiting species can further be sub-divided into those that enter the creek for shelter, feeding and spawning during the monsoon season, and may stay for a period of one to two months spanning the juvenile stage, and those that enter the creeks with high tides and may return with the receding tides.

Among the pelagic species *Sardinella gibbosa, S. albella, Nematolossa nasus, Anodontostoma chacunda, Chirocentrus nudus, Hilsa kelee, Leiognatha blochii* and *Scombrids commersoniana* (juveniles) are common visitors. The demersal species include Queen Fishes, *Scatophagus argus, Mugil cephalus, Arius arius, A. teniuspinis, Therapon jarbua*, most of the mullet species and mudskippers. Juveniles of species like *Pomadasys kaakan, Lutjanus johni, Rhabdosargus sarba* etc. are also commonly observed.

Ahmed 1971 reported three species of oyster, *Crassostrea virginica, C. gryphoides*, and *C. glomerata*, in the area. Today however, these species are very seldom seen in the region. Similarly the beds of Windowpane *Oyster Placuna placenta* that had abundantly occurred in the area are vanishing. The once thriving population of *Solen truncatus* also seems to have declined. The foremost reason for the reduction in the populations of these molluscs is over fishing and the growing pollution in the region. Other mollusc species known from the area are *Bankia sp., Acartia sp.*, and *Sternula sp.*

5.3.5 Sampling Methodology

Direct count method was adopted to identify total number of identified species during the ecological baseline surveys. The list of identified mammals is presented below in Exhibit 5.5.
### Exhibit 5.5: List of Identified Mammals of the Project Area

<table>
<thead>
<tr>
<th>S. No</th>
<th>English Name</th>
<th>Scientific Name</th>
<th>Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Five-striped Palm Squirrel</td>
<td>Funnambulus pennantii</td>
<td>x</td>
</tr>
<tr>
<td>2</td>
<td>Roof Rat</td>
<td>Rattus Rattus</td>
<td>x</td>
</tr>
<tr>
<td>3</td>
<td>House Mouse</td>
<td>Mus musculus</td>
<td>x</td>
</tr>
<tr>
<td>4</td>
<td>Small Indian Mongoose</td>
<td>Herpestes javanicus</td>
<td>x</td>
</tr>
</tbody>
</table>

### Exhibit 5.6: Pictorial profile of Mammalian fauna

- **Five-striped Palm squirrel**
- **Roof Rat**
- **House Mouse**
- **Small Indian Mongoose**
5.3.6 Herpito fauna of the Project area:

The site is very poor in reptiles. Only few garden lizards were observed. None of the species is protected or threatened.

Exhibit 5.7: Reptiles of the project area

<table>
<thead>
<tr>
<th>S. No.</th>
<th>English Name</th>
<th>Scientific Name</th>
<th>Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Common</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Less Common</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Scare</td>
</tr>
<tr>
<td>1</td>
<td>Garden Lizard</td>
<td>Calotes veriscolor</td>
<td>x</td>
</tr>
<tr>
<td>2</td>
<td>Common House Gecko</td>
<td><em>Hemidactylus frenatus</em></td>
<td>x</td>
</tr>
<tr>
<td>3</td>
<td>Black Cobra</td>
<td><em>Veranus veranus</em></td>
<td>x</td>
</tr>
</tbody>
</table>

Conclusion:

The project site is located in completely urbanized setup while on the other hand harsh environmental conditions and overgrazing activities does not allow floral species to flourish. Moreover, the species observed are of less ecological importance. No cutting of trees or clearance of vegetation is envisaged at any location of the project. However, in case of cutting of trees, one plant should be replaced by 1:3 for immature plants and 1:6 for mature plants. Project activities will be started by low intensity jobs, which will serve as early warning system for reptiles and mammals of the project area.
6.1 SCOPE AND METHODOLOGY

This chapter presents the assessment of the socio-economic baseline of the entire surroundings of the project area based on social surveys. The assessment includes the administrative, demographic and social structures, amenities, health, education, livelihood, security and economics of the project area. The assessment also includes a focus on the gender aspects.

A brief socio-economic profile of the command area, based mainly on secondary data, is also provided following the needs and requirements of an Environmental Impact Assessment (EIA), incorporating the Pakistan Environmental Assessment Procedures 2000.

6.1.1 Tools for Data Collection

The socio-economic assessment is focused on evaluation of population, languages, literacy rate, education facilities, health facilities, private medical facilities, diseases, number of houses, available utilities, access to social amenities, road access, availability and medium of transport, occupational statistics, water resources and pressing needs of the people living in the area.

Interviews, focus group discussions and consultative meetings were conducted at community level and with different private and government departments and organizations to gather additional relevant primary data. A brief profile was designed very carefully and administered to sample the target population of the area.

The information gained helped in the measurement and determination of the impacts (positive and negative) on social services, livelihood and cultural pattern of the population under study.

**Exhibit: 6.1** shows the socioeconomic features of the project area.
6.2 PROJECT LOCATION AND ADMINISTRATIVE SETUP

The proposed project falls under the administrative town of Karachi South District referred as Saddar Town as well as under the KPT administrative area of Lalazar.

The major landmarks which lie within the close proximity of the project area are:

- Naval Officers Residential Estate 1
- Bahria Complex
- Port Grand
- Jinnah Bridge
- Beach Luxury Hotel
- U.S. Consulate
- Customs House
- Karachi Stock Exchange
- Karachi Dry Port
- Efu Building
- Ismaili Jamat Khana Kharadar
- Kharadar General Hospital
- Karachi Port Trust Building

Since these areas are of high societal services and one of the well-populated urban areas, traffic and regular businesses disturbances might occur due to project activities.
6.3 TRAFFIC INLETS AND OUTLETS

Since the project area is situated in the well-developed urban setup of the city, it has very sophisticated and defined network of roads and streets, thereby making it easily accessible from all the major roads of Karachi. The project area has the following traffic inlets and outlets:

- M.A. Jinnah Road
- M.T. Khan Road
- I.I. Chandigar Road
- Mai Kolachi Road
- Mauripur Road
- West Wharf Road
- Napier Road
- Baloch Colony Road

6.4 DEMOGRAPHICS

Karachi is one of the world's largest populated cities, spread over 3,530 square kilometers. The city credits its growth to the mixed populations of economic and political migrants and refugees from different national, provincial, linguistic and religious origins that come to settle here permanently along with their families.

According to Pakistan Economic Survey 2013-14, the population of Saddar Town is 1,232,302. The area is famous for centralized commercial activities and in fact this area is the backbone of economic hub of Karachi. The average household size is 4-6 members per family. Almost medium and upper class families are living in this Town.

6.5 NETWORKING AND BUSINESS ACTIVITIES

The proposed project is located near the areas which have commercial, residential as well as recreational importance and the residents of these areas belong to upper and middle classes. There are large numbers of commercial buildings, educational institutions, restaurants, parks and business avenues, frequently accessed by the inhabitants of Karachi; each area has its own identity.
During the survey, it was established that about 80% of businessmen, shopkeepers and employers were not residents of the area and all came from different parts of the city on daily basis.

Traffic in Karachi is mismanaged, especially in Sadar Town. The transportation vehicles are polluting the environment heavily and are one of the significant causes of stress and respiratory diseases. Heavy traffic of all sorts like mini buses, vans, trucks, cars, rickshaws, oil tankers, trailers cause heavy traffic jams on the roads which cause more environmental pollution. The area is the main artery to connect Karachi Port with the dockyards and railway track systems to all other parts of the country. Meanwhile, the main roads take these connections to Hub and other parts of the cities. The area is in constant load of traffic in all forms of vehicles either trains, trucks, cars, ships.

**6.6 LIVELIHOOD**

The livelihood of upper class people in the area mainly depends on business, private and government jobs and a lot of people are settled and employed abroad, however medium and lower class people living here specially depends on small businesses, jobs and labor. Many people of the area are engaged with the profession of fishing and ship making. Large scale of the area is involved in the business of warehouse and dockyard logistics. Multinational companies are involved as well as local companies develop the economy of the area too. The lifestyle of the people of these colonies is advanced and reflects urban culture.

The family system of middle and upper class people in this area mainly consist of single family system while large families were found in the surrounding slum areas and old city area.
6.7 **DRINKING WATER**

The major source of supply of drinking water in the project area is KWSB. People also use water supply line and underground water for drinking purpose but mostly for gardening, sanitary or cleaning purposes. According to the people of this area, there is shortage of water. The water through KWSB in most of the areas comes daily or on alternative days for around one hour. If there is load shedding at that time, people cannot store the water. In this case people have to purchase water through tankers. The underground water of the area is brackish and hard in nature. Sea water intrusion is prominent in the area and the ground water is not suitable to use for drinking purpose, as the salt content is very high in the water.

6.8 **EDUCATION AND LITERACY**

The project vicinity mainly includes prominent and famous educational institutions. The institutions found in this area are considered expensive and only children of upper class can avail educational facilities here. The alma mater of the founder of Pakistan, Sindh Madressatul Islam is also located near the project area on II Chandrigar Road. Literacy rate is moderate. The educational institutes include:

- Bahria College NORE-1
- St Michael’s Convent School
- Sindh Madressatul Islam University
- Okhai Memon School
- Subhe Nau School NORE-I

All the above stated institutions is located in the surrounding areas of the project.
6.9 HEALTH

Due to strong urban development in the area, modern health facilities are available in the surrounding areas of the proposed project. Major hospitals and clinics include:

- Kutyana Memon Association Hospital
- Civil Hospital
- Kharadar General Hospital

These hospitals are well equipped and provide emergency services round the clock. Beside these large medical facilities, some small clinics and dispensaries are also serving in surrounding colonies. Contagious diseases are on the rise because of constant exposure to unhygienic and polluted environment. Furthermore, due to poor hygienic practices and awareness, skin diseases and Gastro-Intestinal Track diseases are common in lower class community. Intake of contaminated drinking water is the major cause of spreading GIT diseases.

6.10 CULTURE AND RELIGION

Since the transmission line is located in the highly developed area so the people are highly urbanized. Karachi is home to many cultural sects such as Sindhi, Punjabi, Saraiki, Pathan, Baloch, Urdu-speaking, Gilgiti etc. Clifton is reputed to be a residential place of the rich and famous people of Karachi so the life style of the people here is very much different and advance as compared to the people living in other towns of Karachi. Mostly people of the area travel abroad frequently. The dresses and daily routine activities of the residents do not represent common Pakistani culture.

The area has also got religious importance and many popular places of worships besides large Jama Masjids in the surrounding area. Ismaili Jamat Khana is located in the project route. There are two prominent Hindu temples located in the project area namely, Sri Laxmi Narayan Mandir and Daryalal Mandir respectively.
6.11 RECREATIONAL AREAS

The area is also famous for recreational facilities and some prominent parks, clubs and restaurants are located in the vicinity of the proposed project besides the local family parks designated by city administration in different societies. Some of the very famous recreational facilities are:

- Port Grand
- Beach Luxury Hotel
- Boat Basin
- Shaheed Benazir Bhutto Park
- Sea view and Clifton beach

6.12 ROLE OF WOMEN

Women of this area are usually professional, and are engaged in different private and government jobs, and other fields of life. Some women look after their homes and also pick and drop their children from school. Females of this area regularly go out of their homes mainly for shopping and recreations. Generally the women of the area wear simple Pakistani dresses, some also opt western wears like jeans, T-shirts etc in the advanced parts of the area.

On the other hand the women in old city area and other lower colonies of the area are relatively less educated and literacy rate is too low. Generally the women are housewives and spend most of time in their homes. Trend of jobs in women was found too low in the colonies due to cultural and ethnic reasons. Only needy women try to get jobs in different areas.
**Exhibit 6.1: Socioeconomic Features of the Project Area**

<table>
<thead>
<tr>
<th>Well Being Indicator</th>
<th>Saddar Town</th>
</tr>
</thead>
<tbody>
<tr>
<td>GPS Coordinates</td>
<td>N 24°50’38.6”  E 67°07’50.9”</td>
</tr>
<tr>
<td>Major Communities</td>
<td>Urdu-speaking, Memon, Sindhi, Baloch, Pukhtoon, Gilgiti, Kashmiri</td>
</tr>
<tr>
<td>No. of Houses</td>
<td>205, 383</td>
</tr>
<tr>
<td>Population (2014)</td>
<td>1,232,302</td>
</tr>
<tr>
<td>Livelihood</td>
<td>Dockyards, Business, Banking, Fishing, Govt. and Private Jobs</td>
</tr>
<tr>
<td>Electricity</td>
<td>Available</td>
</tr>
<tr>
<td>Fueling Source</td>
<td>Available</td>
</tr>
<tr>
<td>Major Institutions</td>
<td>Sindh Madressatul Islam University, Bahria College, Subh-e-Nau School</td>
</tr>
<tr>
<td>Literacy Rate</td>
<td>Moderate</td>
</tr>
<tr>
<td>Drinking Water</td>
<td>Tankers system, Groundwater, KWSB</td>
</tr>
<tr>
<td>Major Health Problems</td>
<td>Malaria, GIT, Hepatitis and Lungs Diseases</td>
</tr>
<tr>
<td>Well Being Indicator</td>
<td>Saddar Town</td>
</tr>
<tr>
<td>----------------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Health Facilities</td>
<td>Fair</td>
</tr>
<tr>
<td>Major Hospitals</td>
<td>Civil Hospital, Kutyana Memon Hospital</td>
</tr>
<tr>
<td>Major Needs</td>
<td>Safe Drinking Water, Continuous Electricity, Solid Waste and Wastewater Management Systems</td>
</tr>
<tr>
<td>Transport</td>
<td>Public and Private Transport, Motorcycles, Rickshaws</td>
</tr>
</tbody>
</table>
7.1 INTRODUCTION

Stakeholder consultation is a fundamental principle of the EIA process. Beside the statutory requirement of Sindh EPA act of 2014 and part of EIA/IEE regulations 2014, it is a valuable source of information on key impacts, potential mitigation measures and the identification and selection of alternatives for any proposed developmental project. It is a two way flow of information between public and developers, with opportunities for public to express their views. It also ensures the EIA process is open, transparent and healthy, characterized by defensible analysis.

The range of stakeholders involved in an EIA typically includes:

- the people (individuals, groups and communities) who are or indirectly affected by the project activities;
- the proponent and other project beneficiaries;
- government agencies;
- NGOs and interest groups; and
- Others, such as donors, the private sector, academics etc.

