WHEN YOU NEED TO BE SURE SGS

Environmental Impact Assessment (EIA)

132 KV Airport II Hybrid Grid Station and Overhead Transmission line to Korangi East Project

October, 2009

Karachi Electric Supply Company Limited

The Karachi Electric Supply Company Ltd.

Executive Summary

The Karachi Electric Supply Company (KESC) limited incorporated in 1913 is principally engaged in generation, transmission and distribution of electric energy to industrial, commercial, agricultural and residential consumers of Karachi. The licensed area of KESC is spread over 6000 Km^2 including entire Karachi and its suburbs up to Dhabeji and Gharo in Sindh and over Hub, Uthal and Bela in Baluchistan. The Company has been privatized in November 2005 with the transfer of 73% shares to new management while 25 % of shares still lie with the government of Pakistan. Karachi is a business centre of Pakistan with a wide network of power transmission but still inadequate to meet consumer rapidly growing demand. This situation limits the national development and economic growth of the country. To cope with the constraints, Karachi Electric Supply Company has proposed to improve and upgrade existing power transmission infrastructure.

KESC aims to improve the electricity supply of Karachi and adjacent areas through their System Stabilization, Rehabilitation and Loss Reduction Programme. The programme is being implemented to expand generation capacity through installation of clean and more energy efficient gas-fired combined cycle units at existing thermal power stations on a fast track basis and up gradation /rehabilitation of existing transmission and distribution (T&D) assets in order to reduce the energy losses. A number of projects have been initiated to meet the targets of System Stabilization, Rehabilitation and Loss Reduction Programme. This Environmental Impact Assessment (EIA) study covers a portion of the rehabilitation comprising installatiohn of a 132 KV hybrid grid station at Shah Faisal Colony (Airport II) and laying of approximately 3 km long overhead transmission line starting from the Korangi East near Murtaza Chorangi passing over the Malir River to Shah Faisal Colony. Grid station will maintain consistent energy supply to the consumer through voltage stabilisation and further transmission. Overhead transmission will be for transmission and distribution of electricity. The line will pass from a scarcely populated area of the city where insulation to the electromagnetic field will be provided by air. The power line will be suspended by thirteen high towers or poles, each installed at a distance of 250 meter between the transmission lines. The project once functional will support of power transmission and distribution network of Karachi city and facilitate the supplies by reducing loss of electricity during transmission.

According to Pakistan Environmental Protection Act 1997 each new development project has to undertake Environmental Impact Assessment (EIA) or Initial Environmental Examination (IEE) in order to predict and mitigate the impacts of the development at an early stage. Based on nature,

size, cost, legal context and associated impacts, the proposed project has been categorized for EIA study. This report documents EIA findings and recommendations.

The EIA process of the project started with the identification of potential environmental and social impacts resulting from the proposed project's activities their rating as slight, moderate and negligible with the aid of an impact assessment matrix. Project activities that were likely to result in high impacts were investigated further to validate the anticipated impact and an alternative project activity was determined that has a medium or low-level impact. For project activities with moderate and minor level impacts, suitable mitigation measures are proposed to reduce the impact to a low category impact or as low as reasonably possible. Finally, for insignificant impacts, no alternatives or mitigation measures were explored, as it is expected that the environmental management systems in place will be sufficient to avoid or reduce those impacts.

Impact of the proposed project has been assessed for construction and operations which will be controlled through mitigation measures. Mitigation measures are proposed mitigation through technology change, environmental management and clean practises. The exposure of noise generated during operations will be controlled through providing PPEs to the workers. All vehicles, generators and other equipment used during the construction will be properly tuned and maintained in good working condition in order to minimize emission of pollutants. Vehicular movement will be restricted to a specific time for dumping of supplies and construction material. Effect on Flora and Fauna will be reduced through predefining the route in such a manner that minimal clearing of the vegetation is required as to reduce the damage on large scale. Construction activities generate considerable waste and provision for suitable separation, storage of waste in designated and labelled areas on the camp site and near each construction area will be made. Proper mitigation measures have been provided to reduce all the anticipated impacts of the project.

Environmental management plan (EMP) has been proposed in order to ensure that the measures are practically implemented during the construction and operation of the project. Responsibilities of the project proponent and the contractor has been clearly defined and allocated to ensure effectiveness of the plan. EMP will serve as a tool for effective communication of environmental issues between the proponent and the contractor during the construction and operations phase of the project. Project proponent will undertake overall responsibility for compliance with EMP and will carry out verification checks to ensure that the contractors are effectively implementing mitigation measures.

The proposed mitigation measures will ensure that anticipated impacts of the project on the area's natural and socioeconomic environment will be well within acceptable limits. The project

proponent has expressed commitment to protection of the social and natural environment from any potential adverse impact of the project. A preventive maintenance philosophy, supported by robust inspection plans and sound operational practices will be adopted to ensure sustainable and sound operation of the proposed development.

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Acronyms

AIS	Air Insulated Switchgear
CU	Color Units
EIA	Environemental Impact Assesment
EPA	Environmental Protection Agency
EPD	Environmental Protection Department
GIS	Gas Insulated Switch Gear
JTU	Jackson Turbidity Units
KESC	Karachi Electric Supply Company
mg/l	milligrams per liter
NCS	National Conservation Strategy
NEQS	National Environmental Quality Standards
NS	No Standards
NTU	Nephelometric Turbidity Units
PEPC	Pakistan Environemental Protection Councel
PMD	Pakistan Meteorological Department
PPE	Personal Protective Equipment
Pt-Co	Platinium Cobalt Standards,
SEPA	Sindh Environemental Protection Agency
TON	Threshold Odor Number,
WHO	World Health Organization

1. Introduction

This chapter of the report describes the purpose of the EIA study including a brief description of nature, size and location of the project. A defined scope of study, magnitude of efforts and concise description of project proponent is also included in this chapter.

In last few years Pakistan has faced the great energy crisis, especially the Karachi city. Being an electric supply and distribution company in the city, KESC has found few solutions in order to over come energy problems. One of this solution is the KESC "System Stabilization, Rehabilitation and Loss Reduction Programme" which is being implemented to expand generation capacity by adding clean and more energy efficient gas-fired combined cycle units at existing thermal power stations on a fast track basis and upgrade/rehabilitate the existing transmission and distribution (T&D) assets in order to reduce the energy losses. Airport II Grid station at Shah Faisal Colony and Overhead transmission line between Airport II and Korangi East grid station are also the part of KESC upgradation/rehabilitation program. The objective of this project is to enhance customer service, improve power supply reliability, and strengthen health, safety and environmental management system. It is expected that increased power generation supported by appropriate infrastructure will resolve the problem of power outages of the city.

This Environmental Impact Assessment (EIA) study covers a portion of the rehabilitation, which will include instalment of a new 132 KV hybrid grid station and laying of approximately 3 km long overhead transmission line for Korangi East. The EIA studies covering other areas of the "System Stabilization, Rehabilitation and Loss Reduction Programme" have also been initiated as part of this programme. .

Keeping in view the legal requirements of the project, KESC has engaged the services of SGS Pakistan (Pvt.) Ltd. to carry out EIA. This report documents the findings of the study.

1.1. Project Proponent

The Karachi Electric Supply Company limited was incorporated in 1913 under the Indian Companies Act, and later it registered according to Companies Ordinance 1984. Government of Pakistan took control of the company by acquiring major shareholding in 1952.

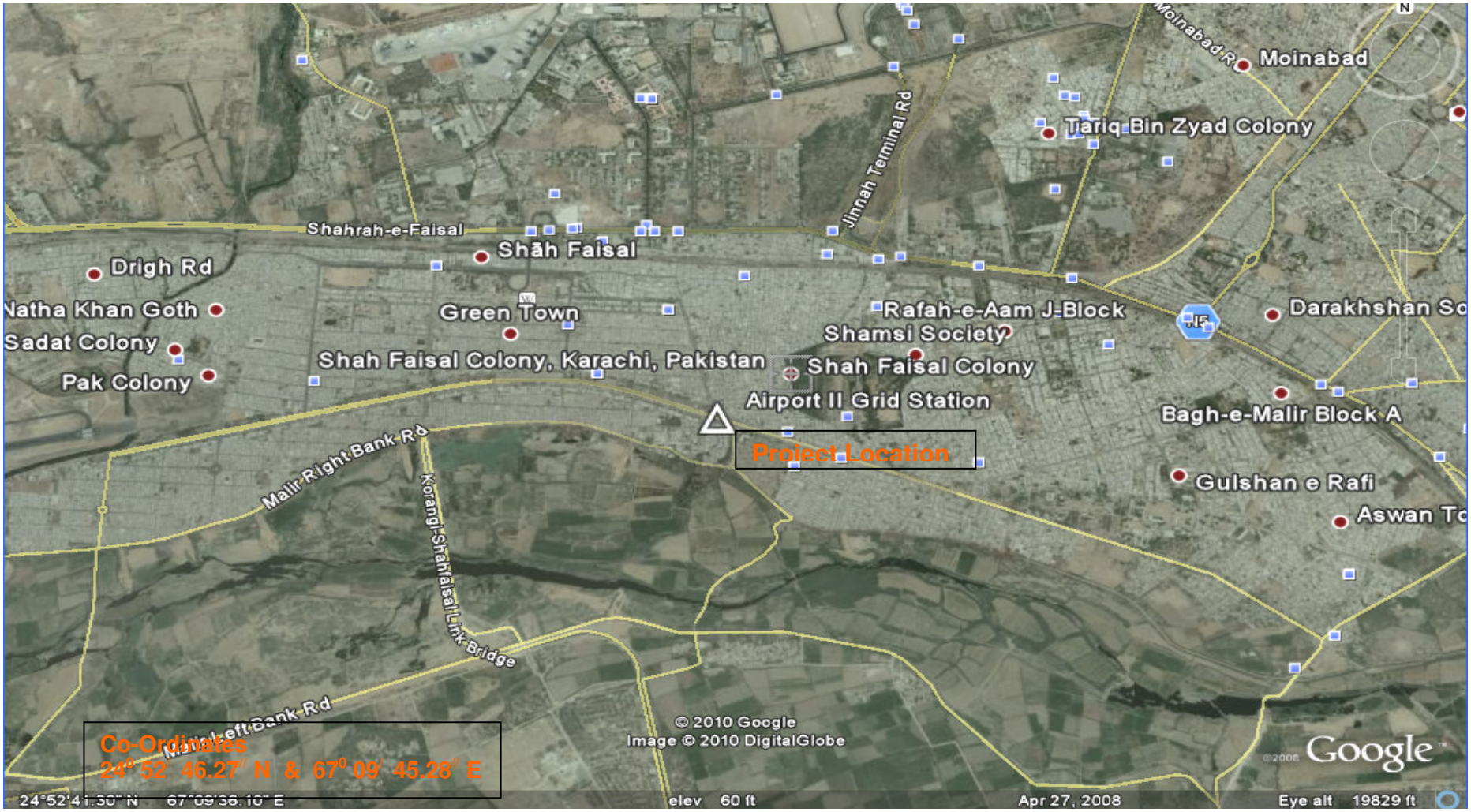
KESC is principally engaged in generation, transmission and distribution of electric energy to industrial, commercial, agricultural and residential consumers. The licensed area of KESC is spread over 6000 Km^2 including entire Karachi and its suburbs up to Dhabeji and Gharo in Sindh and over Hub, Uthal and Bela in Baluchistan.

1.2. Project Location

The project comprises of the Hybrid grid station at Shah Faisal Colony (Airport II) and Overhead transmission line, starts from the Korangi East near Murtaza round about and passes over the Malir River to Shah Faisal Colony, Airport II. Figure 1.1 & 1.2 shows the location of the proposed grid station and its vicinity.

Figure 1.1 Project Location

Figure 1.2 Location of the proposed Gird Station and its adjoining vicinities.



1.3. Objective of EIA Study

The EIA study of proposed project is being prepared with a number of following specific objectives:

Collection of baseline information/data for assessment of impacts;

Collation of information collected during previous investigations into a comprehensive environmental document;

Assessment and evaluation of the actual and potential environmental impact of the proposed development; and Development of Environmental Management Plan to identify the mitigation strategies targeted towards avoidance, minimization and rehabilitation of impacts.

The basic guiding principles of the Environmental Impact Assessment have been:

To inform decision makers and result in appropriate levels of environmental protection and community well being;

To apply the 'best practicable environmental option' and 'best available techniques not entailing excessive cost' methodologies to minimize the environmental impact of the plant;

To provide information and outputs those assists with problem solving and are acceptable to and able to be implemented by the KESC;

To focus on significant environmental effects and key issues;

To ensure that the EIA Team has involved appropriate techniques and experts from the relevant disciplines and to ensure that this team has had the chance to interact on the interrelationships between the bio-physical, social and economic issues;

To provide, as far as is possible, an objective, rigorous and balanced assessment of the issues.

1.4. Methodology of EIA Study

The Environmental Impact Assessment of proposed project has been performed in following phases:

1.4.1 Scoping

In scoping exercise of EIA, Sectoral guidelines and checklists of likely impacts and mitigation measures contained in Sectoral guidelines, proponents and reviewer of EIA project are considered against adopting a mechanistic approach.

Scoping is a vital early step, which identifies the issues that likely to be important during the environmental assessment, and eliminates those that are not. In this way, time and money are not wasted on unnecessary investigations. Scoping is a process of interaction between the interested public, government agencies and the proponent. Scoping refers to the process of identifying, as early as possible:

The appropriate boundaries of the environmental assessment;

The important issues and concerns;

The information necessary for decision-making; and

The significant impacts and factors to be considered.

In scoping phase, SGS Pakistan has compiled a generic description of the proposed activities relevant to environmental assessment with the help of the proponent. Information on relevant legislation, regulations, guidelines, and standards were reviewed and compiled. Furthermore, potential environmental issues were identified.

1.4.2. Baseline Data Collection

The change caused by a particular environmental impact can be evaluated by comparing the expected future state of environmental components with the predicted state of those components if the project does proceed. Therefore, one of the first tasks involved in the detailed analysis of an impact is the collection of information that will help to describe the baseline situation at the expected time of implementation. Specialized knowledge is usually required to specify, and set appropriate limits on, the data collection required to meet the needs of any analysis and ongoing monitoring programs that may be established.

Environmental and Socio-economic experts were used by SGS for collecting the considerable amount of baseline information on the project area. Available literature and other studies already conducted close to the project area were also used for baseline formation. In field visits, SGS Experts verified this information and collected some other information about the socio-economic status of region, flora and fauna, ground water quality, ambient air and other environmental issues.

1.4.3. Impact Identification and Evaluation

The environmental, socio-economic, and project information collected was used to assess the potential impacts of the proposed activities. The issues studied include the potential project impacts on:

Ambient air quality and ambient noise levels

Soil and Ground water qualities

The ecology of the area, including the flora and fauna

People living in immediate neighboring

Wherever possible and applicable, the discussion covers the following aspects:

The present baseline condition;

The potential change in environmental parameters likely to be effected by project related activities;

The identification of potential impacts;

The evaluation of the likelihood and significance of potential impacts;

The defining of mitigation measures to reduce impacts to as low as practicable;

The monitoring of environmental impacts including residual impacts.

1.4.4. Impacts Mitigation

One of the main tasks of impact assessment is to predict and prevent unacceptable adverse affects through the implementation of appropriate project modifications also known as mitigation measures. The purpose of mitigation in the environmental assessment process is to:

Look for better ways of doing things so that the negative impacts of the proposal are eliminated or minimized, and the benefits are enhanced; and make sure that the public or individuals do not bear costs which are greater than the benefits which accrue to them.

In evaluation of mitigation measures for proposed project, close consultation with KESC was carried out to ensure that any significant adverse or potentially adverse impacts identified in the project. SGS Pakistan has considered the best available techniques and practicable environmental options in the EIA Report. Moreover, all identified measures were discussed with KESC Management to ensure that their implementation is technically and economically feasible.

1.4.5 Environmental Management Plan

An environmental management plan is a document designed to ensure that the commitments in the Environmental report, subsequent review reports, and environmental approval conditions are fully implemented. It is the technically comprehensive document, which is usually finalized during, or following detailed design of the proposal, after environmental approval of the development application.

For proposed project, separate Environmental management plan for smooth and effective implementation has developed and included in EIA report by SGS Pakistan. The scope of environmental management and monitoring included in plan is in accordance with national regulatory requirement and severity of impacts.

1.4.6 Documentation

This report documents the environmental impact assessment process and results are prepared according to the relevant guidelines set by the Pakistan Environmental Protection Agency and other international guidelines.

1.5. Limitations

The EIA document has been prepared by drawing inferences from site visits, primary data and secondary information. The study has been conducted by the consultants in a manner consistent with the level of care and skill ordinarily exercised by members or environmental engineering and consulting profession.

The conclusion in this study are based on the primary and secondary data, results derived from earlier studies, and a subjective evaluation of the possible environmental aspects that may influence the existing environmental status of the site during construction and operations of the proposed project. Opinions relating to the specific conditions are based upon information that existed at the conclusions were formulated.

The mitigation measures and other recommendations put forth in this report are of the level of conceptual design and implementation framework.

1.6. Structure of Report

This report has been structured in the following manner:

Chapter-1 of this report provides the background information, location and proponent of project. Afterwards, it provides the EIA objective and methodology and consultant details.

Chapter-2 describes the proposed project, project need, layout plan and associated activities, raw material details and utilities requirement.

Chapter-3 gives an overview of Policy and Legislation along with International Guidelines relevant to electricity grid station and transmission line.

Chapter-4 provides a description of the micro-environment and macro-environment of the proposed project site. This chapter describes the Physical, Ecological and Human resources and Economic Development, Land Use Planning etc. It also includes the quality of life including socio-economic, aesthetic and cultural values.

Chapter-5 describes the potential environmental and social impacts of proposed project on the different features of the micro and macro-environment, and by using the checklist method, presents the potential environmental impacts at the designing, construction and operation stages. This chapter also presents mitigation measures for different anticipated impacts.

Chapter-6 presents the Environmental Management Plan.

Chapter-7 summarizes the Report and presents its conclusions.

The last section is followed by the references and series of Annexure that provide supporting information.