7.2 PURPOSE AND OBJECTIVES OF STAKEHOLDER CONSULTATION

The purpose of stakeholder consultation is to:

- inform the stakeholders about the proposed project and its likely impacts, (either positive or negative) on biophysical and socioeconomic environment;
- canvass their inputs, views, suggestions and concerns; and
- take account of the information and views of the public in the EIA and decision making.

The key objectives of stakeholder consultation are to:

- obtain local and traditional knowledge that may be useful for decision-making;
- facilitate consideration of alternatives, mitigation measures and tradeoffs;
- ensure that important impacts are not overlooked and benefits are maximized;
reduce conflict through the early identification of contentious issues;
provide an opportunity for the public to influence project design in a positive manner (thereby creating a sense of ownership of the proposal);
improve transparency and accountability of decision-making; and
increase public confidence in the EIA process.

7.3 PROCESS
A team of environmental consultants organized meetings with the primary and secondary stockholders of the proposed project, including local residents, business community, civil servants and representatives of other institutions. The team visited various prominent places in the project area to meet the targeted audience. During these meetings a simple, non-technical description of the project was given, along with an overview of the project’s likely environmental and socioeconomic impacts. Following the project description, a discussion was held so that the participants could voice their concerns and opinions. These concerns and suggestions were recorded in field notes and questionnaires. Participants were also asked to suggest alternatives in case of their particular concerns.

Stakeholders were divided in two categories during consultation as General Stakeholders and Administrative Stakeholders. In the first stage, meetings were arranged with the General Stakeholders at prominent locations in the surrounding areas who are engaged in various activities e.g. jobs, business, labor, households, academia and hospitals. In the second stage meetings were arranged with the Administrative Stakeholders including KPT, Customs House, Pakistan Railways and Traffic Police etc. Project location map was shared with all stakeholders and project description was explained in simple language. All the stakeholders were encouraged to ask questions and share their concerns related to the project.

During the stakeholder consultation process, it was conveyed that photographic evidence is necessary for reporting in ESIA, but most stakeholder representatives were reluctant to let the team take photographs or even disclose their name as a matter of authorized protocols. Where the team was allowed to take photographs, photographs of Stakeholder Consultation are compiled and attached in the end of this chapter as Exhibit: 7.2

7.3.1 Community Views

- Generally all the participants agreed with the proposed project and positive opinions were found about the project along with a few concerns.

- The participants were of the opinion that the proposed project is a developmental project and it will enhance the capacity of electricity and reduce load shedding in the area.
• All participants were mainly employees or businessmen who commute on daily basis to these areas from all over the city and each day is important for commercial activities.

• Some of participants raised concerns related to temporary roads and transportation disturbance due to the movement of heavy machinery and vehicles involved in the project activities and they demanded to complete the project as quick as possible;

• All participants raised concerns based on previous experiences of utility works that when roads and streets are dug for laying of pipelines or cables they are then left unattended without restoration which results in inconveniences to the public.

• All the participants wished that the project will be completed on time because any delay in the project can prolong inconvenience especially in transportation.

• People of surrounding colonies had the concern that during construction/excavation activities any supply of utility including electricity, gas and water should not be disturbed or damaged.

• These areas already have heavy traffic load since it connects with dockyards and warehouses. Day and night heavy vehicles move along the routes for supplies in and out of city. During construction, contractors have to be careful about where and how they will use the machineries and manage the time efficiently.

### 7.4 MAJOR STAKEHOLDERS

Following major stakeholders were consulted:

1. Pakistan Railways
2. Customs House
3. Bahria Complex
4. Subh-e-Nau School
5. NORE-1
6. Ismaili Jamat Khana
7. Docks Police Station

#### 7.4.1 Pakistan Railways

• Positive impacts are anticipated from the project.

• Mr. Rashid briefed that the Railway Engineering Department coordinates with the contractors and thoroughly plans how the cables are going to be
laid within the Railway premises. Safety precautions will be then taken accordingly for both workers as well as the train tracks.

- Usually Pakistan Railways has their own electric cables too for supporting the railway track system, but the proposed route does not seem to interfere with their systems since they usually originate out of Karachi throughout Pakistan.

- Furthermore, Mr. Imran discussed that the depth of K-electric cables is more than Pakistan Railway cables hence it is usually permitted for installation. As a precaution, depth is recommended to be increased if coincided due to EMF interaction.

- Tracks are open 24 hours and they cannot be closed or dismantled for any work other than maintenance.

- Since the weight of train bogie or sometimes cargo units is around 40 to 45 tons, it becomes necessary to be careful and alert the trains when approaching the sites where cables are laid.

- Pakistan Railways is always promoting developmental projects and will facilitate the proposed project when it is implemented.

- The project is strongly supported if the mitigation measures are properly taken.

7.4.2 Customs House

- Very recently, an initiative has been taken by Customs House, informed Mr. Adnan of Projects Department, as a token of ownership of the city to revive the cultural heritage of old Karachi.

- A paver block road is constructed in front of Customs House buildings with new exterior designing works; the project budget is approximated as Rs. 12 crores.

- It would not be feasible to deconstruct the road when a landmark for citizens is being created and it will play an important role for the citizens as well as all lovers of old Karachi.

- However, it is being planned in such a way that it has ducts present in both ends which are of about 4 feet wide; they are reserved for any future utility development works such that cables may be installed so that the road shall not be deconstructed.

- If this project needs to be done, it would be preferred that these ducts can be used or any other alternative route shall be considered.
7.4.3 Bahria Complex

- The Bahria Foundation covers administrations of Bahria Complex I, II and III located on M.T. Khan Road which fall on the project route.

- These are all business avenues and have mainly multinational companies.

- Working hours are although around 9 to 6 but since most of them are foreign based companies their timings are synchronized by their local country times and it may turn out to be late hours in Pakistan.

- The main issues are that parking is limited and construction works must be executed very accurately, otherwise both the complex as well as the contractors work may be affected due to poor coordination and inconvenience.

- In addition to this, foreigners visit the complex frequently, therefore it is recommended that, contractors shall proceed the works with proper planning and execute the works efficiently with restore the affected areas.

- Moreover, since maintenance is required in such works, it is suggested that, instead of going for whole length trenching or excavating and using heavy machineries; it would be better to develop separate blocks from where one side a cable is laid down and pulled or when maintenance is required the area can be opened and through a rolling machine the whole cable can be inspected.

- Nevertheless, the project if executed well will be supported.

7.4.4 NORE-1

- The NORE-1, Bahria College and Subh-e-Nau School are all under the administration of PNS Dilawar which is the Head Quarter of Pakistan Navy.

- NORE-1 is an Officers Residential area, meanwhile Bahria College and Subh-e-Nau School are educational institutions under the Pakistan Navy administration.

- Based on previous experiences; it is observed that K-Electric installs its cables but then does not repair the roads and leave the works uncompensated.

- Recently, paved footpaths were dismantled for cable installation and Pakistan Navy had to bear the cost for repairing the path.

- The project is positive and it will be promoted but the impacts caused like damaged roads are not acceptable and must be compensated immediately.
• If the lines already exist at entrances of school, college and residential area, it is suggested to leave the patch unexcavated and proceed further ahead where the cable can be pulled and inserted without extra effort.

• Construction works during night hours will be not allowed near NORE-1 areas due to security reasons.

7.4.5 Beach Luxury Hotel

• The Project is appreciated and promoted.
• People usually have a misconception that this hotel is used for events but its quite different, it is 24 hours open and guests live here day and night.
• This hotel also has different companies’ offices whose employees come daily for their jobs.
• It is suggested that the working hours be restricted to day time only as most events are held during evenings. It would become difficult for the contractors as well as for the hotel management to handle the continuous flow of traffic.
• As far as the route is concerned, there does not seem any negative impact since the line already exists.

7.4.6 Shri Laxmi Narayan Mandir

• The Project is appreciated and promoted.
• The Hindu Community manages to come anyway to the temple and it will be fine with them during construction phases too.
• Port Grand was constructed earlier and has caused many issues for the temple and its people and has no respect for its sanctity like playing loud music which disturbs the worshipers.
• It is an important site and all kinds of Hindu festivals are held here. Hindus from all over the city come here to perform their rituals.
• Even they honor their dead and afloat their ash in the sea.
• The project does not seem to affect any activity of the temple but through this forum it is being requested to respect the minor religious sects too.
Exhibit 7.1: Photographs Stakeholder Consultation

- Beach Luxury Hotel
- Pakistan Railways
- Warehouse Dealer
- Loader Contractors
- Bahria Complex
- Shri Laxmi Narayan Mandir
Analysis of alternatives is part of the ESIA process to select the best among all possible project options. The assessments and recommendations made by the ESIA team are presented below:

### 8.1 NO PROJECT ALTERNATIVES

While not developing the Power line would avert negative impacts commonly associated with power lines such as trenching and underground cable laying works especially in residential areas, impact on road, street infrastructure, utilities services and land take. It will not balance the need of development in the city for fulfilling the electricity demands. Furthermore, focusing on the Need of the Project previously described, if the project is not implemented there is no other alternative power source to provide electric supply to the area which might lead to a major power breakdown since the old cables are outdated and need immediate replacement.

Since there is increasing demand of electricity at local and national scale, the “No-Development” Alternative is not considered as a feasible option.

### 8.2 ALTERNATIVE ROUTES

The proposed project route was finalized from many alternate routes. The final route was planned considering primary factors:

The key considerations in selecting the corridor route included clustered settlements, common access routes and pathways, markets, community structures, private land (by avoiding it to extent possible). The shortest possible route was identified after considering all above factors.

Technically the route identified for transmission line is as follows:

- While selecting the route, due weightage was given to the accessibility of the line for construction as well as for maintenance for its total life span;

- The line is sited in areas which are accessible by slight deviations and marginal increase in the route length;
In most part of the route it is possible to transport materials and tools quickly in case of breakdowns;

- Proper planned system is designed to use the existing road infrastructure; line routes and stations are easily accessible.

- It would be possible for the personnel patrolling the line to be able to reach every location, careful inspection of the towers, insulators and the accessories without any obstruction from the land owners;

- Prior consultations were held with the concerned departments.

- Minimizing the transmission line exposure over residents/houses.

- Proper compensation to the affected people would be given.

### 8.3 ALTERNATIVE TECHNOLOGIES

Trenching is carried out generally with machinery like excavator and jack hammer for rocky soil but in streets/narrow paths where machineries are unable to reach the project area trench is made manually by using a spade or shovel and not a fork or pick-axe, in areas where utility services exist. Horizontal Directional Drilling (HDD) will be done where direct trenching cannot be done.
After a thorough assessment of the existing environmental and socio-economic conditions and review of technical data, a team of environmental professionals analyzed the environmental impacts and suggested the necessary measures of mitigation for significant impacts. This Chapter presents the environmental impact assessment of the proposed project as a whole including all the components.

The transmission line project is not an air, water polluting and resource intensive project. Installation of conventional underground cables typically involves permitting, working around traffic and other surface activity, trenching, laying cable and avoiding other underground utilities, such as gas pipelines and telecommunication cables.

Construction phase impacts are usually temporary and localized phenomenon, except the permanent changes that might be introduced in the local landscape and land use patterns along the Right-of-Way. Construction of underground transmission lines may have substantially greater impacts to soils and associated resources than construction of overhead lines. However, these impacts are given due consideration, wherever applicable.

### 9.1 ENVIRONMENTAL IMPACTS ASSESSMENT

#### 9.1.1 Environmental Impacts associated with construction phase

The construction works would require excavation of the entire length of the line, resulting in large areas of disturbance from the excavation and associated activities, such as heavy equipment use and soil storage. Ecological impacts could be increased by the greater soil disturbance, as could impacts to archeological and cultural resources. During the operation phase, most of the construction phase impacts will get stabilized and the impacts will be restricted only to the operation and maintenance of the project.

The impacts on the environment from various activities of the project can be categorized as follows:

- Impact on Physical Resources
  - Impact on Topography
9.1.2 Impact on Physical Resources

Impact on Topography

During the construction of the transmission line, the topography will change due to excavation. The most prominent impact on the surface topography will be due to the removing of the soil which might affect the stability of the ground near sewage drains. This will lead to change in the surface features only.

Mitigation Measures:

Top soil will be reused for refilling and compaction in excavated areas during the construction phase of the transmission line. The existing access routes will be utilized during the operation and maintenance of the transmission lines.
9.1.3 Impact on Environmental Resources

Impact on Air Quality

During the construction phase, the activity would involve excavation, movement of transporting vehicles carrying the construction materials etc. along the haul road (through un-built roads, but are not maintained). At majority of locations, movement of heavy vehicles may not be possible; from approach road to construction site material will be head loaded. All these activities would give rise to emission of dust particles thereby affecting air quality marginally at the site which will be transitory in nature.

Mitigation Measures:

Sprinkling of water during excavation will reduce the dust emission to a great extent. Stockpiles of excavated material must be covered at all times. Meanwhile, the vehicles to be used must be properly tuned and maintained.

Impact on Noise Levels

During the construction phase, the major sources of noise pollution include movement of vehicles, transportation of construction material and equipment to the site and operation of heavy machineries. The major work of the construction is expected to be carried out during the day time.

Nuisance to the community around the site can occur during the construction phase. Provision of appropriate noise barriers will be essential in this regard. Timings of construction work should be limited such that during night, when people need to rest other disturbance will pose as nuisance to them

Mitigation Measures:

Following measures will help to keep noise and vibration in acceptable level during construction phase:

- The most likely people to be affected shall be fairly warned about the severity of the works.

- Contractor shall equip their heavy construction equipment and plants with exhaust silencers to limit the engine noise so as not to exceed 75 db(A) (compacters, loaders, vibrators and cranes) and regularly maintain all construction vehicles and machinery in accordance with the National Environmental Quality Standards.

- Contractor shall limit working time for activities that create noise only from 7.00 am to 8.00 pm except for construction site near public sensitive receptors. Construction related activities closer to sensitive receptors have to be scheduled in coordination with the relevant authorities.
Impact on Surface Water Quality

The construction of the transmission lines will not have any major impact on the surface water quality in the area. Since there are no water related activities involved, no grey water will be generated, thereby, no surface water run-off is expected.

Mitigation Measures:

Ensure that minimum water is lost during construction activities and no water remains stagnant at any place.