1.7. Point of Contract

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1.8. EIA Consultant

The EIA study was carried out by team of SGS Pakistan (Pvt.) Ltd. comprising of Environmentalist, Sociologist, Environmental Chemist and Environmental Auditors with diversified experience on local and international assignments.

2. Project Description

This Section includes the description of the proposed project with a clear explanation of project status and construction and commissioning schedule. The cost of proposed project, its need and scope are also mentioned in this part of report.

2.1. Project Status and Construction Schedule

The proposed project has planned to commission in 04-06 months from the start date of project and after getting permission from the Sindh Environmental Protection Agency (SEPA). The land has been procured for the Hybrid grid station in Shah Faisal Colony (Airport II) and Overhead transmission route has been finalized in consultation with relevant departments/agencies

At this point of EIA Study, proposed project is on planning and construction mobilization stage, work schedule for project development is tentative and will be updated during detailed planning and implementation phases of project.

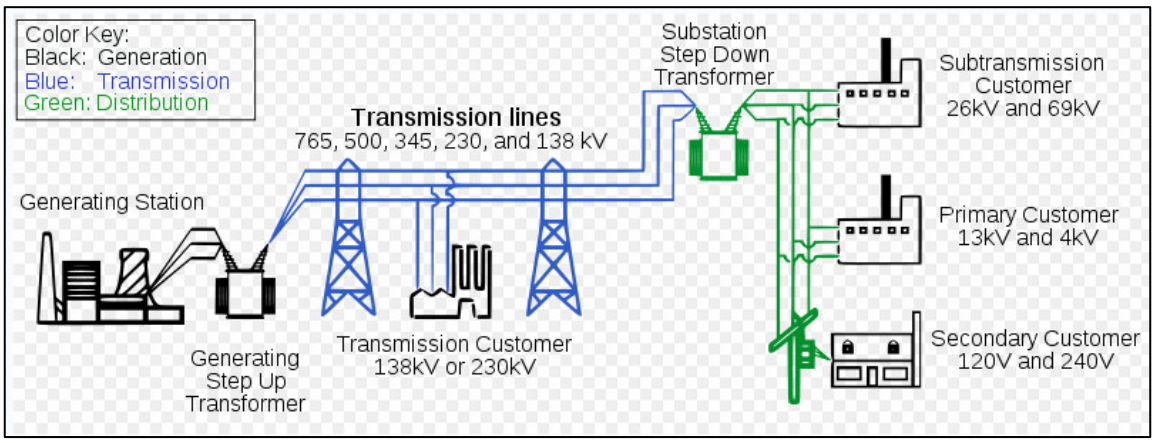
2.2. Capital Cost

The proposed Overhead transmission line and Hybrid grid station are being developed in eastern and southern parts of Karachi city with a total capital investment of approximate Rs. 144,040,621.857. This will include the installation and operation of project, associated amenities and budgetary cost for utilities, civil work and equipment/machinery purchase.

2.3. Project Need

Karachi has a wide network of power transmission but the standards and conditions of the power transmission system are inadequate to meet rapidly growing demand of electrical power. This situation limits the national development and economic growth. To cope with the constraints, the existing power transmission infrastructure has proposed to be improved and upgraded in proposed System Stabilization, Rehabilitation and Loss Reduction Programme. This program will enhance the customer service, improve power supply reliability, and strengthen health, safety and environmental management system. The power generation and transmission system is shown Figure 2.1.

Table 2.1: Power Generation and Transmission Overview



2.4. Project Description

The proposed project is for the support of power transmission and distribution network of KESC in Karachi city. The detail of these projects are given in following sections..

2.4.1. Hybrid Grid Station

A Grid station is an important element of the electricity transmission and distribution system. Its function is to transform voltages from high to low or the reverse, using transformers and other heavy-duty electrical switchgear. In Grid station, the electrical feed to the different destinations is fed into common distribution conductors called busbars. From these busbars, electricity is then fed into dedicated transmission lines running to specific geographic areas where the power is needed. Transmission requirements and lines routes initially determine the general location of a Grid station. Hybrid Grid Station is a mix of GIS (Gas Insulated Switch Gear) and AIS (Air Insulated Switchgear) technologies. It consists of bays where some are of AIS components only and some are mix of AIS and GIS technology, or where some are of GIS components only. Alternatively, and more commonly, elements of AIS and GIS technology are typically mixed in the same bay of equipment and this mixture is a hybrid of the two technologies and is applied across the complete grid station. Under the system stabilization, rehabilitation and loss reduction Programme, KESC has proposed to install hybrid grid station in different parts of Karachi. Which are once completed, would be considered one of the latest and state of the art Grid stations. These pre-fabricated stations would require very small space, while commissioning and installation of compact machinery would be time efficient. The detail layout plan of this Grid station is given in Figure 2.2.

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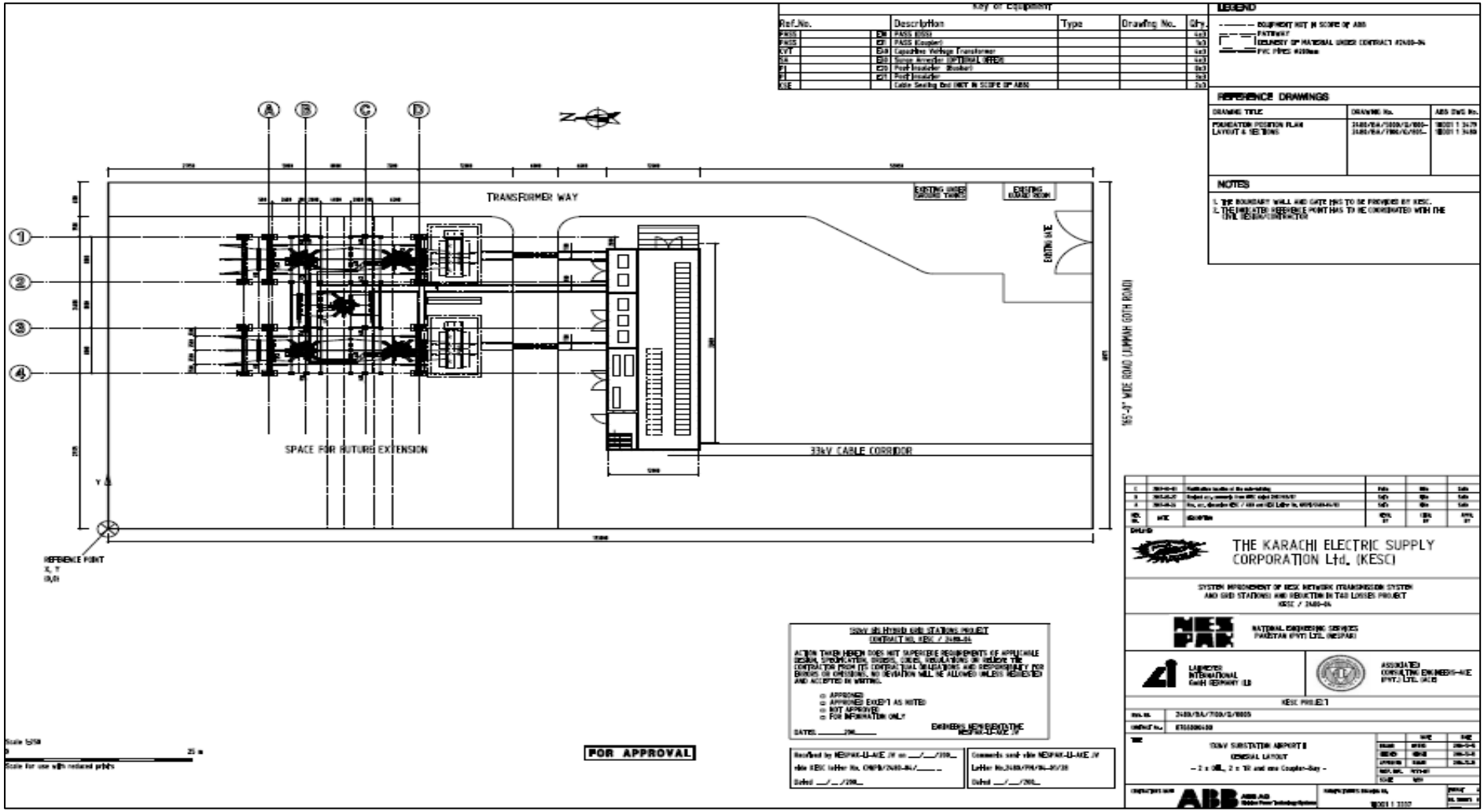
Figure 2.2: Layout of the Proposed Grid Station



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2.4.2. Accessories of Grid Station

In Grid station, switches, protection and control equipment and circuit breakers are installed. Circuit breakers interrupt any short circuits or overload currents that may occur on the network. In Grid station, line termination structures, high voltage switchgear, low voltage switchgear and surge protection controls and metering are also installed.

By using Grid station, it is possible to de-energize a transmission line or other electrical switchgear for maintenance or for new construction or installation. In this way it is possible to maintain the reliability of supply during maintenance work or during the development of any fault in transmission lines or in the associated switchgear. The brief detail of some main components of Grid station is as under:

Transformers

It uses for step down the voltage. The winding of transformer is immersed in oil. It's a highly refined mineral oil that is stable at high temperatures and has excellent electrical insulating properties. Its functions are to insulate, suppress corona and arcing, and to serve as a coolant also as it provides part of the electrical insulation between the internal live parts. It must remain stable at high temperature over an extended period.