Impact on Ground Water Quality

Ground water contamination might take place during construction activities. In case of an accidental spill or maintenance works of vehicles, machineries and different components of the transmission line; chemical substances and oily wastes, which are often used in the construction vehicles and machineries, may leach into the soil and percolate to the ground water. In rainy seasons, the quality of soil is vulnerable since the porosity increase and leachate formation is escalated which may eventually bring an impact on the ground water resources.

Mitigation Measures:

Thus following measures will be required in order to prevent deterioration of water from the construction and construction related activities:

- All construction vehicles and equipment should be maintained in proper conditions to avoid any leakage

- Contractors shall use silt traps and erosion control measures where the construction is carried out in close proximity to the water bodies to avoid cement particles, rock, rubbles and waste water entering the surrounding water bodies

- Construction activities should be restricted to dry season

- All liquid raw materials and semi-liquid components must be kept at impermeable floorings and covered properly with appropriate labeling which shall avoid any leakage that might occur due to accidental spill or rain water runoff.

Impact on Soil and Geology

Installation of underground lines requires trenching in soils and might require tunneling or rock cutting in along some routes. Turns and bends in the path are constrained by the limited flexibility, or minimum bend radius, of underground cables. Project activities including excavation, cut and fill operations etc., will
enhance the soil erosion during the rainy season. Removal of trees and green cover vegetation will reduce infiltration rate of rainwater. The impact on soils will be due to the soil erosion at the construction site and along the access routes. Excavation activity and land clearance in the erosion prone areas have to be minimized. Leveling and stabilization of excavated land sites will be done after completion of construction activity which will avoid surface runoff and damage to the topsoil.

**Mitigation Measures:**

The impact associated with landslides due to excessive erosion and other civil works can be avoided or minimized by following mitigation measures:

- As per feasibility, 50% of removed soil may be reused for restoring the excavated areas.
- Maximum effort should be taken to minimize removal of trees and green cover vegetation
- Minimize obstruction or destruction to natural drainage pattern of the surrounding area
- Proper treatment of clearing and filling areas against flow acceleration
- Contractors shall restrict cut and fill operation around sharp/deep slope areas

**9.1.4 Impact on Ecological Resources**

There is no national wildlife park, bird sanctuary, wetland in the route alignment of the proposed transmission line. The study area for route alignment has sparse plantations area. The ecological impacts are briefly described in the following sections

**Effect on Flora and Fauna**

The species reported in the project area and route includes 14 different floral, 09 species of Avifauna, 03 species of mammalian fauna and 02 species of Herpito fauna. It is important to note that not even a single species is protected under the Sindh Wildlife Ordinance or included in IUCN Red List and CITES. The migratory paths of small mammals and reptiles may be affected due to construction activities. Noise, vibration and emission from construction vehicles, equipment will occur during construction and pre-construction stages in temporary manner.

**Mitigation Measures:**

The impacts related to above activities are temporary and can be mitigated through following measures:
• Strict attention on worker force regarding disturbance to surrounding habitats, flora and fauna including hunting of animals and unnecessary cutting of plants

• Construction activities must begin with low intensity which may serve as an early warning system for the fauna to leave the area and go to safer areas

• Ensure habitat conservation by avoiding dumping of construction and sanitary waste like debris, bricks, gravel, litter, food leftovers in open areas and seek a place with the municipal office to extricate a place to release them

Impact on Terrestrial Ecology

There is no sensitive ecological area / protected forest area such as national wildlife park, or bird sanctuary crossing the proposed route alignment. The removal of herbaceous vegetation from the soil and loosening of the top soil generally causes soil erosion. However, such impacts would be primarily confined to the project site during initial periods of the construction phase.

Mitigation Measures:

These would be minimized through adoption of mitigation measures like paving and surface treatment and water sprinkling.

Removal of Trees

No removal of trees will be done since the area is completely urbanized and developed. No natural vegetation will interfere with the proposed transmission line route.

Mitigation Measures:

If at any point, cutting or clearing of vegetation is deemed necessary, replanting of similar species with the ratio of 6 against 1 mature plant and 3 against 1 immature plant will be implemented.

Effect on Local Road Network

Iron bars, concrete materials, equipment etc. will be transported through the provincial and local road network to the project site. Heavy transportation vehicles might disturb the local traffic specially at peak working hours. Visibility is usually minimum during night time where there are less street lights, this will pose as a hazard for the local traffic travelling in night time.
Mitigation Measures:

- Construction vehicles will only be allowed to operate at times when there is minimum traffic load
- Diversion routes must be allocated for normal and construction vehicular traffic to maintain normal traffic flow
- The site that has to be excavated will be barricaded by means of safety signs and symbols, such as using reflectors to improve indication of excavated sites in night time
- Emergency routes must be kept clear and ensure that they are easily accessible.

A comprehensive Traffic Management Plan is provided in Annexure – 7.

9.1.5 Impact on Human Environment

Health and Safety

Health and safety impacts will be in terms of risk of accidents and exposure to all working sites along the alignment. The accidents may be caused due to electrocution, lightening, fires and explosions. To avoid this, no houses or settlements will be allowed within the ROW of the project. Necessary training on safety aspects to the personnel working at the line will be provided by the contractor. Personal protective equipment like safety gloves, helmet, shoes etc. will be provided during Construction period. First aid facilities will be made available with the labor groups and doctors called in from nearby locations when necessary.

Mitigation Measures:

Project activities may create accidental damage to public as well as the construction workers. Therefore, contractors should take necessary action to enhance personal safety during Construction works through following measures:

- Organize awareness programs relevant to personal safety of the workers in particular and public in the area in general.
- Installation of warning signs to particular locations such as transverse points of local road network by transmission lines, additional workers and general people specifically children will not be entertained for accessing the work place especially during erection
- Necessary training regarding safety aspects to the personnel working at the line will be provided by the contractor
- Ensure that hazards associated with manual lifting are controlled by proper lifting techniques, work rotation system will reduce the chances of being exposed to work related stress associated with construction activities.

- All the workers involved in construction, operational and maintenance activities will be provided with proper PPEs according to their job description including; safety belts, footwear, helmets, goggles, eye-shields, and clothes to workers depending on their nature of work.

- Arrangement of proper first aid unit and emergency vehicle to take affected personnel to the nearest medical facility.

- The ‘HSEQ Policy’ and ‘Contractors and Suppliers HSEQ Management Procedure’ are attached as Annexure -5 and 6 respectively.

9.1.6 Socio-Economics

Skilled workers will be employed for these works; local people will be engaged for communication of project activities.

Temporary Outage of the Electricity

Temporary disconnection of power supply will occur during the construction activities. Thus public and industrial places, which are located in project-affected area, will face inconvenience for short periods.

Mitigation Measures:

The following measures will have to be taken:

- Advance notice to the public about the time and the duration of utility disruption, and

- Restoration of the utilities as early as possible to overcome public inconvenience.

Cultural Sites

There are no archaeological, historical, or cultural important sites along the route alignment; and hence, the impacts on these sites are not envisaged.

9.1.7 Traffic and Transport

The transmission line routes are allocated in low population areas, hence traffic and transport systems will have minimum impact. However, M.T. Khan Road and M.A. Jinnah Road may be affected on temporary basis in terms of traffic.
Mitigation Measures:
During the Construction phase, traffic disturbance needs to be minimized by avoiding high-density areas, using proper traffic signs, ensuring proper access roads and avoiding road blockage specifically at M.T. Khan Road and M.A. Jinnah Road.

A detailed Traffic Management Plan is provided in Annexure – 7.

9.1.8 Waste Disposal

Construction Waste

Construction waste management

Almost all the activities from excavation to erection will generate waste, however the waste will be of inert nature, in addition the waste will mainly comprise of cement and concrete waste, the concrete material resulting from batching and mixing will harden the ground surface resulting in growth inhibition of plant growth. This would also result in unaesthetic environment of the site.

Furthermore, solid wastes will be generated and will be categorized according to their nature. For instance, packaging materials, wood left-overs, plastics of various categories etc.

Mitigation Measures:

Thus following measures are needed to protect and enhance the quality of environment during the construction stage:

- It is strongly recommended that waste should be reduced at source and by reusing the residual waste
- It will be ensured that waste will be segregated and collected, however recyclable waste will be sent to the recycling industry to generate revenue
- The waste which cannot be reused or recycled will be dumped to the proper and allocated containment facility

A comprehensive Waste Management Plan is provided in Annexure – 8.

Sanitary Waste Disposal at Construction Sites

The temporary labor camps generating the human excreta will not be significant to cause contamination of ground water. Mostly, labors shall use the community services for solid waste, water and sanitation.

Unacceptable solid waste disposal practices such as open dumping of solid waste and poor sanitation facilities will lead to pollution of surrounding environment,
contamination of water bodies and increase adverse impact to the aquatic; terrestrial lives and general public inhabited in the area. Surrounding of labor camps, garbage disposal sites and material storage yards provide favorable habitats for vectors of diseases such as mosquitoes, rats and flies.

**Mitigation Measures:**

Provision of adequate washing and toilet facilities shall be made obligatory. This should form an integral component in the planning stage before commencement of construction activity.

There should be proper solid waste disposal procedure to enhance sanitation of workers who stay in camps. Thus, possibilities of infecting water borne diseases or vector borne diseases (parasitic infections) will be eliminated by adopting proper solid waste disposal procedure.

Following measures are needed to protect and enhance the quality of environment during the construction stage:

- A better way to overcome garbage disposal as mentioned previously is by reducing or avoiding the construction of labor camps, thus the selection of majority of skilled and unskilled workers from the project influence area will be a proper measure in this regard.
- Provision of solid waste disposal, sanitation, and sewage facilities at all sites of the construction/labor camps to avoid or minimize health hazards and environmental pollution.
- Contractor shall handle and manage waste generated from the construction/labor camps without contamination to natural environment thus reducing risk to neighboring community.
- Contractor shall provide garbage bins near construction sites, for dumping wastes regularly in a hygienic manner.

A comprehensive Waste Management Plan is provided in **Annexure – 8.**

**9.1.9 Environmental impacts associated with operational stage**

**Electric shock**

This may lead to death or injury to the workers and public in the area.

**Mitigation Measures:**

This can be minimized or avoided by:

- Cordon off possible hazard-zones for example, range of conductor wire falling if breakage occurs.
- Display of warning signs.
• Careful design using appropriate technologies such as earthing wire clamps or electrical shock absorbers etc. to minimize hazards.

**Electric & Magnetic Field**

Electric and magnetic fields are produced by any wiring or equipment carrying electric current. This includes overhead and underground power lines carrying electricity, wiring in buildings, and electrical appliances. The strengths of the fields decrease rapidly with increasing distance from the source. Electric and magnetic fields are fundamentally different, in their physical nature and in the way they interact with the body, from true electromagnetic radiation such as radio waves and microwaves. Typical magnetic field levels found in various locations are presented in table.

<table>
<thead>
<tr>
<th>S/no</th>
<th>Source</th>
<th>Electric Field (kV/m)</th>
<th>Magnetic Field</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>μT</td>
<td>mG</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>High Voltage Transmission line (Direct beneath line)</td>
<td>0.3–3</td>
<td>0.5–5</td>
<td>5–50</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>High Voltage Transmission line (40 metres from line)</td>
<td>0.01–0.1</td>
<td>0.1–1</td>
<td>1–10</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Near street distribution lines</td>
<td>0.01–0.1</td>
<td>0.05–2</td>
<td>0.5–20</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Substations</td>
<td>Generally less than 0.1 kV/m</td>
<td>Generally decrease to around 0.1 Within 5 metres of equipment except near where supply lines enter or leave the station.</td>
<td>Generally decrease to around 1 Within 5 metres of equipment except near where supply lines enter or leave the station.</td>
<td></td>
</tr>
</tbody>
</table>

Generally, magnetic fields decrease to around 0.1 μT (1 mG) within 50–100 metres of the line.
Mitigation Measures:

Basic Restriction and reference level of occupational and public exposure to 50 Hz ELF electric and Magnetic field

<table>
<thead>
<tr>
<th>Exposure characteristics</th>
<th>Basic restriction</th>
<th>Reference levels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Induced current density (mA/m²)</td>
<td>Electric field strength (kV/m)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Occupational</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>General public</td>
<td>2</td>
<td>5</td>
</tr>
</tbody>
</table>

Note: All values are rms (root-mean-square, a kind of average)

Ref. National Radiation laboratory Manatu Haura
(http://www.who.int/peh-emf/project/mapnatreps/nznrl_emfbooklet2008.pdf)

K-Electric has SOPs established to regularly monitor EMF levels for its High Voltage Transmission Lines and they are found to be within safe limits defined by International Standards Guidelines such as ICNIRP Guidelines for EMF Public and Occupational Exposure. These practices should be continued in existing and future networks.

9.2 ENVIRONMENTAL MANAGEMENT PLAN

An Environmental Management Plan (EMP) is a framework for the implementation and execution of mitigation measures and alternatives. It usually covers all phases of the project, right from pre-construction to the operation and maintenance phases of the transmission line project. The plan outlines mitigation measures that will be undertaken to ensure compliance with environmental laws and regulations and to eliminate or reduce adverse impacts. The objectives of an EMP, thus, are:

- To ensure that mitigation measures are implemented;
- To establish systems and procedures for this purpose;
- To monitor the effectiveness of mitigation measures;
- To ensure compliance with environmental laws and regulations;
- To take any necessary action when unforeseen impacts occur;
### Exhibit 9.1: Environmental Impact Mitigation Plan

<table>
<thead>
<tr>
<th>S/No</th>
<th>Aspect</th>
<th>Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Construction phase</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Land Disturbance</td>
<td>The potential problem that can arise from the installation of underground cable is land disturbance.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>There is possibility of land disturbance at project area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>It is expected that there are small chances of change in land at project area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The only change in land use for underground cables installation will be due to earth works and excavation activities which may damage paved road</td>
</tr>
</tbody>
</table>

**Mitigation Measures**

- Earth work should be technically designed according to geological feature of project site.
- Obtain all the exact approved routes and locations which have been selected for grid station and shall issue “Notices of intent” to all concerned authorities at least four weeks prior to commencement of the work, such as the employer, Municipality, Telecommunication Department, Traffic police, etc. Also excavate the material with care to avoid damaging the existing services and electric cables.
- Excavation operations shall be confined to a minimum working area consistent with efficient operations.
- Damage to road, footpaths, ditches, etc caused by the project activities should be repaired during completion of earth work on immediate bases.
The trenches (excavated area) shall be located exactly within the approved reservation and no more than two adjacent sections of excavated trench shall be open at a time.

- Restore the paved and unpaved roads. Road need to be paved and backfilled rapidly and properly where cable transmission line is installed.

<table>
<thead>
<tr>
<th>S/No</th>
<th>Aspect</th>
<th>Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Ambient air quality</td>
<td>The potential problems that can arise is the dust emissions from the excavated material and Gaseous emissions from the construction equipments/vehicles. Fugitive dust emission from construction activities like excavation, trench foundations, backfilling or road leveling. Gaseous emission from the construction and erection machinery.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Use dust abatement techniques on unpaved, un vegetated surfaces to minimize airborne dust and during earthmoving activities, prior to clearing, excavating, backfilling, compacting and grading.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Excavated material need to be disposed of away (which is not in use) from the construction area to prevent dust emission.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Sprinkling of water frequently in the area where earth filling and excavation is being carried out.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Post and enforce speed limits to reduce airborne fugitive dust caused by vehicular traffic.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Cover construction materials and stockpiled soils if they are a source of fugitive dust.</td>
</tr>
<tr>
<td>S/No</td>
<td>Aspect</td>
<td>Impacts</td>
</tr>
<tr>
<td>------</td>
<td>-------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>3</td>
<td>Noise Pollution</td>
<td>- While construction noise is unwelcome during night time in residential areas when people are trying to sleep, sometimes it may be too loud, impulsive, and interrupting in people’s activities.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Mitigation Measure</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- If the right-of-way is in a residential area, construction hours and the number of equipment operating simultaneously need to be limited to reduce noise levels.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Noise pollution due to construction works should be controlled by completing the task in a short period of time and also by confining it to day time hours.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Use of noise barriers or noise canceling acoustic devices should be considered if necessary.</td>
</tr>
<tr>
<td>4</td>
<td>Ground Water contamination</td>
<td>Breakdown of construction vehicles may cause oil leakages, leading into the ground and ultimately contaminating ground water. Sewage water leakages or sewage pipe damages during excavation work of trenches which can contaminate ground water quality</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Mitigation Measure</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Vehicles and equipment must be placed away from water sources.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Incase of spill, immediate action must be taken to prevent leaching.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- In case of incidental leakages from sewage line, it is recommended that leakage line should be replaced to reduce the ground water quality</td>
</tr>
<tr>
<td>S/No</td>
<td>Aspect</td>
<td>Impacts</td>
</tr>
<tr>
<td>------</td>
<td>---------------------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>4</td>
<td>Soil and land contamination</td>
<td>- contamination and leachate formation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Also use municipal tankers to collect water filled in excavated/trench area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Before any earth work consult with concerned department.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Contractors must quickly alert spill response team.</td>
</tr>
<tr>
<td>5</td>
<td><strong>Soil and land contamination</strong></td>
<td>Spillage of Oil and lubricants may cause soil contamination, slippery surface and oil sludge formation.</td>
</tr>
<tr>
<td></td>
<td>Oil, lubricant chemical spillage, construction and debris may cause land contamination.</td>
<td>Mitigation Measure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- The secondary containment facility should be available to avoid any spillage or fire hazard and material should be stocked according to the inventory requirement.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Vehicles and equipment must be maintained properly, and checked before allowing to work.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Construction debris should be collected and disposed of properly.</td>
</tr>
<tr>
<td>6</td>
<td><strong>Solid Waste</strong></td>
<td>Waste may cause land contamination, slippery site surface and harm natural environment, excavated material with trench may slide on workers, choking of drains, etc.</td>
</tr>
<tr>
<td></td>
<td>Lubricants and chemicals, construction debris and other waste installation material (metal, wooden, plastic &amp; cable pieces and packaging material, as well as excavated (dredged) material.</td>
<td></td>
</tr>
</tbody>
</table>
## Table: Mitigation Measures and Impacts

<table>
<thead>
<tr>
<th>S/No</th>
<th>Aspect</th>
<th>Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mitigation Measure</td>
<td>• Use waste minimization techniques to reduce, reuse &amp; recycle waste material.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Excavated materials should be segregated from other wastes to avoid contamination thereby ensuring acceptability at Secondary Waste Storage Units “Kachra Kundi” areas and avoiding the need for disposal at landfill.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Raw material inventory records should be maintained and excessive stocks should be avoided.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Integrated waste management plan should be prepared to minimize waste generation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Hazardous waste should be stored with proper labels in air tight lid container.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Hazardous waste should be disposed of through EPA certified contractors.</td>
</tr>
<tr>
<td>7</td>
<td>Ecological Impact</td>
<td>• No major vegetation clearing will be carried out during transmission line installation phase except for common vegetation in negligible quantities for access route maintenance.</td>
</tr>
<tr>
<td></td>
<td>Ecological disturbance from project activities.</td>
<td>• The plants species within the vicinity of the proposed site are of minor ecological importance.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Animals of the area are urbanized species i.e. adapted to city developments and will not be disturbed by the project.</td>
</tr>
<tr>
<td>S/No</td>
<td>Aspect</td>
<td>Impacts</td>
</tr>
<tr>
<td>------</td>
<td>--------</td>
<td>---------</td>
</tr>
</tbody>
</table>
|      | **Mitigation Measure** | • Construction techniques should be environment friendly to minimize local vegetation clearance of the project site.  
• Workers must be warned not to clear vegetation unnecessarily.  
• Avoiding night construction whenever possible to minimize fauna disturbance.  
• Small animals or birds of the area should not be harmed from project activities |
| 8    | **Health and Safety** | Excavation way may interfere by numerous public utilities and service systems including water, sewer, electric, Sui gas and telecommunication lines which may cause incidents and fire hazard by electrocution, fractures gas and dust emissions may harm far community, Structure collapse, accidents during transportation, handling, installation of high transmission line and land (excavated material sliding may cause serious injury). |
|      | **Mitigation Measure** | • Establish and maintain a safety and health program for the worksite. Provide adequate systematic policies, procedures, practices  
• Surface encumbrances that create hazards must be removed/supported  
• Only Trained Employees must be allowed to operate heavy equipments  
• Use barricades, hand or mechanical signals, stop logs to keep operators safe.  
• Appropriate PPEs should be provided to workers.  
• Implementation of a fall protection program must be done that will |
<table>
<thead>
<tr>
<th>S/No</th>
<th>Aspect</th>
<th>Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>include inspection, maintenance, and replacement of fall protection equipment; and rescue of fall-arrested workers, among others.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• All workers and contractors will be properly trained for the task.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Fitness test of all workers is deemed necessary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Evacuation plan must be designed according to the project activities on site.</td>
</tr>
<tr>
<td>9</td>
<td>Traffic</td>
<td>Lock-Out-Tag-Out (LOTO)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Before approaching Live line LOTO procedures must be followed to prevent live voltage in wires.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Prior to commencement of works, proper grounding shall be ensured wherever applicable.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Provide complete line charts to contractors and communicate all in-house procedures for live line works.</td>
</tr>
<tr>
<td></td>
<td>Vehicle movement disturbance on main road</td>
<td>Proposed Construction activities would temporarily affect transportation facilities within the project area. It is likely to cause temporary traffic delays.</td>
</tr>
<tr>
<td></td>
<td>of project site</td>
<td>Mitigation Measure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Minimize disruptions to traffic patterns while maximizing the directness of detoured routes, thereby minimizing short-term impacts on emergency services (police, fire, rescue, and hospital access) and transit services throughout the project area. Wide and oversized loads would be restricted to barges, where possible.</td>
</tr>
<tr>
<td>S/No</td>
<td>Aspect</td>
<td>Impacts</td>
</tr>
<tr>
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</tr>
<tr>
<td></td>
<td><strong>Social Impacts</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Blocking of Right of Ways in streets, Electricity supply shut down</td>
<td>• visual and auditory disturbance due to the presence of machinery, construction workers, transmission towers, and associated equipment&lt;br&gt;• Shut down of electricity will affect the daily routine of consumers.</td>
</tr>
<tr>
<td></td>
<td><strong>Mitigation Measure</strong></td>
<td>• People to be informed about the construction activities and surveys.&lt;br&gt;• Construction vehicles should be placed at designated areas to avoid any incident.&lt;br&gt;• Electricity shut down must be planned and communicated to the affected general public.&lt;br&gt;• Contractor shall limit working time for activities that create noise only from 7.00 am to 8.00 pm except for construction site near public sensitive receptors</td>
</tr>
<tr>
<td>11</td>
<td><strong>Meteorological impacts</strong></td>
<td>• Excavated material in wind storms may harm the environment.&lt;br&gt;• Improper back filling may cause serious incidents in rainy season&lt;br&gt;• Rainfall may affect the construction work. Heavy rain have tendency to collapse foundation or trench structure</td>
</tr>
</tbody>
</table>
## Mitigation Measure

- Proper HSE Plan and Emergency Response Plan will be prepared and implemented to deal with natural hazards.
- Construction work during heavy rainfall, flooding and windstorms will be prohibited.

## Post Development Phase

### Meteorological impacts

- Damages of equipment's and construction structure caused by heavy rainfall, flooding & wind storms.

<table>
<thead>
<tr>
<th>S/No</th>
<th>Aspect</th>
<th>Impacts</th>
</tr>
</thead>
</table>
| 1    | Meteorological impacts | - Improper back filling may cause serious incidents in rainy season  
|      |        | - Heavy rain have tendency to collapse foundation or trench structure.  
|      |        | - These hazards may work as a medium between ground objects and energized conductors. This may cause any serious incident.  |

| Mitigation Measure | Safety measures should be sufficient in case of any natural hazards such as tightening insulator clamps and proper earthing.  
<p>|                    | Prohibit the maintenance work during heavy rainfall, flooding and windstorms. |</p>
<table>
<thead>
<tr>
<th>S/No</th>
<th>Aspect</th>
<th>Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Electric and Magnetic field</td>
<td>There is public and scientific concern over the potential health effects associated with exposure to EMF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• There is no empirical data demonstrating adverse health effects from exposure to typical EMF levels from power transmissions lines and equipment. However, while the evidence of adverse health risks is weak, it is still sufficient to warrant limited concern.</td>
</tr>
<tr>
<td></td>
<td>Mitigation Measure</td>
<td>• Identification of potential exposure areas in the workplace, including surveys of exposure levels in new projects and EMF measurement will be carried out in accordance with Corporate EMF Management Procedure</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Establishment and identification of safety zones to differentiate between work areas with expected elevated EMF levels compared to those acceptable for public exposure.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Depth of transmission lines to be increased at least in residential areas.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Since Pakistan does not have NEQS for EMF levels, it is suggested to follow international guidelines of IFC’s Environmental, Health and Safety Guidelines “Electrical Power Transmission and Distribution” as well as ICNIRP’s standards.</td>
</tr>
<tr>
<td>S/No</td>
<td>Aspect</td>
<td>Impacts</td>
</tr>
<tr>
<td>------</td>
<td>-------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>3</td>
<td>Health and Safety</td>
<td>Incident may occur in case of improper management and work practices</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PLDP or bays may interfere by public utilities, fire hazard by electrocution and Structure collapse maintenance of high power transmission line.</td>
</tr>
<tr>
<td></td>
<td>Mitigation Measure</td>
<td>• Establish and maintain a safety and health program for the worksite.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Provide adequate systematic policies, procedures, practices.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Health and safety Impact assessment should be prepared before starting project activity to prevent any incident to workers or nearby community.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Contractor should be aware of health hazards from project activities.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Employees must be trained before working</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Use barricades, hand or mechanical signals, illuminants painted towers for traffic safety in night hours, stop logs to keep operators safe.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Appropriate PPEs should be provided to workers during maintenance work.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Implementation of a fall protection program that includes use of fall protection measures; inspection, maintenance, and replacement of fall protection equipment; and rescue of fall-arrested workers.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Understand the minimum approach distances outlined for specific live line voltages.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Ensure proper use of special safety equipment and procedures when working near or on exposed energized parts of an electrical system.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• The worker is properly isolated and insulated from any other conductive object (live-line work).</td>
</tr>
</tbody>
</table>
### Exhibit 9.2: Environmental Management Plan

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Impact</th>
<th>Mitigation</th>
<th>Monitoring Parameter</th>
<th>Location</th>
<th>Frequency of Monitoring</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Air</strong></td>
<td>Chronic health effects</td>
<td>Sprinkling of water</td>
<td>Particulate Matter</td>
<td>All project locations</td>
<td>Monthly</td>
<td>Contractor K-Electric</td>
</tr>
<tr>
<td></td>
<td>Reduced visibility on roads</td>
<td>Tuning of construction vehicles &amp; machines</td>
<td>Smoke</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Dust masks for laborers</td>
<td>CO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monitoring of vehicular emission</td>
<td>SOx</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monitoring of Ambient Air</td>
<td>NOx</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise</td>
<td>Stress</td>
<td>Avoid working at night</td>
<td>Noise levels</td>
<td>Project location close to</td>
<td>Monthly</td>
<td>Contractor K-Electric</td>
</tr>
<tr>
<td></td>
<td>Hypertension</td>
<td>Lubrication of construction vehicles</td>
<td></td>
<td>residential areas</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Hearing loss</td>
<td>Ear plugs</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Headache</td>
<td>Monitoring of Ambient Noise</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land and soil</td>
<td>Erosion due to excavation</td>
<td>Proper backfilling and stone pitching around the excavated site if required</td>
<td>Surface topography</td>
<td>All project locations</td>
<td>Continuous</td>
<td>Contractor K-Electric</td>
</tr>
<tr>
<td></td>
<td>Formation of pits due to improper backfilling</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Vegetation</td>
<td>No cutting of trees is involved</td>
<td>In case of cutting of trees, one plant should be replaced by 1:3 for</td>
<td>No of trees cleared</td>
<td>All project locations</td>
<td>Continuous</td>
<td>K-Electric</td>
</tr>
<tr>
<td></td>
<td></td>
<td>immature plants and 1:6 for mature plants</td>
<td>cut</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ensure re-plantation by appropriate tree compensation ratio of same species</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Aspect</td>
<td>Impact</td>
<td>Mitigation</td>
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<td>Location</td>
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<td>Responsibility</td>
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</tr>
<tr>
<td><strong>Water</strong></td>
<td>Wastage and misuse of water</td>
<td>Avoid unnecessary use of water Prevent leakages</td>
<td>Record log of water usage</td>
<td>All project locations</td>
<td>Continuous</td>
<td>Contractor</td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Social Environment</strong></td>
<td>Disturbance to routine activities</td>
<td>Specify time scale for construction activities</td>
<td>Review of complaint register</td>
<td>All project locations</td>
<td>Monthly</td>
<td>K-Electric</td>
</tr>
<tr>
<td></td>
<td>Conflicts between laborers and local communities</td>
<td>Discussion with local people regarding conflicts if any</td>
<td>Local Consultations</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Roads and networks</strong></td>
<td>Traffic congestion leading to accidents</td>
<td>Diversion routes must be notified to maintain traffic flow</td>
<td>Signs and detours are being followed</td>
<td>Intersections of diversions</td>
<td>Monthly</td>
<td>Contractor</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Signs and reflectors must be boarded for driver’s visibility at night</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Health and Safety</strong></td>
<td>Lack of awareness among general public about safety may lead to accidents</td>
<td>Safety symbols and instructions will be boarded at work sites</td>
<td>Record of Safety Talks</td>
<td>On all project sites</td>
<td>Monthly</td>
<td>Contractor</td>
</tr>
<tr>
<td></td>
<td>Incompetent and untrained workers might cause harm to themselves and others</td>
<td>Trained personnel will be appointed for the specific work</td>
<td>Record of safety Incidents (Major &amp; Minor)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Construction works may include many risks and hazards that may lead to injuries or even death</td>
<td>Appropriate PPEs must be used for technical work</td>
<td>Record of PPEs Visual Assessments</td>
<td></td>
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</tr>
</tbody>
</table>