Formerly, Polychlorinated Biphenyl was used as it was not a fire hazard in power transformers and it was highly stable. However PCB by-products are unstable and toxic and also accumulate in the environment. Therefore, PCB is not permitted to use these day, and will also not be used in transformer of proposed Grid stations.

Busbars

After passing switching components, the lines in the Grid Station tie into a common bus. This consists of a number of heavy metal busbars, usually made of aluminium. In most cases there are three parallel busbars; since electrical power is distributed via three-phase sub-stations that require additional reliability often has a double bus or even a double ring of busbars, in which the bus system is actually duplicated. Each feeder as well as each outgoing line has a connection to each separate busbar. This is a safety measure that is required mainly for reliability so that in the case of a failure it would not cause a large part of the system to be brought down.

Buildings

Once grid station gets operational, it will not man on a 24 hours basis. Therefore, there will be no extensive buildings and services facilities are needed. The main facilities will be provided include a small office, storage space, and a control room to house the high voltage monitoring and control instrumentation and equipment.

Construction of Grid Station

The first construction activity for gird station would be to clear the vegetation from the site and level off the ground surface for those areas where the heavy electrical transformers and other switchgear will stand. After this next activity would be concrete and building construction for foundations for the supporting steelworks, transformers and other switchgear, storm water drainage pipes, slabs, bund walls, the control room, building and storage areas. All open areas between the transformer plinths and other switchgear foundations will be covered with crushed stone. Before laying the crushed zone the ground surface will treat to strict specification with insecticide and herbicide to prevent insect activity and the growth of weeds and other plants in the high voltage yard. The steel work will then be erected. The transformers, circuit breakers and other high voltage equipment will be delivered to site, erected and then commissioned.

2.4.3. Overhead Electric Transmission Lines

An overhead power line is an electric power transmission line suspended by towers or poles. Since most of the insulation is provided by air, overhead power line is generally used in scarcely populated area. The right of way of proposed 132 KV Over head transmission line will start from Korangi east and end at Shah Faisal Colony (Airport II). There will be 13 towers between Korangi East and Air Port II Grid Station. The total distance between two towers will be 250 m. Overhead transmission line was selected for installation because the area is scarcely populated with vegetative cover. Today Overhead lines are routinely operated at voltages exceeding 765,000 volts between conductors, with even higher voltages possible in some cases. Overhead power transmission lines are classified in the electrical power industry by the range of voltages:

Low voltage – less than 1000 volts, used for connection between a residential or small commercial customer and the utility.

Medium Voltage (Distribution) – between 1000 volts (1 kV) and to about 33 kV, used for distribution in urban and rural areas.

High Voltage (Sub transmission if 33-115kV and transmission if 115kV+) – between 33 kV and about 230 kV, used for sub-transmission and transmission of bulk quantities of electric power and connection to very large consumers.

Extra High Voltage (Transmission) – over 230 kV, up to about 800 kV, used for long distance, very high power transmission.

Ultra High Voltage – higher than 800 kV.

Lines classified as "low voltage" are quite hazardous. Direct contact with (touching) energized conductors still present a risk of electrocution. A major goal of overhead power line design is to maintain adequate clearance between energized conductors and the ground so as to prevent dangerous contact with the line. This is extremely dependent on the voltage the line is running at.

2.5. Resource Requirement during Construction

2.5.1. Water

Water will be required for probable used in the foundations construction for the Grid stations. The water will be sourced from the Karachi Water and Sewerage Board (KWSB), Tanker water will also be used on a site.

2.5.2. Solid Waste Disposal

Solid waste will be collected from the different parts of construction site and will be stored temporarily on-site until dispose off permanently in an appropriately permitted landfill site.

2.5.3. Electricity

Either KESC will provide the electricity during construction phase of Grid stations or diesel power generators will be utilized for the provision of electricity. For operation phase, electricity will be supplied by KESC power distribution system.

2.5.4. Work Force

There will be 80-100 people employed during different activities of construction phase of overhead transmission lines and Grid stations. Most of the workers will be recruited from the local areas, whereas, for operational phase the already KESC employed people will be utilized.

2.6. Project Alternatives

Location of Grid station and technology for electricity transmission, such as Overhead transmission line will be used in proposed project, were selected according to the power

requirement of the Karachi city. This project was designed to provide the consistent electricity supply at various areas of the city. Location evaluation was carried out by KESC within the city, rationale was to lie the transmission network in such a manner that energy is distributed evenly and efficiently in different regions of the city. Karachi is divided into eighteen towns and the location was evaluated according to the requirements of the city and available land. The present site was considered as most suitable option for Grid station and the Overhead transmission route due to availability of land, improving the transmission and distribution system between Korangi and Shah Faisal Colonies and minimizing the losses during electricity distribution. .

Similarly, technology options were also evaluated for the proposed project, and most widely used technology of Grid station was considered i.e. Hybrid grid station over GIS and AIS technology for installation. This technology has been designed to cover lesser area and have minimal environmental and health impacts.

3. Policy, Legal and Administrative Framework

The concept of sustainable development that emerged in the past few decades aims at developing a new framework for economic and social development, while maintaining the environmental and ecological integrity for the present as well as future generations. The concepts of sustainable development are included in the environmental laws for the betterment of environment. This section provides an overview of the policy framework and national legislation that applies to the proposed project. The project is likely to comply with all national legislation relating to environment in Pakistan, and to obtain all the regulatory clearances required.

3.1. National Policy and Administrative Framework

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

Two organizations, the Pakistan Environmental Protection Council (PEPC) and the Pakistan Environmental Protection Agency (Pak-EPA), are primarily responsible for administering the provisions of the Pakistan Environmental Protection Act, promulgated by the Government of Pakistan in 1997. The PEPC oversees the functioning of the Pak-EPA. Its members include representatives of the government, industry, non-governmental organizations, and the private sector. The Pak-EPA is required to ensure compliance with the NEQS and establish monitoring and evaluation systems. As the primary implementing agency in the hierarchy, it is responsible for identifying the need for, as well as initiating legislation whenever necessary. The Pak-EPA is also authorized to delegate powers to its provincial counterparts, the provincial EPAs (environmental protection agencies). One of the functions delegated by the Pak-EPA to provincial EPAs is the review and approval of environmental assessment reports of projects undertaken in their respective jurisdictions.

3.2. Pakistan Environmental Protection ACT, 1997

The Pakistan Environmental Protection Act, 1997 empowers the Pak-EPA to:

Delegate powers, including those of environmental assessment, to the provincial EPAs;

Identify categories of projects to which the IEE/EIA provision will apply;

Develop guidelines for conducting initial environmental examinations (IEE) and Environmental Impact Assessment and procedures for the submission, review and approval of the same;

Develop environmental emission standards for parameters such as air, water and noise;

Enforce the provisions of the Act through environmental protection orders and environmental tribunals headed by magistrates with wide-ranging powers, including the right to fine violators of the Act.

Under the provisions of the 1997 Act, the Pak-EPA has empowered four provincial EPAs to manage the environmental concerns of their respective provinces. The provincial EPAs can frame environmental regulations tailored to the requirements of their province, provided these regulations meet or exceed the minimum standards set by the Pak-EPA. They are also required to review and approve IEE/EIA of all development projects undertaken in their respective provinces, including those projects implemented by federal agencies.

3.3. Regulations for Environmental Assessment

Under Section 12 (and subsequent amendment) of the 1997 Act, a project falling under any category specified in Schedule I (SRO 339 (I0/2000), requires the proponent to file an IEE with the federal agency concerned (the Pak-EPA). Projects falling under any category specified in Schedule II require the proponent to file an EIA with the federal agency. Within ten working days of the IEE or EIA having been deposited, the federal agency will confirm that the document submitted is completed for the purpose of review. During this time, should the federal agency require the proponent to submit any additional information, it will return the IEE or EIA to the proponent for revision, clearly listing those aspects that need further discussion. Subsequently, the federal agency shall make every effort to complete an IEE review within 45 days and an EIA review within 90 days of filing.

Recognizing that the Pak-EPA has delegated powers to the provincial EPAs to enforce the provisions of the 1997 Act, an IEE must be submitted to the following agencies for the sections of the highway falling in their respective domains:

The Sindh Environmental Protection Agency

The Punjab Environmental Protection Department (EPD)

The Pakistan Environmental Protection Agency (for federal capital territory).

At the time of application, the project proponent is also required to pay a specified fee to the EPAs concerned.

3.4. Guidelines for Environmental Assessment

The Pak-EPA has published a set of environmental guidelines for conducting environmental assessments and the environmental management of different types of development projects. The guidelines that are relevant to the proposed project are listed below, followed by comments on their relevance to the proposed projectThe guidelines on the preparation and review of environmental reports target the project proponents, and specify;

The nature of the information to be included in environmental reports;

The minimum qualifications of the IEE/EIA conductors appointed;

The need to incorporate suitable mitigation measures at every stage of project implementation;

The need to specify monitoring procedures.

The terms of reference for the reports are to be prepared by the project proponents themselves. The report must contain baseline data on the project area, a detailed assessment thereof, and mitigation measures.

Guidelines for Public Consultation, Pakistan Environmental Protection Agency, May 1997;

These guidelines deal with possible approaches to public consultation and techniques for designing an effective program of consultation that reaches out to all major stakeholders and ensures that their concerns are incorporated in any impact assessment study;

Sectoral Guidelines: Pakistan Environmental Assessment Procedures, Pakistan Environmental Protection Agency, October 1997;

The guidelines for 'major roads' are structured to assist in identifying key environmental issues related to road development projects, as well as the various mitigation measures and alternatives that should be considered and applied accordingly. These guidelines are aimed at intermediate-

level projects where the impact is likely to be more significant, as opposed to minor works such as the maintenance, repair, and improvement of existing roads.

3.5. National Environmental Quality Standards, 2000

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

Maximum allowable concentration of pollutants (32 parameters) in municipal and liquid industrial effluents discharged into inland waters, sewage treatment facilities, and the sea (three separate sets of numbers);

Maximum allowable concentration of pollutants (16 parameters) in gaseous emissions from industrial sources;

Maximum allowable concentration of pollutants (two parameters) in gaseous emissions from vehicle exhaust and noise emission from vehicles;

Maximum allowable noise levels from vehicles.

These standards also apply to the gaseous emissions and liquid effluents generated by batching plants, campsites and construction machinery. The standards for vehicles will apply during the construction as well as operation phase of the project. Standards for air quality have not been prescribed as yet.

3.6. National Resettlement Policy and Ordinance

There is no such kind of land acquisition or resettlement of Project affected persons. Therefore, no further details have been discussed. The provisions of the Draft Resettlement Policy are consistent with the requirements of the World Bank's OP 4.12 on involuntary resettlement. After becoming law, these provisions will apply when addressing the resettlement issues that arise in the project.

3.7. Interaction with other Agencies

The client is responsible for ensuring that the project complies with the laws and regulations controlling the environmental concerns. This section describes the nature of the relationship between the client and line departments concerned.

3.7.1. Federal and Provincial EPAs

The client will be responsible for providing the complete environmental documentation required by the Pak-EPA, and Punjab EPA and remain committed to the approved project design. No deviation is permitted during project implementation without the prior and explicit permission of the EPAs concerned.

3.7.2 Provincial Revenue Departments

Under the national law, matters relating to land use and ownership are provincial subjects, and the revenue department of the province concerned is empowered to carry out the acquisition of private land or built-up property for public purposes, including on behalf of another provincial or federal agency. For this purpose, the lead department must lodge an application with the provincial government concerned to depute a land acquisition collector (LAC) and other revenue staff who will be responsible for handling matters related to acquisition and the disbursement of compensation.

The client will provide logistic support and assist in preparing the documents necessary for notification. It will also need to liaise with the provincial departments of agriculture, horticulture, and forestry in order to evaluate affected vegetation resources, such as trees and crops, etc., for compensation purposes.

3.7.3 Provincial Governments

The client must ensure that the project meets the criteria of the Punjab provincial government as related to the safe disposal of wastewater, solid waste, and toxic materials. The client will coordinate and monitor environment-related issues.

3.7.4 Local Government and Municipalities

The client will work with local government/administration and municipalities on the resettlement of squatters and removal of encroachments or sources of congestion. In specific cases, the Client will frame an agreement with the municipality, local government, or other service provider concerned on the resettlement of displaced squatters.

3.8. Other Environment-Related Statutes

This section outlines statutes apart from the Pakistan Environmental Protection Act, 1997, which are relevant to the project.

3.8.1 Antiquities Act, 1975

The Antiquities Act relates to the protection, preservation and conservation of archaeological/historical sites and monuments. It prohibits construction (or any other damaging) activity within 200 m of such sites unless prior permission is obtained from the Federal Department of Archaeology and Museums. The Antiquities Act also binds the project proponent to notify the department should anything of archaeological value be excavated during project construction.

3.8.2 Provincial Local Government Ordinances, 2001

These ordinances, issued following the devolution process, establish regulations for land use, the conservation of natural vegetation, air, water, and land pollution, the disposal of solid waste and wastewater effluents, as well as matters related to public health and safety.

3.8.3 Motor Vehicles Ordinance, 1965, and Rules, 1969

The Motor Vehicles Ordinance, 1965, was extended in 1978, to the whole of Pakistan. The ordinance deals with the powers of motor vehicle licensing authorities and empowers the Road Transport Corporation to regulate traffic rules, vehicle speed and weight limits, and vehicle use; to erect traffic signs; and to identify the specific duties of drivers in the case of accidents. It also describes the powers of police officers to check and penalize traffic offenders at the provincial level. At the same time, the ordinance also empowers the Regional Transport Authority to operate as a quasi-judicial body at the district level to monitor road transport, licensing requirements, and compensations for death or injury to passengers on public carriers

3.8.4 Factories Act, 1934

The clauses relevant to the project are those that concern the health, safety and welfare of workers, disposal of solid waste and effluent, and damage to private and public property. The Factories Act also provides regulations for handling and disposing of toxic and hazardous materials. Given that construction activity is classified as 'industry', these regulations will be applicable to the project contractors

3.8.5 Pakistan Penal Code, 1860

The Pakistan Penal Code deals with offences where public or private property and/or human lives are affected due to the intentional or accidental misconduct of an individual or body of people. In the context of environment, the Penal Code empowers the local authorities to control noise, noxious emissions and disposal of effluents. The NEQS enforced by the EPAs supersede the

application of this legislation on industries and municipalities. The Penal Code, however, can provide a basis for the client to coordinate its activities with the local authorities to ensure that its construction activities do not become a cause of public nuisance or inconvenience.

3.8.6 Explosives Act, 1884

Under the Explosives Act, the project contractors are bound by regulations on handling, transportation and using explosives during quarrying, blasting, and other purposes.

4. Environmental and Social Baseline

The baseline information is being presented here pertain to the physical, biological and socio-economic environment of the areas where the proposed development would be carried out. Information available from the electronic/printed literature relevant to baseline of the area was collected at the outset and reviewed subsequently. This was followed by surveys conducted by experts to investigate and describe the existing socio-economic status, and physical scenario comprising geographical, geological, ecological and ambient environmental conditions of the area.

4.1. Physical Environment

4.1.1 Land Use

This grid station will be situated in close proximity of Northern bank of River Malir in Shah Faisal Colony. It will cover an area of 96802 yard with operational capacity of 132 KV. The proposed project would be surrounded by residential houses from two sides whereas the third side would be reserved for a Housing Schemes. This grid station would be connected to Korangi East Grid Station through overhead transmission lines passing over Malir river basin covering a distance of about 2.60 Km The 132 KV overhead transmission line would be originating from Korangi Grid Station, situated in Korangi Industrial Area and would be terminating at Airport II grid station, situated in Shah Faisal Colony next to the northern bank of Malir River. The length of Overhead Transmission Line would be about 2.56 Km. Area on the path of the transmission lines is cultivated with patches the residential region. The cultivation land is mainly covered with seasonal vegetables. Coconut orchids, mango trees and other low land vegetative cover are common in the area. The Overhead transmission line will be passing over Malir River, which is highly polluted due to sewerage and industrial waste entering the river at various points.

4.1.2 Geology and Topography

Ridges, plains, and the coastal belt are the dominant topographic features of the project area. Details of topographical features of the area follow:

Ridge and Runnel Upland in Sindh Kohistan: This is an area of rugged topography in the north. It is an offshoot of the Kirthar mountain range and forks away in a southwest direction from the main range at the mountain knot of Gorag at an altitude of 2,126 m, gradually decreasing in height as it approaches the Gadap plain.

Plains and Plateau of Malir-Lyari Interflous: The vast tract of land lying between the Malir and Lyari rivers forms the interflous of the drainage systems of the two rivers. This area has very little natural drainage scars, which indicate it having a rocky base of alternating layers of consolidated sandstone, intervened by silt and clay beds.

Plains and Hills of the Coastal Belt: The southern part of the Malir District follows the coastal strip of the Gharo and Korangi creeks, demarcating the northern boundary of the old Indus delta. The areas, to the south of the east-west baseline of the triangular outline of the Karachi division subsided and were covered by the sea making a shallow basin. In the course of time the deltaic deposits of the Indus River filled this shallow basin and the northern part of the basin, which coincided with a fault line making the coastal edge. The terrain rises gradually northward from the Arabian Sea, culminating in low, flat-topped, parallel hills. Sub-parallel ridges interrupted by wide intervening plains, categorized as marine denudation plains, sand dunes, and marine terraces, are prominent features of this area.

Soil in the project area is alluvial soil that constantly washed out and drifted during monsoon and rainy season; because viable variety of soil released by its tributary rivers is deposited in Malir river basin during torrential precipitation period of time. The freshly transferred alien soil brings new type characteristics in terms of soil texture along with flora variations. The soil of Malir basin is reasonably fertile for almost any type of vegetation with the result that this corridor present lush green landscape not encountered in any part of Karachi. Area with more vegetative cover starts mainly from urban Malir 15 area until its Sea-Outfall at Korangi Creek beside DHA- Marina club.