GEMSESIA1001115KE     Environmental Impact Assessment & Environmental Management Plan   9-25
<table>
<thead>
<tr>
<th>Aspect</th>
<th>Impact</th>
<th>Mitigation</th>
<th>Monitoring Parameter</th>
<th>Location</th>
<th>Frequency of Monitoring</th>
<th>Responsibility</th>
</tr>
</thead>
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<tr>
<td><strong>Operational Phase</strong></td>
<td></td>
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</tr>
<tr>
<td>Electric Shock</td>
<td>Lead to death or injury of employees or public in the area.</td>
<td>Cordon off the area</td>
<td>No trespassing allowed</td>
<td>Grid station and Bay towers</td>
<td>Regularly</td>
<td>K-Electric</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Display warning signs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Install Earthing wires</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>No trespassing allowed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grid station and Bay towers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electric Magnetic Field (EMF)</td>
<td>Human health impacts such as, neuropsychological disorders or cardiovascular diseases</td>
<td>Increase depth of cables to suppress the EMF levels</td>
<td>EMF Intensity</td>
<td>Neighboring communities near the corridor</td>
<td>Biannually</td>
<td>K-Electric</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Appropriate cabling with protective shields to suppress electron flux</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>No trespassing allowed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grid station and Bay towers</td>
<td></td>
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</table>
The ESIA of the proposed replacement of transmission line project has achieved the following goals:

- Identification of national and provincial environmental regulatory requirements that apply to the proposed project activities;

- Identification of the environmental features of the project area including the physical, biological and social disturbance and likely impact of the project on the environment;

- Recommendation of appropriate mitigation measures that K-Electric will incorporate and ensure as per this ESIA into the project to minimize the adverse environmental impacts.

Baseline physical, biological, socio-economic and cultural data and information was collected from a variety of primary and secondary sources, including field surveys, review of relevant literature and online publications. The collected data was used to organize profiles of the physical, biological and socio-economic environments, likely to be affected by the project. Communities were consulted through public consultation processes. These included women, men and institutional stakeholders. The aim of public consultation was to assure the quality, comprehensiveness and effectiveness of the ESIA as well as to ensure that the views and opinions of the local people were adequately taken into account in the decision making process.

Further an Environmental and Social Impact Assessment Report was made to highlight the potential impacts of the described project on the area's physical, biological, socio-economic and cultural environments.

It is concluded that the potential impacts of the proposed K-Electric’s transmission line replacement project will be insignificant on most of the environmental receptors, provided that the EMP and the mitigation measures proposed in this report are implemented in true spirit. However, some areas will need special care with regards to the disturbance to the community of the area. K-Electric must be constituted to ensure minimum impacts.
After assessing the proposed project activities and investigating the project area, the environmental consultants, GEMS have concluded that:

"If the activities are undertaken as proposed and described in this report, and the recommended mitigation measures and environmental management plan is adopted, the project will not result in any long-term or significant impacts on the local community or the physical and biological environment of the project area rather it will prove to be beneficial in many ways and contribute to development in Karachi."
ANNEXURE-1

TECHNICAL PROVISIONS
PART B: POWER AND FIBRE OPTIC CABLES

TP-1 GENERAL

This part of the Technical Specifications shall cover the local survey, design, manufacture, factory testing, packing, delivery, transportation, laying and installation, interfacing with the existing system, site testing, commissioning and energization till final acceptance of:

- Single-core high voltage XLPE cables and their accessories.
- Fibre optic cables and their accessories.
- Distributed Temperature Monitoring System (DTS) and sensor cable.
- All civil works related to installation of cables.
- ROW related to laying of XLPE cables

Including all works as described under "Scope of Supply" and shall be handed over in good operational condition.

1.1 Expected life of Materials

All materials used in the project should have the expected life of 25 years or greater. All the materials should also be type tested from the internationally recognized third party laboratory.

1.2 Factory Acceptance Test

Factory acceptance test shall be witnessed by the personnel of the Employer. All cost in connection with witnessing of factory acceptance test by the Employer shall be borne by the contractor. These shall include the cost of the air travel to the place of testing/inspection and back, hotel accommodation, boarding, lodging, inland transportation and daily allowance per day per person as per schedule of FAT.

1.3 Trainings

Job Site Training

The contractor should provide on site trainings to the Employer’s staff to maintain and operate properly.

Foreign Training

The contractor shall provide foreign trainings to the Employer’s staff in the contractor premises/factory or wherever else work in connection with the contract is in hand. All cost in connection with the foreign training shall be borne by the contractor. These cost include; air travel to the place of training and back, hotel accommodation, boarding, lodging, inland transportation and daily allowance per day per person.
1.3 Compliance of HSEQ and EIA policy

Contractor shall strictly comply K-Electric safety & EIA policy documents such as SP-022&EIA 15, 16, 17 etc.

1.4 Spares

The contractor shall provide the essential spare parts as selected by the Employer from the recommended list provided in the tender document.

TP-2 DESIGN

The following shall form the basis for each Bidder to optimize his Bid with regard to local facts, meteorological conditions manners and customs, and also to the prevailing technical realities.

Climatic conditions are extraordinary; in coastal areas the atmosphere is saliferous, humid and highly corrosive. Humidity is high and due to this particular reason attention shall be paid to the severe corrosive conditions.

Some cable circuits shall run partly in ducts and shall partly be buried directly in the ground. Some shall be laid in naturally ventilated concrete trenches designed and constructed specially for this purpose. The relative soil temperature conditions to be taken into consideration for Bid purposes only are:

- soil thermal resistivity \((g)\) approximately   \(~200\) K-cm/W
- maximum ground temperature \(~35°\) C
- minimum ground temperature \(~5°\) C
- site level above sea level approximately \(~20\) m
- maximum air temperature inside concrete trenches \(~55°\) C

All these figures are to be assumed only for calculation purposes and for filling-in the Specific Works Data.

Furthermore, the equipment offered must be suitable in all respects for operation within the Employer's high voltage systems.

The characteristics of these systems are:

- operation voltage/highest system voltage \(132/145\)kV
- Low Voltage \(380/220\) V AC
- frequency \(50\) Hz
- system earthing 132 kV effective (solidly)
The Technical Specifications are intended to give the frame of the equipment required. It is understood that the work includes everything requisite and/or necessary to finish the entire work properly, and the equipment has to be complete in every respect, notwithstanding the fact that every item may not be specifically mentioned.

The routes for the cables, as well as the positions of the cable junction points, have not yet all been exactly decided upon. Consequently, all particulars relating to lengths shall be understood as preliminary only.

The binding delivery quantities shall, in the event of an award of a Contract, be determined by the Employer and the Contractor. They shall be delivered accordingly, and prices shall be adjusted accordingly.

The Employer will neither furnish manpower assistance for transportation, laying or construction, nor equipment assistance or other material.

All incidental costs shall be included in the Bid Price. Should further clarification of the local conditions be necessary for preparation of the Bid, then this shall be the responsibility of the Bidder.

All cables and their accessories shall be designed in accordance with the latest issue of IEC Publication or equivalent standards. Complete sets of authorized English translations of all relevant standards according to which the cable and accessories are manufactured shall be attached to the Bid.

All cables and their accessories to be offered shall have insulation levels able to withstand any voltage surge, due to switching operations, sudden load variations, faults, etc., which is normally expected to occur in the power system in which the cable is to be included.

The cables and their accessories shall be constructed to fulfil the requirements when operating with full load or at any load factor. Contractors are requested to submit:

- Calculation results of the continuous current rating (as indicated in the Bid) of the proposed cables and their accessories.
- Calculation results of zero sequence impedance and positive sequence impedance of the power cables.
- Report of onsite measurements of the actual zero sequence impedance and positive sequence impedance of the power cable.
- Calculation result for DC conductor resistance (20°C) of power cables.
- Report of onsite measurement of actual DC conductor resistance (20°C)
- Calculation result for capacitance of power cables.
- Report of onsite measurement of actual capacitance of the power cables.

- Report of onsite measurements of the actual soil thermal resistivity and prevailing ground temperature along the route before cable laying.

- Report of density, grain size distribution, cement/sand ratio and thermal characteristics of proposed bedding material for power cables.

- Report of onsite measurements of the actual soil thermal resistivity of the backfilling material after cable laying.

- The correction factor of permissible transmission capacity applied for the site conditions as a result of the chosen bedding and backfilling material of the power cables and including all pipe crossings.

- Report on permissible overload current of the power cables, starting from 50, 75 and 100% of the above mentioned continuous permissible transmission capacity of 1, 2, 3, 4 and 5 hours.

- Curves showing the variation of the permissible transmission capacity against:
  a) The axial separation of the cables.
  b) Soil thermal resistivity of surrounding material.
  c) Depth of burial.

- Calculation of induced voltages in metallic sheath of power cables.

- Report of measurements of induced voltages on metallic sheath.

- Calculation of earthing wire cross-sections and details of cross-bonded systems.

- Report of onsite DTS results.

- Calculation of charging current.

- Calculation results for maximum induced voltages grounded by Sheath Voltage Limiters (SVL).

- Jointing and termination methodology

- Cable laying and installation methodology

- Site test protocols
ANNEXURE-2
S.O.P of Supervision of Erection, Testing & Commissioning (ETC)
S.O.P

(Standard Operating Procedure)

Supervision of Erection, Testing & Commissioning (ETC) of Overhead & Underground Transmission Lines till Taking over/Handing-over & closure of project
Title: Supervision of Erection, Testing & Commissioning (ETC) of Overhead & Underground Transmission Lines till Taking over/Handing-over & closure of project

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<th>Issuing Department</th>
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<th>Released By &amp; Date</th>
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<td>00</td>
<td>31.03.2015</td>
<td>05.05.2015</td>
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1. Purpose:

1.1. The purpose of this SOP is to:

1.1.1. Define the procedure for safety during the site activity and identify the control of safety process.

1.1.2. Define the procedure for supervision of Erection, Testing & Commissioning (ETC) of OH/UG Transmission lines work and identify the control process for the supervision of ETC activity.

1.1.3. Define the procedure for Taking Over/Handing-over the project and identify the controls for taking over/handling over process.

1.1.4. Define the procedure for project closure.

2. Scope:

2.1. This SOP is applicable to the employees of Transmission Section of PID.

3. Safety:

3.1. Procedure:

3.1.1. The Contractor shall ensure compliance to the SOPs developed for Contractor Management (e.g. document no. SP-022 Contractor HSEQ, Management Procedure). Other SOPs may be applied depending upon the scale and scope of the project.

3.1.2. Contractor shall submit the emergency exit plan on the request of KE via MOM/Letter/email if required in the project.

3.1.3. Tool Box Talk (TBT) including headcount will be performed to ensure that all the present staff at the site shall be equipped with healthy PPE/SPE. It may highlight the probable hazards that can occur during the course of work and their mitigation plan.

3.1.4. In case of work in existing grid station, DM/AM/AE shall inform to grid in-charge present at site or LDC about the activity.

3.1.5. Excavated/drilled area shall be properly barricaded. All excavations shall be back filled by the contractor (and refinshed as per existing) before the removal of warning sign / barricade.
3.2. Monitoring & Control:

3.2.1. Dully filled and signed SP-22 document is submitted by the contractor before start of the project. (e.g. Ref. No. DTS/KE/Project/XXX/Date)

3.2.2. Emergency Exit Plan shall be available at site by contractor. The work shall be started after discussing of emergency exit plan. (e.g. Ref. No. DTS/KE/Project/XXX/Date)

3.2.3. Dully filled Toolbox talk (TBT) form No. KEK-SP101 should be available at site and copy received by DM/AM/AE of PID.

3.2.4. Entry in grid log book shall be made for both starting/finishing the work, where applicable.

3.2.5. Safety coordinator will perform real time delivery of the work once a week using criteria mentioned in SP-22 (e.g. document no. SP-022 Contractor HSEQ Management Procedure), if safety coordinator finds any discrepancy during real time delivery verification like poor workmanship or non-conformance, he/she will perform the analysis of discrepancy and inform to concerned GM.

3.3. Responsibility & Authority:

3.3.1. Contractor is responsible for compliance of the submitted SOP. However, Safety Coordinator of PID is responsible to check the compliance of the SOP at site.

3.3.2. Contractor’s HSEQ personnel shall discuss the emergency exit plan with the all present staff. DM/AM/AE of PID should witness. Contractor’s HSEQ personnel or PM of contractor shall email or send the record of emergency exit plan to safety coordinator of PID-KE. (e.g. Ref. No. DTS/KE/Project/XXX/Date)

3.3.3. Contractor’s engineer/leader or HSEQ personnel shall perform the Toolbox talk (TBT). DM/AM/AE of PID should witness. DM/AM/AE of PID shall maintain the record of TBT and shall submit the record to safety coordinator of PID. ref. email of Transmission (PID). Record of all safety documents should be maintained by Safety Coordinator.