4.1.3 Seismicity

Pakistan is classified into 15 seismotectonic regions. The proposed project is believed to be located in the Rann-of-Kutch-Karachi fault region, also known as Karachi-Jati Allah Bund fault, passes close to the Eastern Industrial zone of Port Qasim. It has three other segments namely the Jhimpir fault, the Pab fault and the Surjan fault. These are the infra-plate active faults that pose major earthquake hazard in the Indus delta and the estuaries of the passive continental margin.

The orientation of the Rann-of-Kutch fault is roughly east-west oriented, and is 225 km in length. This is the fault zone that is responsible for the production of earthquakes of considerably high magnitude of up to 7.6 M on Richter scale and of IX to X intensity on the Modified Mercali (MM) scale. The Pab fault on the other hand is 135 Km in length and is oriented north-south. On the basis of the established seismic potential of the active faults viz. Rann-of-Kutch and Pab faults over their entire length, together with analyses of historical and instrumental records of the

Pakistan coastal zone, the risk factor for this region is estimated at 7.7 to 8.2 M for the former and 7.2 to 7.8 M for the latter.

4.1.4 Climate

The proposed project is proposed to construct/commission in the Karachi city of Sindh Province. It has typical climate of subtropical coastal zones lying in the monsoon region. The proposed project will be located in city, which has dry, hot and humid conditions, and in general it is moderate, sunny and humid. There is minor seasonal intervention of a mild winter from mid-December to mid-February into a long hot and humid summer extending from April to September. A brief description of physical environment in the region of proposed project location is given below.

4.1.5 Rainfall

The last five years annual rainfall data shows variation between 0 – 250.4 mm, and annual maximum rainfall reported in the area is 465.6 mm during the year of 2007. The rainfall data of Karachi city is summarized in Table 4.1.

Table 4.1: Rainfall Data at Karachi in mm

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual
2004	13.7	0.0	0.0	0.0	0.0	T	3.0	5.6	T	39.3	0.0	4.3	65.9
2005	10.8	12.8	T	0.0	0.0	T	1.3	0.3	54.9	0.0	0.0	17.1	97.2
2006	T	0.0	T	0.0	0.0	0.0	66.2	148.6	21.9	0.0	3.1	61.3	301.1
2007	0.0	13.2	33.4	0.0	0.0	110.2	41.0	250.4	0.0	0.0	0.0	17.4	465.6
2008	8.0	T	1.1	0.0	0.0	0.0	54.0	37.5	T	0.0	0.0	21.0	121.6

Data Source: Pakistan Metrological Department
National Metrological Data Processing Centre
University Road, Karachi

4.1.6 Temperature

At Karachi Airport, Pakistan Meteorological Department (PMD) has monitoring station, which recorded climatic data represents the all parts of Karachi city. The ambient air temperature of this city varies from summer to winter and this change in temperature has a direct influence on the environment of city. The hot weather during summer, deteriorate the air quality and increase the ambient particulate matters due to drying of road payments and open soil. The mean monthly temperature in the area varies from 17.2 to 36.8 ºC and annual average temperature is kept within 27.4 – 32.8ºC. The maximum temperature reaches to 36.8ºC during summer and minimum temperature reaches 17.2ºC during winter. The mean monthly minimum and maximum temperatures of Karachi city for last five years are given in Table 4.2.

Table 4.2: Mean Monthly Temperature (C°)

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual
2004	26.6	29.9	36.2	35.4	36.8	35.6	33.5	32.6	32.8	33.7	30.7	29.4	32.8
2005	24.9	26.2	31.4	35.3	35.4	36.1	33.2	33.2	34.2	35.2	33.1	28.2	32.1
2006	18.9	24.7	25.7	29.4	31.0	32.0	31.1	28.7	30.5	30.4	26.4	20.1	27.4
2007	19.9	23.4	25.5	30.3	31.8	32.5	31.3	30.1	30.6	28.6	26.2	20.0	27.5
2008	17.2	19.0	27.0	29.2	30.6	32.1	30.7	29.4	30.7	29.6	25.0	21.0	26.8

Data Source: Pakistan Metrological Department
National Metrological Data Processing Centre
University Road, Karachi

4.1.7 Humidity

As the city lies near the Arabian Sea, therefore humidity levels usually remain high during entire year. December is the driest month and August is count as most moist month of Karachi climate. The relative humidity in project region varies from 25 to 76 %. The highest humidity in the area

was recorded 76%, which was in the month of August. The humidity data from 2004 to 2008 is summarized in the Table 4.3.

Table 4.3: Mean Monthly Relative Humidity (Mean) at 1200 UTC (%)

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Annu
2004	34	33	26	47	55	62	64	66	59	43	32	25	45.5
2005	29	41	45	37	55	59	65	65	60	37	36	30	46.6
2006	31.0	37.0	38.0	49.0	62.0	59.0	68.0	76.0	61.0	54.0	38.0	40.0	51.1
2007	31.0	44.0	43.0	47.0	57.0	64.0	66.0	72.0	59.0	35.0	41.0	31.0	49.2
2008	28.0	30.0	36.0	48.0	66.0	62.0	63.0	68.0	58.0	48.0	31.0	47.0	48.8

Data Source: Pakistan Metrological Department
National Metrological Data Processing Centre
University Road, Karachi

4.1.8 Winds

Karachi weather is characterized by pleasant weather due to sea breeze, which blows all the year excepts during local disturbances experienced sometimes in winter and summer months. This wind has highest velocities during the summer months, when the direction is southwest to west. In winter, winds are of low force from North to Northeast and seldom there is stormy weather. In summer, South West monsoon prevails with wind force ranging between 0.4 m/s and 9.5 m/s on account of low atmospheric pressure due to disturbances. Heavy storms of severe intensity are rare but strong gusts of winds can take place abruptly due to changes in atmospheric pressure. The data on wind speed, experienced in Karachi region during the years 2004 - 2008 is given in **Table 4.4** while wind directions are shown in **Table 4.5**.

Table 4.4: Mean Monthly Wind Speed at 0000 UTC (Knots)

Year	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Annual
2004	2.1	2.1	2.1	3.9	6	8	8.6	9.5	5.5	2.3	0.4	2.4	4.4
2005	2.1	4	3.7	3.1	4.3	5.5	8.6	7.1	5.1	1.7	0.7	0.8	3.9
2006	1.5	1.6	1.6	4.3	7.2	6.7	6.6	5.9	4.0	3.0	0.9	1.6	3.9
2007	0.8	1.4	2.3	2.3	3.9	3.9	3.5	4.5	4.1	1.1	0.6	1.7	2.5
2008	1.5	2.3	2.3	3.4	7.7	4.9	6.6	6.3	5.2	2.2	1.3	2.1	3.8

Data Source: Pakistan Metrological Department
National Metrological Data Processing Centre
University Road, Karachi

Table 4.5: Mean Monthly Wind Direction at 1200 UTC (Knots)

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
2004	N27E	S46W	S53W	S49W	S52W	S54W	S54W	S62W	S56W	S47W	S45W	N86E
2005	N63E	S51W	S50W	S52W	S63W	S48W	S54W	S49W	S87W	S54W	S52W	N23W
2006	S48W	S62W	S50W	S57W	S64W	S60W	S67W	S78W	S51W	S53W	S49W	N79E
2007	S30W	S62W	S47W	S55W	S58W	S47W	S41W	S55W	S60W	S48W	S46W	N45E
2008	N45E	S47W	S54W	S51W	S52W	S39W	S50W	S52W	S46W	S39W	S38W	N

Data Source: Pakistan Metrological Department
National Metrological Data Processing Centre
University Road, Karachi

4.2. Air Quality

Air of this section is viably clean and is free from air borne contaminants mainly caused by vehicular traffic and nearby Korangi Industrial Zone located at Southern bank of Malir River. Wind speed remains fairly higher due to formation of Malir river channel where northeastern bound see-breeze is dominant. Some ground-extracted water from basin is used for irrigation as well as for drinking purpose.

Mobile air quality station was installed at a location near project site for 24 hours. The ambient air quality was monitored for the priority pollutants such as carbon monoxide (CO), sulphur dioxide (SO_2), nitrogen dioxide (NO_2), and particulate matter (PM10). The monitoring was carried out

using state of the art equipment and USEPA approved methods. All equipments were calibrated prior using to get the accurate data. The world health organization (WHO) standards and draft NEQS for ambient air quality are provided for reference in Table 4.6. The summary of air quality data results at two locations is given in Table 4.7. The results of air quality monitoring indicate that the concentration of CO, NO2, SO2 and PM10 are well within range of the WHO and Pak-EPA Standards while the concentration of PM is higher than range which is expected to be due to the windy weather at time of monitoring.

Table 4.6: Ambient Air Quality Standards

Pollutant	Draft Pak-EPA Standards(NEQS)		WHO Standards	
	Standard	Average Time	Standard	Average Time
CO	5 mg/m³	8 hour	35 ppm	1 hour
NO_2	80 µg/m³	24 hours	106 ppb	1 hour
SOx	120 µg/m³	24 hours	134 ppb	1 hour
PM_{10}	250 µg/m³	24 hours	70 µg/m³	24 hours

Table 4.7: Ambient air Quality of the Project Area

Parameter	Unit	Duration	LDL	Concentration
Nitrogen Dioxide (NO_2)	ppb	24Hours	1.0	3.81
Sulfur Dioxide (SO_2)	ppb	24 Hours	1.0	0.548
Carbon Monoxide (CO)	ppm	24 Hours	0.01	2.082
PM_{10}	mg/Nm^3	24 Hours	2	160.03

4.3. Water Quality

Ground bored water extraction is common in the area for commercial selling .The ground water characteristics of this section is sweet in character because of Malir river proximity. Total of 2 Groundwater and one surface water sample was collected from project corridor.