3.3.4. DM/AM/AE shall be responsible to enter the work in grid log book for both start/finish the work.

3.3.5. Contractor HSEQ personnel shall be responsible to ensure the barricade of excavated/drilled area. Placement of safety sign board is also the responsibility of the contractor.
4. Supervision of Erection/laying of OH/UG Transmission Line:

4.1. Procedure:

4.1.1. Work should be conducted according to approved project schedule, drawings, specifications and layouts.

4.1.2. All heavy equipment should be unloaded by means of a crane or lifter. The operator of crane/lifter must have certificate with valid operating license.

4.1.3. When equipment is transported at site, inspection should be conducted for any apparent damage.

4.1.4. When all the relevant materials/equipment have reached at site, erection and installation works for both overhead transmission line and underground cables shall be started. If required, shutdown will be arranged prior to start the work.

4.1.5. During and after erection and installation of all the towers, conductor, hardware and laying of cable with terminations, all works should be inspected properly.

4.1.6. Customer Feedback will be taken from TMOH/TMUG during execution of the project.

4.2. Monitoring & Control:

4.2.1. Approved project schedule, drawings, specifications and layouts shall be made available at site. (ref. letter GM (PID) /XXX/Date).

4.2.1.1. DM/AM/AE Transmission Line will remain on site during all working duration and can stay late if required for supervision of the site activities.

4.2.1.2. Manager Transmission Line will perform real-time delivery of the work once a week using SOP (PID/TL/SC/03). Schedule will be the part of criteria, if Manager finds any discrepancy during real-time delivery verification like poor workmanship or non-conformance to project schedule or quality standard. He/she will perform the analysis of discrepancy and then inform to DGM / GM Transmission Line.

4.2.1.3. DGM Transmission Line will perform real-time delivery of the work twice a month using SOP (PID/TL/SC/03). Schedule will be the part of criteria. Upon finding any deviation
from the project plan or drawing or discrepancy reported by manager or AM, he/she will perform the RCA and forward the case to concerned GM.

4.2.1.4. GM implementation will perform real time delivery once a month using SOP (PID/TL/SC/03). Schedule will be the part of criteria. Upon finding any deviation from the project plan or drawing or discrepancy reported by DGM, he/she will send the RCA to contractor. GM implementation will ensure that the contractor should remove discrepancy as soon as possible, if required Liquidity Damage (LD) will be imposed on delay of work. GM will issue LD to the contractor.

4.2.2. Checklist of Crane and lifter should properly be filled. (Ref No. PID/TL/CL/04)

4.2.3. Checklist of Equipment Inspection should be properly filled. (Ref Doc. PID/TL/EI/XX).

4.2.4. Shutdown is taken well in advance by submitting the LDC shutdown form. SBO (switch board operator) shall ensure proper grounding of all phases of line under shutdown at both ends of transmission line before start of the work. (Ref. Doc. PID/TL/CL/S/04)

4.2.5. Checklist of inspection after installation should properly be filled. (Ref No. PID/TL/CL/XX).

4.2.6. Customer feedback should be taken on the form PID/TL/CFF/04 and recorded properly.

4.3. Responsibility & Authority:

4.3.1. Contractor is responsible to provide approved project schedule, drawings, specifications and layouts at site. DM/AM/AE Transmission Line shall be responsible for supervising the site works as per project schedule and ensure the work to be done according to approved documents.

4.3.1.1. In case of deviation, DM/AM/AE Transmission Line will inform to the concerned manager/DGM for further actions.

4.3.1.2. Manager Transmission Line shall ensure the work done by the team at site is according to approved design and project schedule. Any deviation intimated by DM/AM/AE, manager shall communicate to respective DGM accordingly if required. DGM shall further communicate to the GM accordingly if required.

4.3.1.3. GM will notify the reported deviation to contractor if required via email or letter.

4.3.1.4. Manager Transmission Line is responsible to perform real time delivery once a week or as per plan.
4.3.1.5. DGM Transmission Line has a responsibility to perform real time delivery twice a month or as per plan.

4.3.1.6. GM Transmission Line has a responsibility to perform real time delivery once a month or as per plan.

4.3.1.7. Record of duly filled and signed checklist of erection/laying work will be kept by MR-PID.

4.3.1.8. Certificate of works / Measurement sheet / Invoices shall be verified by respective Managers/DM/AM/AE; however, the same shall be vet and approved by DGM and GM Transmission Line respectively.

4.3.2. DM/AM/AE is responsible to fill the checklist of crane and lifter. DM/AM/AE inform to manager or DGM if required certificate is not present or not valid and inform to Manager/DGM.

4.3.3. DM/AM/AE Transmission Line is responsible to inspect all incoming Goods and its verification. He/She is authorized to reject the goods if abnormality found. DM/AM/AE has the responsibility to sign documents received with Goods and send to Manager or DGM.

4.3.4. DGM or Manager Transmission Line shall be responsible to arrange shutdown where required as per LDC shutdown procedure.

4.3.5. DM/AM/AE is responsible to fill the checklist of inspection after installation. DM/AM/AE are authorized to find shortcomings in the project and inform to Manager/DGM.

4.3.6. Customer Feedback will be taken from TMOH/TMUG department as an end user, feedback will be taken by respective Manager. Records are maintained by MR for future actions.

5. Testing & Commissioning:

5.1. Procedure:

5.1.1. Once the Installation is completed, the next phase is the testing and commissioning of the equipment.

5.1.2. SAT (Site Acceptance Test) protocol submitted by contractor (e.g. Ref. No. DTS/KE/XXX/Date) will be reviewed and commented/approved by the GM before testing &
commissioning, ref. letter GM (PID)/XXX/Date. All test and commissioning activities are to be witnessed by KE site engineer.

5.1.3. At all stages, the approved SAT protocol must be filed by DM/AM/AE and any deviation from the approved values may be discussed and notified.

5.1.4. Any type of deviation need to be rectified by contractor immediately and verified by KE site engineer.

5.1.5. Following tests will be performed, in the presence of KE site engineer, by the contractor for Underground Transmission Line project;

- 5.1.5.1. 10kV DC Sheath Test
- 5.1.5.2. Meggar test for outer sheath
- 5.1.5.3. Earth Resistance test for joint bays
- 5.1.5.4. 24 hour soak test on no load

5.1.6. Following tests will be performed, in the presence of KE site engineer, by the contractor for Overhead Transmission Line project;

- 5.1.6.1. Soak test
- 5.1.6.2. Positive Sequence Test
- 5.1.6.3. Zero Sequence Test
- 5.1.6.4. Earth Resistance Test
- 5.1.6.5. Painting Test
- 5.1.6.6. Tower Tightening Test

5.1.7. Feedback will be taken from TMOH/TMUG department after completion of testing activity.

5.2. Monitoring & Control:

5.2.1. Approved SAT protocol shall be available at site by contractor. Testing & Commissioning shall be done as per approved project schedule. Ref. no. ProjectName/Schedule/XXX/XXX

5.2.2. DM/AM/AE of transmission line shall be responsible to fill and sign the SAT protocols in coordination with maintenance department representative.

5.3. Responsibility & Authority:

5.3.1. Work shall be assigned by Manager to DM or AM.

5.3.2. DM/AM/AE of Transmission line shall be responsible for supervising the testing & commissioning as per project schedule and ensure the activity to be done according to SAT protocol and approved drawings.
6. Taking over / Handing Over

6.1. Procedure:

6.1.1. "Taking over Certificate" TOC request submitted by contractor (e.g. Ref. No. DTS/KE/XXX/Date) will be reviewed and commented/approved by the GM ref. letter GM (PID)/XXX/Date

6.1.2. "Handing over Certificate" HOC of commissioned project/work shall be issued to user/maintenance department by GM PID.

6.1.3. Customer Feedback will be taken from TMOH/TMUG and LDC department as an end user by concerned Manager.

6.2. Monitoring & Control:

6.2.1. The Taking Over (from Contractor) of the project should be done after receiving the following documents from the contractor;

   6.2.1.1. Energization of Grid/Transmission line or underground cable.
   6.2.1.2. Completion of Works declaration.
   6.2.1.3. Confirmation Letter for the completion of List of Open Points (LOPs).
   6.2.1.4. Complete End Documentation.
   6.2.1.5. Complete Tests (Factory & Site) Reports.
   6.2.1.6. As-Built Drawings.
   6.2.1.7. O&M Manuals.

6.2.2. The Handing Over to End User of the project should be considered as Completed, with the handing over of following documents to the End User;

   6.2.2.1. Complete Tests (Factory & Site) Reports.
   6.2.2.2. As-Built Drawings.
   6.2.2.3. O&M Manuals.
   6.2.2.4. End Documentation

6.3. Responsibility & Authority:

6.3.1. GM of project shall be responsible to issue TOC and HOC of the project.

7. Procedure for Close out the Project
7.1. The project shall be finally Closed Out after:

7.1.1. Material Reconciliation
7.1.2. Successful completion of Defects Liability Period (DLP) and Issuance of DLP Certificate.
7.1.3. Commercial / Financial close out of the project.

8. Abbreviations

8.1. Following abbreviations are used in the document;

8.1.1. ETC (Erection, Testing and Commissioning)
8.1.2. SOP (Standard Operating Procedure)
8.1.3. OH (Over Head)
8.1.4. UG (Underground)
8.1.5. TBT (Tool Box Talk)
8.1.6. LDC (Load Dispatch Center)
8.1.7. PPE (Personal Protective Equipment)
8.1.8. SPE (Special Protective Equipment)
8.1.9. GM (General Manager)
8.1.10. DGM (Deputy General Manager)
8.1.11. DM (Deputy Manager)
8.1.12. AM (Assistant Manager)
8.1.13. AE (Assistant Engineer)
8.1.14. PM (Project Manager)
8.1.15. DD (Deputy Director)
8.1.16. HOD (Head of Department)
8.1.17. HSEQ (Health Safety Environment Quality)
8.1.18. PID (Project Implementation Department)
8.1.19. KE (K-Electric)
8.1.20. RCA (Root cause analysis)
8.1.21. SBO (Switch Board Officer)
8.1.22. LD (Liquidity Damage)
8.1.23. SAT (Site Acceptance Test)
8.1.24. MR (Management Representative)
9. Distribution List

9.1. HOD
9.2. GM (PID)
9.3. DGM/Manager/DM/ AM/AE of transmission section
9.4. MR

10. Approvals:

<table>
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<tr>
<th>Name</th>
<th>Designation</th>
<th>Date</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prepared By</td>
<td>Maaz Siddiqui</td>
<td>Assistant Manager</td>
<td>31/3/15</td>
</tr>
<tr>
<td>Checked By</td>
<td>Abid Khokhar</td>
<td>Manager</td>
<td>31/3/15</td>
</tr>
<tr>
<td>Witnessed By</td>
<td>Shahid Mehmood</td>
<td>Deputy General Manager</td>
<td>31/3/15</td>
</tr>
<tr>
<td>Reviewed By</td>
<td>Syed Niaz Hayder</td>
<td>General Manager</td>
<td>March 31, 2015</td>
</tr>
<tr>
<td>Approved By</td>
<td>Bilal Ahmed Mirza</td>
<td>Deputy Director</td>
<td>05.05.15</td>
</tr>
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ANNEXURE-3

Checklist for Excavation Works
Scope: Procedure to check excavation work at site.

Purpose: To attain quality of work during excavation activity.

Responsibility: AE/ AM/ DM/ Manager/ DGM.

Project Name: 

Date of Activity: 

Contractor: 

Supervisor Name: 

### Check List

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<tr>
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<th>Item</th>
<th>Yes</th>
<th>No</th>
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<tr>
<td>1</td>
<td>TBT has been conducted.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Area of excavation is properly barricaded.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Latest approved drawing is available with contractor at site.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Excavation is done as per approved drawing.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Adequate dewatering system is available and is in working condition.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>6</td>
<td>Arrangement to dispose-off excavated material.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>ROW is available at site.</td>
<td></td>
<td></td>
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<tr>
<td>8</td>
<td>All underground services &amp; lines are marked and protected.</td>
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<td></td>
<td></td>
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<tr>
<td>9</td>
<td>Contractor's designated/authorized person is present at site.</td>
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Remarks (if any):

________________________________________________________________________

________________________________________________________________________

________________________________________________________________________

__Signature of AE/AM/DM (with date):__

________________________________________________________________________

Informed to Manager/DGM: Name: 

Signature:
## Approvals:

<table>
<thead>
<tr>
<th>Name</th>
<th>Designation</th>
<th>Date</th>
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<tr>
<td>Prepared By</td>
<td>Maaz Siddiqui</td>
<td>Assistant Manager</td>
<td>April 22, 15</td>
</tr>
<tr>
<td>Checked By</td>
<td>Sharjeel Ahmed</td>
<td>Deputy Manager</td>
<td>22-04-15</td>
</tr>
<tr>
<td>Reviewed By</td>
<td>Shahid Mahmood</td>
<td>Deputy General Manager</td>
<td>23-04-15</td>
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<tr>
<td>Witnessed By</td>
<td>Niaz Hayder</td>
<td>General Manager</td>
<td>May 05, 2015</td>
</tr>
<tr>
<td>Approved By</td>
<td>Bilal Ahmed Mirza</td>
<td>Deputy Director</td>
<td>05.05.2015</td>
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</table>
ANNEXURE-4

Checklist for Laying of XLPE Underground Cable
Contents
1. Purpose: .................................................................................................................. 2
2. Scope: ..................................................................................................................... 2
3. Responsibility & Authority: .......................................................... 2
4. Procedure/Checklist: .......................................................................................... 2
5. Approvals: ........................................................................................................... 4
1. Purpose:

1.1. The purpose of this SOP is to:
   1.1.1. Define the procedure for checking and recording the laying of underground XLPE power cable during site activities.
   1.1.2. Identify the responsibility & Authority during site works.

2. Scope:

This SOP is applicable for UG Transmission Section of PID to increase the quality standard for laying of Underground XLPE Cables.

3. Responsibility & Authority:

3.1. Deputy Manager
3.2. Assistant Manager
3.3. Assistant Engineer

DM/AM/AE shall ensure to check the procedure during the site activity. He can stop the work if any deviation found and inform to his Manager.

4. Procedure/Checklist:

The following checklist e.g. PID/TL/CL/04 shall be followed during the work activity:

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<tr>
<td>1</td>
<td>Entry Permit and ROW is available</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Cable trench, Cable drum, Cable Puller and rollers are available in good condition</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>The area is cordoned off using warning tapes and safety signs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Description</td>
<td>Action</td>
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<td>-------------------------------------------------------------------------------</td>
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<tr>
<td>4</td>
<td>All the engineers and associated staff present at the site is equipped with healthy PPEs</td>
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<td></td>
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<tr>
<td>5</td>
<td>Bottom of the trench is covered with approved bedding material</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Trench or other places where the cable is to be installed are free from any materials which may damage the cable</td>
<td></td>
<td></td>
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<tr>
<td>7</td>
<td>All the communicative equipment's are in good condition and distributed on the route</td>
<td></td>
<td></td>
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<tr>
<td>8</td>
<td>Enough personnel shall be distributed along the cable route section during pulling to avoid hazard conditions</td>
<td></td>
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<tr>
<td>9</td>
<td>Maximum pulling speed shall be 5m/min. and drum rotation speed shall be controlled according to the laying speed</td>
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<td></td>
</tr>
<tr>
<td>10</td>
<td>Watch the cable on the cable rollers, and maintain sufficient clearance between exiting services.</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Outlook of the cable is checked and it shall be confirmed that the cable has not got any damage during cable pulling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Necessary protection to the cable is provided against mechanical damage and any other possibility to damage the cable</td>
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Remarks: 

Signature: __________________________
5. Approvals:

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<tbody>
<tr>
<td>Prepared By</td>
<td>Maaz Siddiqui</td>
<td>23/2/15</td>
<td>Maaz</td>
</tr>
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<td>23/2/15</td>
<td></td>
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<tr>
<td>Witnessed By</td>
<td>Abid Khokhar</td>
<td>23/2/15</td>
<td></td>
</tr>
<tr>
<td>Head of Department</td>
<td>Bilal Ahmed Mirza</td>
<td>24/03/15</td>
<td></td>
</tr>
<tr>
<td>DCTO</td>
<td>Muhammad Adil</td>
<td>25/2/15</td>
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CORPORATE HSEQ POLICY

TITLE

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<td>05</td>
<td>1st December 2014</td>
<td>1 of 1</td>
<td>CORPORATE HSEQ</td>
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HSEQ POLICY

We at KE are committed to surpassing the requirements and expectations of our customers, improving our Health, Safety, Environment and Quality performance and minimising the impact of our activities on the environment by:

- Complying with applicable legal and other requirements to which our company subscribes.
- Embedding the Health, Safety, Environment and Quality requirements in our routine and non-routine activities.
- Preventing injuries and ill health to personnel affected by our activities through a proactive system of risk management.
- Conserving natural resources and reducing the carbon footprint of activities by proactively assessing their environmental impact and mitigating their adverse effects.
- Ensuring competency of employees by providing them with adequate training, information, instructions and supervision.
- Communicating with stakeholders to ensure better understanding of our HSEQ policies, standards, programmes and performance.
- Ensuring continual improvement through a system of performance planning, measurement and reviews.

KE employees are at the forefront of this policy; for its successful implementation they shall demonstrate their HSEQ consciousness by practicing their assigned safety roles and responsibilities. The policy shall also reinforce our standards of nurturing and developing our substantial talent pool, building shareholder value through performance excellence & improved financial results and measuring customer satisfaction by providing reliable, safe and cost effective services.

It is my firm belief and a core business value that all accidents and work related ill health is preventable. To achieve this, I shall ensure that timely decisions are taken and resources provided to demonstrate our commitment on implementing our HSEQ vision and strategy.

TAYYAB TAREEN
CHIEF EXECUTIVE OFFICER
Date: 1st December’14
ANNEXURE-6

Contractors and Suppliers HSEQ Management Procedure
1.0 Purpose:

The purpose of this procedure is to describe the process required to be adopted with respect to Health, Safety, Environment and Quality (HSEQ) management during implementation of Contracts and Procurement process for acquisition of goods and/or services. The main objectives are to:

- Define the minimum HSEQ objectives to be met at each stage of a contract.
- Develop a strategy for proactive management of Contractor & Supplier HSEQ.
- Highlight the benefit of effective proactive approaches, particularly prior to tendering and mobilization.
- Describe a planned approach to Management of Contractor and Supplier HSEQ that will ensure a continuing improvement in HSEQ performance for all contractor activities.
- Describe the role and responsibilities of key personnel in contractor and supplier HSEQ management.

2.0 Scope:

This procedure applies to KESC employees, contractors and suppliers.

3.0 Distribution:

All employees at KESC, Contractors and Suppliers.

4.0 Definitions:

**Company:** Karachi Electric Supply Company.

**Contract:** A formal business agreement detailing the terms and conditions for the supply of products or the provision of services.

**HSEQ Plan:** A formal document showing how it is intended to manage the hazards determined. It should be recognized that in many situations, particularly for larger contracts, this HSEQ Plan will effectively form a significant part of the contract.

**Contractor:** A Supplier holding a Contract with Company for the supply of goods or services.

**Contract Sponsor:** The department, BU or function that has budget and management authority to execute the Contract.

**Contract Manager:** The person named in the contract to represent the Contractor in respect of the contract and to be responsible for the management of the contract or supplies.
Contractor Representative: The person appointed in writing by the Contract Manager to supervise the execution of the contract activities or supplies.

Scope of Work: The objective and extent of work to be accomplished by a Contractor or Supplier.

Services: Reflect work done in which people play a prominent role in delivery. A service is an intangible product. Work performed for pay.

5.0 HSEQ Requirements:

5.1 Corporate HSEQ Policy:

- Embedding the Health, Safety, Environment and Quality requirements in our routine and non-routine activities.
- Preventing injuries and ill health to personnel affected by our activities through a proactive system of risk management.
- Improving competence and skill through training and awareness.
- Ensuring continual improvement through a system of performance planning, measurement and reviews.

5.2 ISO 14001:2004 Specifications (Section 4.4.2) - Training Awareness and Competence:

The organization shall ensure that any person(s) performing tasks for it or on its behalf that have the potential to cause a significant environmental impact(s) identified by the organization is (are) competent on the basis of appropriate education, training or experience, and shall retain associated records.

5.3 OHSAS 18001 Specifications (Section 4.4.2) - Training Awareness and Competence:

Personnel shall be competent to perform task that may impact on OH & S in the work place. Competence shall be defined in terms of appropriate education, training and or experience.

6.0 Objectives:

The overall objectives of this procedure are:

- Ensure that contractors / supplier meet or exceed KESC HSEQ standards.

6.1 Adherence to Hazards and Effects Management Process:

All hazards to contractor's personnel, KESC staff, public and to the environment shall be:
6.2 Mutual HSEQ awareness:

The contractor / supplier and the Contract Sponsor shall be mutually aware of both parties' minimum obligations to manage HSEQ and these obligations shall be within mutually agreed contractual terms.

6.3 Means to monitor the contract HSEQ management:

The means to monitor the contract HSEQ management system (HSEQMS) shall be mutually defined, understood, accepted and agreed by both parties as contractually binding.

6.4 Equal attention to Health, Safety, Environment and Quality:

6.5 Controls in place for hazards and effects management

The controls necessary for the management of hazards and effects shall be in place and working. Where they are not, this shall be speedily remedied or in extreme cases, work should be stopped.

6.6 Ensure clarity between Contract Sponsor and Contractor regarding responsibilities:

7.0 Procedure:

7.1 Contract Phases and HSEQ Planning:

The influence and inclusion of HSEQ issues in the preparation of tender and contract documents and the subsequent HSEQ management of a contractor shall be described within the context of an identifiable series of phases:

- Planning and invitation to tender.
- Tender period.
- Bid evaluation and contract award.
- Mobilization.
- Execution
- Demobilization
- Close-out.

More details are in the below table
### 7.2 Pre-Qualification and Tender Process:

Pre-Qualification is a process that shall be conducted preferably in advance of, but may be in parallel with, Tendering, to determine if a Contractor has the capacity to deliver a specific service. In all cases, pre-qualification shall include an HSEQ assessment component.
HSEQ prequalification pack shall include but not be limited to the requirement for potential Tenderers to submit the following:

- Contractor Self Evaluation Form (KESC-SP-022-F01).
- HSEQ policy.
- Contractor HSEQ Management plan.
- HSEQ Organizational structure.
- Details of Contractor HSEQ training and audit systems.
- Overview of the Contractor’s recent HSEQ performance.

In addition, any specific HSEQ requirements of the Contractor/Supplier should be defined based on the control measure outcomes of identified in the Risk Evaluation process and included in the Pre-Qualification package.

7.3 HSEQ Tender Package:

The Tender package shall clearly present all HSEQ requirements applicable to the Scope of Work. HSEQ documentation to be included in the HSEQ Tender package and must include but not be limited to the following HSEQ documentation:

- KESC Corporate HSEQ Policy.
- KESC Corporate HSEQ Manual.
- KESC-SP-022 – Contractor / Supplier HSEQ Management Procedure.
- All relevant KESC Corporate HSEQ Procedures (If required by the contractor).

These requirements are mandatory for all Contracts with the Company – irrespective of their jurisdiction. The applicability of all Company HSEQ requirements must be assessed on a case by case basis for each contract.

7.4 Tender Schedule:

A specific HSEQ Tender Schedule shall be prepared that lists all HSEQ related information to be provided by the Tenderer in their submission. It is used as a formal basis for evaluation of the Tender.

The Tender Schedule should require a response to be submitted by the Tenderer for all key HSEQ issues that must be addressed by the Contractor in performing the Scope of Work.

For simple procurement contracts, the HSEQ Tender Schedule may be limited to a request for basic information repeating to the Tenderers internal HSEQ policies and systems. However, for controlled Site based activities, more detailed information shall be requested of the Tenderer including specific responses to HSEQ related issues pertinent to the Scope of Work (e.g. outline of method statements, etc.).
7.5 HSEQ Evaluation of Tender Submissions:

A weighted evaluation of Tenderers final submissions shall be prepared as a basis determining a preferred Tenderer from an HSEQ perspective. The relative weighting assigned to each component of the Tender Schedule shall be based on the risk exposure associated with each aspect of the Scope of Work.

8.0 Contract Award:

8.1 Pre-award HSEQ alignment meeting:

A Pre-Award HSEQ alignment meeting is mandatory for all high risk contracts. The Contract Sponsor shall arrange a pre-award HSEQ alignment meeting with the preferred Tenderer to ensure that the Tenderer is fully cognizant and aligned with all HSEQ requirements applicable to the Scope of Work. Any discrepancies shall be identified at this meeting, if possible resolved, and outcomes minuted by the Contract Sponsor.

8.2 Finalize HSEQ Contract Documentation:

Should any HSEQ amendments to the Tender documentation be necessary as identified in the Pre-Award HSEQ alignment process, these amendments shall be translated into a revision of Contract documentation prior to Contract award.

Any additions, changes or deletions to the standard HSEQ pro-forma clauses shall be approved by the HSEQ and/or Legal functions.

9.0 Contract Pre-Execution:

9.1 Contractor / Supplier HSEQ Plan:

The purpose of the Contractor/Suppliers HSEQ Plan is to define how the Scope of Work shall be implemented by the Contractor/Supplier in accordance with Company (Contractual) HSEQ requirements. Although a specific Contractors/Suppliers HSEQ Plan shall be required for all Contracts, the content and format of the plan shall be commensurate with the risk associated with executing each aspect of the Scope of Work as determined by risk assessment as well as the necessary control measures.

The Contractors HSEQ Plan shall address any bridging or interfacing requirements necessary to ensure the effective management of HSEQ related issues.

The Plan shall be approved by the Company prior to commencing execution of the Scope of Work.
9.2 Establish Specific HSEQ Systems and Processes:

Specific HSEQ systems and processes shall be established prior to commencing the Scope of Work shall be defined in the HSEQ Plan for the activity and/or the Contractors HSEQ Plan. Following presents a guide to Company expectations regarding HSEQ processes and systems to be established across a range of activities.

The level of inspection and assessment required will be a function of the Scope of Work, work environment and jurisdiction classification of planned activities.

<table>
<thead>
<tr>
<th>Process</th>
<th>Controlled site activities</th>
<th>Supply/Procurement contract only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plan</td>
<td>Equipment (Inspections, Checklists, Certifications, Tagging) as per KESC-SP-022-F02</td>
<td>Inspections</td>
</tr>
<tr>
<td></td>
<td>Procedures (Permit systems and certificates)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Personnel (Induction, training, certifications)</td>
<td></td>
</tr>
<tr>
<td>Do</td>
<td>Maintain hazard register</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inspections</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Actions register maintenance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Contractor coordination meetings</td>
<td></td>
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<tr>
<td></td>
<td>Contractor coordination meetings</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Workforce communications meetings Tool Box Talk</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Behavioral observation systems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Incentive scheme implementation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Knowledge sharing initiatives</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Knowledge sharing initiatives</td>
<td></td>
</tr>
<tr>
<td>Check</td>
<td>Compliance auditing</td>
<td></td>
</tr>
<tr>
<td>Act</td>
<td>Monthly HSE Reporting</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Incident and event</td>
<td></td>
</tr>
</tbody>
</table>

9.3 Complete Pre-Start HSEQ Inspections and Review:

Assessment of key plant, equipment and personnel should be undertaken prior to site mobilization. For example, equipment to be evaluated may include the following:

Fixed and mobile plant (cranes, elevated work platforms, generators, air compressors, etc.). Other specific equipment (scaffolding, ladders, harnesses, rigging, tools, PPE, etc.)

Inspections, audits and third party compliances are mandatory for all activities.

All Personnel working in activities shall have the minimum training, competency and qualifications:
Certificates verifying competency, training and qualifications shall be up to date and made available to upon request.

In addition, short service personnel shall complete a minimum of:

- Site specific HSEQ Induction.

All other personnel shall complete:

- Site specific HSEQ Induction.
- Specific training and competency topics as identified by the site.

10.0 Contract Execution:

10.1 Implement HSEQ Systems and Processes:

The Contract Sponsor and HSEQ Support shall be responsible for monitoring and review of Contractor compliance with all HSEQ requirements defined in the Contract.

A process of continuous review shall be maintained to track HSEQ performance throughout Contract execution. Opportunities for improvement and enhancement of HSEQ systems and processes shall also be identified and implemented. Tools to assist in this process include the following:

- Regular reviews and inspections
- Audit compliance with the HSEQ Plan
- Audit HSEQ performance against the KESC requirements
- Contractor coordination meetings.
- Other feedback mechanisms.

HSEQ performance reviews shall be conducted on a quarterly basis for all high risk contracts.