Ground Water

Analyses of groundwater samples indicate that its PH value is well within limits as defined by WHO in its drinking water guidelines. A copy of WHO standards is given in Table 4.8.

Table 4.8: WHO Drinking Water Guidelines

#	Parametric Tests (mg/L)	WHO
1	Aluminium	0.2
2	Ammonium	1.5
3	Antimony	0.005
4	Arsenic	0.01
5	Barium	0.7
6	Boron	0.3
7	Cadmium	0.003
8	Chloride	250
9	Chromium	0.05
10	Coliforms, total /100ml	0
11	Coliforms,E.Coli/100ml	0
12	Color	15cu
13	Copper	1 - 2
14	Cyanide	0.07
15	Fluoride	1.5
16	Hardness	NS
17	Iron	0.3
18	Lead	0.01
19	Manganese	0.1- 0.5
20	Mercury	0.001
21	Molybdenum	0.07
22	Nickel	0.02
23	Nitrate/Nitrite, total	NS
24	Nitrates(NO_3)-	50
25	Nitrites(NO_2)-	3
26	Odor	NS
27	pH	6.5 - 8.5
28	Phosphorous	NS
29	Phenols	NS
30	Potassium	NS
31	Selenium	0.01
32	Silica Dioxide(SiO_2)	NS
33	Silver	NS
34	Solids, Total dissolved	1000
35	Sodium	200
36	Sulfate	250
37	Turbidity(Non-microbial)	5 NTU
38	Zinc	3.0

Ref: Hach Product Guide, USA, Vol 2003.

NS=No Standards, JTU=Jackson Turbidity Units, NTU=Nephelometric Turbidity Units, CU=Color Units, MPN Coliforms, Total or E.Coli/100ml, Pt-Co = Platinium Cobalt Standards,TON=Threshold Odor Number,*mg/l (milligrams per liter) except where notified.

Major anionic concentration in terms of sulfate and chlorides are exceeding the limit of 250mg/l defined by WHO directives in its drinking water guidelines. Bi-carbonate contents of both samples are fairly higher causing increase of total alkalinity and hardness and increasing the buffering capacity of both the samples. Characteristic determining parameter TDS of both samples is also exceeding the criteria limit as defined by WHO. Among Alkali metals Sodium surpassing the WHO guideline limits of 100mg/l for both samples. Strictly defined toxic metals such as As,Ba,Cd,Cr,Hg,Se,Mn and Ag remained below detection limit of the instrument and as such are not causing any sort of hazard to groundwater ecology. Overall perspective of analyses trait indicates that chemically both the samples are not complying the limits as defined by WHO in its drinking water Guidelines and the water is being used by communities under compulsion. The results of the Ground water analysis are provided in Table 4.9.

Table 4.9: Ground Water Quality of the Project Area

#	Parameters	LDL	WS-1	WS-2
			Near Old Grid Station, Murtaza Crossing	Near Air Port Grid Station, Sikka Factory
1	Temperature	-	32	32
2	pH at 25 °C	-	7.08	7.11
3	Conductivity, Electrical	-	3520	2170
4	Solids, Total Suspended (TSS)	5	7	<5.0
5	Solids, Total dissolved (TDS)	5	2400	1528
6	Turbidity	0.2	2.6	<0.2
7	Total Hardness	0.05	694.99	481.72
8	Alkalinity, Total as CaCO3	5	417.64	560.96
9	Chloride	1	698.45	355.43
10	Sulfate (SO4)	5	333.31	293.81
11	Bicarbonates (HCO3)	5	509.52	684.37
12	Calcium (Ca)	0.02	90	28
13	Magnesium (Mg)	0.02	114	100
14	Potassium (K)	0.2	9	16
15	Sodium (Na)	1	400	319
16	Arsenic	0.005	<0.005	<0.005
17	Barium	0.01	<0.01	<0.01
18	Cadmium	0.002	<0.002	<0.002
19	Chromium	0.02	<0.02	<0.02
20	Copper	0.02	<0.02	<0.02

#	Parameters	LDL	WS-1	WS-2
			Near Old Grid Station, Murtaza Crossing	Near Air Port Grid Station, Sikka Factory
21	Iron	0.02	0.06	0.2
22	Lead	0.01	0.03	<0.01
23	Manganese	0.02	<0.02	<0.02
24	Mercury	0.001	<0.001	<0.001
25	Nickel	0.02	0.03	<0.02
26	Selenium	0.01	<0.01	<0.01
27	Silver	1	<1.0	<1.0
28	Zinc	0.05	<0.05	<0.05

Surface Water

One Sample of surface stream was collected from Malir River. Analyses trait of this sample indicates its most parameters showing acute presence of pollutants in the form of BOD, COD, TSS, NH_3 and TDS. Oxygen demanding substances adds load in the form of BOD and COD at 512 and 1002mg/L respectively. Strictly defined toxic metals such as As, Ba, Cd, Cr, Hg, Se, Mn and Ag remained below detection limit of the instrument and as such are not causing any sort of Hazard to surface water ecology. Other significant pollutants such as Phenolics, Cyanides and Phosphorous were also found in reasonable amount in the surface stream. The results of surface water analysis are provided in Table 4.10.

Table 4.10: Surface Water Quality of the Project Area

#	Parameters	LDL	WS-2
			Malir River, Korangi
1	Temperature	-	-
2	pH	-	10.07
3	Solids, Total Suspended (TSS)	5	44
4	Solids, Total dissolved (TDS)	5	5008
5	Turbidity	0.2	19
6	Biochemical Oxygen Demand (BOD5)	2	512
7	Chemical Oxygen Demand (COD)	5	1002
8	Oil & Grease	1	2
9	Chloride	1	694.32
10	Sulfate (SO4)	5	74.07
11	Ammonia (NH3)	0.2	3.49

#	Parameters	LDL	WS-2 Malir River, Korangi
12	Phenolic Com. (as Phenol)	0.01	0.011
13	Phosphorus	0.05	2.88
14	Cyanide	0.01	<0.01
15	Arsenic	0.005	0.01
16	Barium	0.01	<0.01
17	Cadmium	0.002	<0.002
18	Chromium	0.02	<0.02
19	Copper	0.02	<0.02
20	Iron	0.02	0.2
21	Lead	0.01	0.06
22	Manganese	0.02	<0.02
23	Mercury	0.001	<0.001
24	Nickel	0.02	<0.02
25	Selenium	0.01	<0.01
26	Sulphide	1	<1.0
27	Silver	1	<1.0
28	Zinc	0.05	0.06

4.4. Soil Quality

Total of 3 soil samples were collected from project and its adjoining sites. Three soil samples referred to as SS-1, SS-2 and SS-3 were collected from Project site and its adjoining vicinity. One sample was collected from KESC old grid station in Korangi and second one collected from Cultivated land in the malir river basin and the third one collected from new grid station located in Shah Faisal colony also referred to as Airport II grid station. The results of the soil analysis are provided in Table 4.11.

Analysis pattern of three samples indicates that its PH value is lying well within reasonable limits, and possessing reasonable productive soil character. Major nutrients in the form of Nitrogen, Phosphorous and Potassium were found in reasonable ranges whereas organic matter was found at 0.8, 2.29 and 1.16 % in sample No: SS-1, SS-2 and SS-3 respectively, indicating the soil is reasonably fertile in character. Strictly defined toxic metals remained at reasonably lower limits to cause any type of hazard to soil environment. Iron and Manganese were, however, found at elevated levels because of its large scale distribution on earth crust. Overall perspective of Analyses pattern on three soil samples indicates that the soil is reasonably productive and human

friendly in all of its characteristics and is free from Organo/Inorganic based noxious pollutants. The results of the soil analysis are provided in Table 4.11.

Table 4.11: Soil Quality of the Project Area

#	Parameters	LDL	SS-1	SS-2	SS-3
			Near Hydrant Opposite to KESC Old Grid Station	At Center of Malir River, Agricultural Land	Sikka Factory, Near Airport Grid Station
1	pH at 25 °C	-	8.75	8.5	8.76
2	Moisture	-	2.17	1.78	0.95
3	Electrical Conductivity	-	139.6	369	399
4	Organic Matter	-	0.8	2.29	1.16
5	Total Kjeldahl Nitrogen (TKN)	-	162.2	432.54	297.37
6	Nitrogen Ammonia	0.1	0.59	0.83	0.66
7	Total Phosphorus	0.05	9.6	16	22.4
8	Potassium	0.2	700	2900	3200
9	Chloride (Cl-)	5	227.3	537.27	185.98
10	Sulfate (SO4)	5	223.03	431.46	563.76
11	Nitrate	0.003	0.29	0.58	0.47
12	Nitrite	0.005	0.22	0.47	0.034
13	Oil & Grease	1	20	10	20
14	Barium	0.01	<0.01	<0.01	<0.01
15	Iron	0.02	10600	22200	22800
16	Manganese	0.05	200	385	450
17	Molybdenum	0.5	<0.5	<0.5	<0.5
18	Zinc	1	10	50	30
19	Arsenic	0.005	<0.005	<0.005	<0.005
20	Cadmium	0.003	<0.003	<0.003	<0.003
21	Cobalt	0.03	20	20	10
22	Copper	0.02	20	25	20
23	Chromium	0.02	20	30	20
24	Nickel	0.02	20	35	40
25	Lead	0.01	20	25	40

#	Parameters	LDL	SS-1	SS-2	SS-3
			Near Hydrant Opposite to KESC Old Grid Station	At Center of Malir River, Agricultural Land	Sikka Factory, Near Airport Grid Station
26	Selenium	1	<1.0	<1.0	<1.0
27	Silver	0.1	<0.1	<0.1	<0.1
28	Mercury	0.001	0.56	0.675	0.55

4.5. Noise

The proposed project would be located inside the city where day to day human activities are source of noise generation. The noise levels monitored at the project site are given **Table 4.12**. The WHO standards indicate that the noise levels should not exceed 65 dB during day time and 60 dB during night time in residential area. The results indicate higher noise levels due to human activities in the project area.