An HSEQ Action Register shall be established to ensure HSEQ issues are followed up in a timely manner.

10.2 Reporting and Auditing:

Reporting: The Contractor shall be responsible for providing monthly HSEQ performance data to the Company as defined in the Contract and aligned with Company reporting requirements.

Reporting shall be done of the following as minimum;

- HSEQ Incidents / Accidents
• Near-misses
• Tool Box Talk
• Manning Statistics

Auditing: Auditing shall be undertaken by the Contractor, Contract Sponsor and HSEQ as defined in the Contract and the Contractors HSEQ Plan.

A process of corrective action tracking shall be in place in the event that areas of non-compliance are identified. Depending on the Scope of Work, formal audits and audit reporting may also be required.

10.3 Contract Closeout:

After completion, a Contract HSEQ review shall be prepared that provides a formal record and a concise history of the contractor’s HSEQ performance and capture learning’s that can be applied to future contracts. The review should derive the majority of its content from factual documentation collected during the duration of the contract and lodged with Supply and Chain for future reference.

11.0 Responsibilities:

11.1 Contract Sponsor:

• Shall be responsible for ensuring that this Procedure is implemented for their assigned contract.
• Shall be responsible to conduct regular audit, inspections in conjunction with Corporate HSEQ Department.
• Shall gather the relevant HSEQ documents from the contractor as mentioned in the procedure or as and when required basis.

11.2 Corporate HSEQ Department:

• Shall assist the contract sponsor to conduct the inspections, audits.
• Shall analyze the HSEQ Data received from the contract sponsor for the continuous improvement in the HSEQ System.
• Shall analyze the contracts / tenders with respect to HSEQ Management System prior to the award of contracts.
11.3 Contractor:

- Shall be responsible to conduct regular internal audit, inspections, tool box talks, etc as per company policy.
- Shall provide the HSEQ Data on regular basis as mentioned in the procedure.
- Shall be responsible to provide the HSEQ Resources (PPEs, SPEs, training) to all staff involved in the activity.

12.0 APPLICABILITY

- All Management and non-management staff – KESC.
- 3rd Party contractual.

13.0 FORMS / DOCUMENTS

KESC-SP-022-F01 ------------------ Contractor Self Evaluation Form.

KESC-SP-022-F02 ------------------ Equipment Inspection Checklist.
ANNEXURE-7
Traffic Management Plan
## TRAFFIC MANAGEMENT PLAN

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Measures to be taken</th>
<th>Implementation</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Route Diversions</strong></td>
<td>i. Plan and designate entry and exit points for the project sites which will be required by heavy vehicles during construction phase.</td>
<td>Work planning phase</td>
<td>K-Electric</td>
</tr>
<tr>
<td></td>
<td>ii. Allocate temporary alternative route considering usual traffic volumes and road carrying capacities and feasibility of general public with consultation and approval of City Traffic Police Karachi.</td>
<td>Work planning phase</td>
<td>K-Electric</td>
</tr>
<tr>
<td></td>
<td>iii. Conditions of roads are to be checked prior to selecting routes for both general public and construction vehicles.</td>
<td>Work planning phase</td>
<td>Contractor</td>
</tr>
<tr>
<td></td>
<td>iv. Provide a separate clear path for emergency care vehicles like ambulances and fire brigades.</td>
<td>Work planning phase</td>
<td>Contractor</td>
</tr>
<tr>
<td><strong>Work zone demarcation</strong></td>
<td>i. Ensure proper fencing where storage, campsites and other facilities are located to avoid unauthorized access.</td>
<td>Throughout project</td>
<td>Contractor</td>
</tr>
<tr>
<td></td>
<td>ii. Cordon of the work zone by reflector cones at least 50 m before the actual working site to alert all people passing by.</td>
<td>Throughout project</td>
<td>Contractor</td>
</tr>
<tr>
<td></td>
<td>iii. Allocate appropriate parking areas for the use of employees including contractors and for heavy machineries.</td>
<td>Throughout project</td>
<td>Contractor</td>
</tr>
<tr>
<td></td>
<td>iv. Number of vehicles will be checked that enter and leave the area and unauthorized vehicles will not be allowed to enter in work zone.</td>
<td>Throughout project</td>
<td>Contractor</td>
</tr>
<tr>
<td><strong>Signage</strong></td>
<td>i. Display sign boards and banners about traffic diversions at places on detour routes.</td>
<td>Initiating phase</td>
<td>K-Electric/Contractor</td>
</tr>
<tr>
<td></td>
<td>ii. Ensure use of Traffic Control Devices (TCDs) like reflectors, hazard cones and sign boards as required at main roads.</td>
<td>Throughout project</td>
<td>K-Electric/Contractor</td>
</tr>
<tr>
<td>Aspect</td>
<td>Measures to be taken</td>
<td>Implementation</td>
<td>Responsibility</td>
</tr>
<tr>
<td>------------------------</td>
<td>--------------------------------------------------------------------------------------</td>
<td>--------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td></td>
<td>iii. Construction Vehicles will be installed with revolving hazard lights and hooters for signaling operation when in use.</td>
<td>Throughout project</td>
<td>Contractor</td>
</tr>
<tr>
<td>Speed</td>
<td>i. Install temporary speed bumps / humps near work zone areas and specially near residential areas with consultation and approval of City Traffic Police Karachi.</td>
<td>Initiating phase</td>
<td>K-Electric/Contractor</td>
</tr>
<tr>
<td></td>
<td>ii. Ensure all vehicles in the area maintain speeds up to 30 km/hr.</td>
<td>Throughout project</td>
<td>Contractor</td>
</tr>
<tr>
<td>Timings</td>
<td>i. Undertake construction activities that are audible at any residential receptor, between the following hours: 7:00am to 6:00pm, Mondays to Fridays. 8:00am to 1:00pm on Saturdays. No time on Sundays or public holidays.</td>
<td>Throughout project</td>
<td>Contractor</td>
</tr>
<tr>
<td></td>
<td>ii. Entry of heavy machineries or vehicles and delivery timings on work site will be adjusted such that vehicles do not queue up at other routes.</td>
<td>Throughout project</td>
<td>Contractor</td>
</tr>
<tr>
<td></td>
<td>iii. Temporarily stop work or access in work zone during school and office hours between 8:30am to 9:30am and 2:00pm from Mondays to Fridays.</td>
<td>Throughout project</td>
<td>Contractor</td>
</tr>
<tr>
<td>Foremen / Signaling</td>
<td>i. Special foremen will be employed to control vehicular movement in and outside the work zone.</td>
<td>Work planning phase</td>
<td>K-Electric</td>
</tr>
<tr>
<td></td>
<td>ii. Foremen will wear appropriate PPEs and use TCDs to guarantee efficient work zone management.</td>
<td>Throughout project</td>
<td>K-Electric/Contractor</td>
</tr>
<tr>
<td></td>
<td>iii. Two-way radios and color flags will be provided to all foremen.</td>
<td>Throughout project</td>
<td>K-Electric/Contractor</td>
</tr>
</tbody>
</table>
ANNEXURE-8

Waste Management Plan
WASTE MANAGEMENT PLAN

The purpose of this waste management plan is to assess, and where possible reduce, the amount of waste produced during the construction phase of the Project. This plan will assess how the waste will be dealt with in the most environmentally sustainable way. This plan describes the procedures, methods and techniques to be adopted for disposal of waste (to be generated from camps, offices, vehicles and construction site) during construction phase of the project. It must:

- Identify the types of waste expected to be produced
- Estimate the quantity of each type of waste
- Identify the planned waste management action proposed for each type of waste generated.

Proper management of waste is important because the risk of improper waste handling and disposal to human health and the environment cannot be ignored.

Types of Waste

The expected types of wastes generated in the Project will be:

- Camp sites waste
- Sewage (waste water)
- Workshop waste (vehicles and heavy equipment oil and parts)
- Chemical waste (spent oil from generators and machinery in work, oil, greese, paints)
- Medical waste
- Packing waste
- Debris from construction sites and excavated material

The wastes mention above can also be generalized into following two categories:

- Biodegradable waste: Mainly organic wastes such as food stuffs, fruit and vegetables, wood grass and other biodegradable items.
- Non-biodegradable waste: It includes polythene bags, excavated material, glass, stone/brick, shoppers, plastic products, process wastes, metal scrap and medical wastes such as used needles, tablets, glass bottles and syringes etc.

Waste Management Plan:

The solid waste management plan for Project is developed to ensure that waste must be dealt with an efficient and environmentally sound manner, starting from collection
to disposal. Therefore, waste collection and disposal arrangements will be required separately and independently at camp and working site.

**Waste Minimization:**

- **Avoid:** Waste avoidance by reducing the quantity of waste being generated. This is the simplest and most cost-effective way to minimize waste. It is the most preferred option in the Waste Management Hierarchy and is therefore ranked first.

- **Reuse:** Reuse occurs when a product is used again for the same or similar use with no reprocessing. Reusing a product more than once in its original form reduces the waste generated and the energy consumed, which would have been required to recycle.

- **Recycle and Reprocess:** Recycle involves the reprocessing waste into a similar non-waste product consuming less energy than production from raw materials. Recycling spares the environment from further degradation, saves landfill space and resources.

- **Dispose:** Removing wastes from worksites, compounds, offices and dumping in a licensed landfill site or other appropriate authorized disposal facility.

**WASTE COLLECTION & SEGREGATION:**

The contractor will be responsible for deputing a sanitary staff for daily cleaning and collecting of waste from camp site and placing of waste in the nominated waste bins. It is necessary to sort the waste into various categories. The waste shall be sorted manually or mechanically before applying necessary treatment and disposal arrangement. Waste collection receptacle will have following characteristics:

- Separate receptacles for biodegradable and non-biodegradable wastes (only on sites where non-degradable waste is generated).

- Containment should maintain properly, convenient to handle and environmentally sound.

- Waste bins provided must be suitable for all kinds of wastes generated in project area.

- Distribution of bins will be in way that every person on site can approach without disturbance to work.
WASTE TRANSPORTATION

The waste must be transported from collection points to disposal points in well maintained, designated and covered vehicles. Every transportation vehicle must have fixed routes. Hazardous material must be transported in separate vehicle, should not be mixed with non-hazardous waste.

WASTE TREATMENT

<table>
<thead>
<tr>
<th>Origin of waste</th>
<th>Description</th>
<th>Treatment/Disposal Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Camp site waste</td>
<td>Biodegradable: Foodstuffs, fruits and vegetables, wood, Bones, grass etc.</td>
<td>Biodegradables: Dumping on Site (can be used for composting process)</td>
</tr>
<tr>
<td></td>
<td>Non-Biodegradable: Paper, metals, glass, plastic bottles, shoes, bottles and jars etc</td>
<td>Non-Biodegradable: Should be disposed off through EPA approved contractor.</td>
</tr>
<tr>
<td>Workshop waste</td>
<td>Used oil, ferrous/non ferrous materials, batteries etc.</td>
<td>Handling by the EPA certified recycling Contractor.</td>
</tr>
<tr>
<td>Including solid and Fluid</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medical Waste</td>
<td>Syringes, glass bottles, bandages, blood sampling tubes, expired drugs, dressing etc</td>
<td>Sent to EPA approved contractor for incineration.</td>
</tr>
<tr>
<td>Excavated and Demolition waste</td>
<td>Rocks, sand, silt/clay, concrete, bricks and other building materials</td>
<td>Almost all excavated, construction and demolition waste is capable of being reused in back filling. The recycled materials should be sold to sub-contractor or vendor.</td>
</tr>
<tr>
<td>Excess construction material</td>
<td>Sand, aggregate, cement, bricks, reinforcement steel bars, paints and other construction materials</td>
<td>To be sold back or given to the supplier or other users.</td>
</tr>
<tr>
<td>Origin of waste</td>
<td>Description</td>
<td>Treatment/Disposal Method</td>
</tr>
<tr>
<td>----------------</td>
<td>-------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>Hazardous material</td>
<td>Spills of diesel fuel, gasoline, hydraulic fluid, brake fluid, engine oil, lubricants, etc. Spills of generator and vehicle fluids include mobile refueling trucks and construction vehicles and equipment. Vehicle accidents; and natural disasters.</td>
<td>All Containers will be properly labeled and leak proof placed on hard base. Conduct proper maintenance &amp; inspection of vehicle. All machinery found to be a potential source of a future spill and Vehicles with chronic or continuous leaks must be removed from the construction site and repaired before returning to operations. Restrictions will be placed on all equipment refueling, servicing, and maintenance supplies and Activities on working site. A Spill Containment Kit with following provisions will be available on each site (a) Sorbent socks (b) Disposal bags (c) Safety glasses (d) Rubber bags (e) Sorbent pads</td>
</tr>
<tr>
<td>Liquid Waste (sewage waste water)</td>
<td>Kitchen, Washing and working site</td>
<td>Septic tanks must be provided for waste water. Waste water to be disposed of after treatment through septic tanks.</td>
</tr>
</tbody>
</table>

**TRAINING**

All employees, contractors and utility staff working on site will undergo site induction training (which includes environmental due-diligence training) and environmental training in relation to waste management issues. The induction will address:

- This management plan
- Relevant legislation
- Waste minimization
- Waste recognition and recycling
- Available recycling facilities
- Energy and water minimization measures
Records would be kept of all personnel undertaking the site induction and training, including the contents of the training, date and nature of trainers.

Key staff will undertake more comprehensive training relevant to their position and responsibility. This training may be provided as “TOOL BOX” training.

**INSPECTION, MONITORING, AUDITING AND REPORTING**

**10.1.1 Inspections and Monitoring**

Regular monitoring will be undertaken to track waste management on site. This will be through a series of formal and informal inspections at regular interval.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Resources</th>
<th>Responsibility</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Inspection</td>
<td>Site Diary</td>
<td>Contractor</td>
<td>Daily</td>
</tr>
<tr>
<td>Environmental Inspection</td>
<td>Environmental site checklist</td>
<td>Contractor</td>
<td>Weekly</td>
</tr>
<tr>
<td>Waste removal activities off site</td>
<td>Monthly register for waste materials</td>
<td>Contractor</td>
<td>Monthly</td>
</tr>
</tbody>
</table>

**Auditing**

Audits both (internal and external) would be undertaken to assess the effectiveness of environmental control and compliance with this plan and EPA guidelines. Any audit of this plan will be part of an overall audit of project activity.

**Reporting**

Quarterly report will be produced by the contractor through EPA certified firm.