Table 4.12: Noise Level at the Project Site

Sr. #	Time	Leq(dB)	Lmax(dB)	Lmin(dB)
1	11:00	60.9	65.2	51.3
2	12:00	60.2	66.6	52.8
3	13:00	61.6	68.1	51.2
4	14:00	62.8	67.9	54.0
5	15:00	59.1	64.3	52.6
6	16:00	59.2	66.5	52.7
7	17:00	58.7	65.2	51.4
8	18:00	59.1	65.4	53.9
9	19:00	58.1	66.9	52.7
10	20:00	58.6	67.5	53.3
11	21:00	57.2	69.7	52.6
12	22:00	58.0	68.1	51.3

4.6. Biological Environment in Karachi City

It is difficult to survive for natural environment under harsh climatic conditions, accentuated by drought, and multiplied by land clearance activities demanded by the forces of urbanization.

Natural areas vegetation is restricted all over the urban area to depression areas where moisture would be available for greater part of the year and longer period of time. The native vegetation is of the desert scrub type comprising a wide variety of bushes and shrubs, including capris aphylia (karir), Acacia nilotica (babul), Acacia Senegal (khor), Salvadora oleoides (khabar) and prosopsis Senegal (kandi), Acacia Arabica (kikar), Tamarix gallica (lai), tamarix aphylla, willo or baban (populus euphratica, Aerua javanica, Maerva arenaria, Abutilou sp, Amaranthus viridis, Cordia gharaf, Rhazya sticta, Karil (capparis aphyila), acacia or siris (acacia lebbek), papal (ficus religiosa) and tamarind (tamarindu indica).

4.6.1 Flora

The biodiversity of vegetation on sandy plains and low hills or urban Karachi is characterized by ephemeral species plus trees and shrubs, including prosopis cineraria, Acacia nilotica, Tamarix aphylla, Lycium shawii, Salvadora oleoides, Zizyphus sp., Calligonum polygonoides and Leptadenia pyrotechnica. Species on calcareous hills in Gulistan-e-Johar, for example include Vernonia cinerascens, Commiphora wightii, Grewia tenax and Euphorbia caducifolia. The shallow slopes with varied soils on recent and subrecent substrates at low altitutes chiefly on plains have the trees Zizyphus nummularia, Salvadora oleoides, and Capparis deciduas, and shrubs Grewia tenax, Seddera latifolia, and Rhazya stricta that are the most commonly found species, together with the grasses Ochthochloa compressa, Cymbopogon jawarancussand Aristida funiculate. With prosopis cineraria, Indigofera oblongifolia and Euphorbia caducifolia, the above combination of species makes up most of the total vegetation coverage of Karachi city district.

The two principal habitat types on the course of Lyari and Malir Rivers to central areas of Karachi city district are arid hills, and low lying sandy areas. Vegetation of the hill slopes and hillsides comprise mainly camelthorn (Prosopis spicigera) wild caper (Capparis Decidua) and large succulents such as Euphorbia caudicifolia. The sandy areas are typically vegetated with a sparse cover of small trees such as Acacia Senegal, Zizyphus nummularia and prosopis cineraria, and shrubs and shrublets such as leptadenia pyrotechnica, Colotropis procera, Rhazya stricta, inula grantioides, Zygophyllum, simplex and Sueda fruticosa.

In the upper sections of Keamari town, Orangi town, North Karachi town, Gadap town, and bin Qasim town the land has been cleared to make room for growing vegetables, for construction of poultry sheds, poultry estate and dairy farms and above all for urban construction.

4.6.2 Fauna

The impoverished as well as degraded environment resulting from non-availability of surface as well as groundwater and discharge of untreated wastewater into Lyari and Malir Rivers irreversibly reduced the biodiversity of the indigenous as well as introduced vegetation and hence it offers very little chance for the survival/growth of fauna in the macro environment of Karachi city district. There are even otherwise, no habitats of large and small animals, birds or reptiles within Karachi city district. Domestic livestock, particularly goats, sheep, and camels are found grazing in the suburban towns.

There are a number of characteristic bird species that have adapted to the agricultural environment in the outskirts and suburban areas of Karachi. These include Indian Roller, Common mynah, pigeon, and house sparrow.

4.7. Protected areas / National Sanctuaries

In Pakistan there are several areas of land, devoted to the preservation of biodiversity through the dedication of national parks and wildlife sanctuaries. However, this kind of areas is not found near the project site.

4.8. Socio-economic Environment

This section describes the socioeconomic environment of Karachi city. The detail of this status is discussed in following sections:

4.8.1 Administrative Setup

According to new devolution plan in 2000, the five districts of Karachi have merged into a new city district, structured as a three-tiered federation, with the two lower tiers composed of 18 towns and 178 union councils. The towns are governed by elected municipal administrations responsible for infrastructure and spatial planning, development facilitation, and municipal services, with some functions being retained by the city district government. The third tier 178 union councils are each composed of thirteen directly elected members including a Nazim and Naib Nazim. The UC Nazim heads the union administration and is responsible for facilitating the CDG to plan and execute municipal services, as well as for informing higher authorities about public concerns and complaints.

4.8.2 Economy Status of Karachi City

Karachi city is the financial hub of Pakistan. According to Federal Board of Revenue 2006-2007 book, tax and customs units in Karachi was responsible for 46.75% of direct taxes, 33.65 % of federal excise tax and 23.38% of domestic sales tax. It also accounts for 75.14% of customs duty and 79% of sales tax on imports.

Karachi produces about 30% of value added in large-scale manufacturing. It has been purported that Karachi's GDP is 25% of the total GDP of Pakistan. According to Coopers study released in 2007, that survey GDP of the top cities in the world, Karachi's GDP is around $ 55 billion, which shows Karachi status as Pakistan's largest economy. Textile, Cement, Steel, Heavy machinery, Chemicals, Food, Banking etc. in Karachi several industrial zones as SITE, Korangi, Northern Bypass, Industrial Zone, Bin Qasim and North Karachi, are major sectors contribute to Karachi's GDP.

Most of Pakistani's public and private banks are headquartered on Karachi, while most major foreign multinational companies operating in Pakistan have their headquarters in Karachi.

4.8.3 Demographic Distribution

The demographic distribution in Karachi has undergone numerous changes over the past few decays. Government and other sources have anticipated that Karachi's current population is about 16-18 million. The current population rate is about 5% per year. It is because of rural-urban internal migration.

Before partition (1947), Karachi had communities of Sindhis, Balochs, Pashtuns,Parsis, Hindus, Christian, Jews, Goans, Armenians, Lebanese and Gujaratis. After independence of Pakistan, a large number of Sindhi Hindus and Sindhi Sikhs left the city for India and were replaced by Muslim refugees also known as Muhajirs. The Muhajirs migrated from different parts of India however the majority of them spoke Urdu language. Currently, Karachi has a cosmopolitan mix of many ethno-linguistic groups from all over Pakistan and refugees from neighboring countries.

According to last census of Pakistan, which was conducted in 1998, the religious breakdown of the city is as follows.

Muslim (96.45%)

Christian (2.42%

Hindu (0.86%)

Ahmadi (0.17%)

And Other (0.10%) Other religious groups include Parsis, Sikhs, Bahai, Jews and Buddhists).

4.8.4 Languages

The most commonly spoken language in Karachi is Urdu, the national language. However Sindhi, Punjabi, Pashto and Balochi are also widely spoken in the city. As per the census of Pakistan 1998, linguistic distribution of the city is:[49] Urdu (48.52%), Punjabi (13.94%), Pashto (11.42%) , Sindhi (7.22%), Balochi (4.34%), Seraiki (2.11%) and Other (12.44%). (Other languages mainly include Gujarati and Memoni with other minor languages like Dari, Brahui, Makrani, Hindko, Khowar, Burushaski, Arabic, Persian and Bengali).

4.8.5 Education

The education in Karachi is divided into five levels: primary (grades one through five); middle (grades six through eight); high (grades nine and ten, leading to the Secondary School Certificate); intermediate (grades eleven and twelve, leading to a Higher Secondary School Certificate); and university programs leading to graduate and advanced degrees. Karachi has both public and private educational institutions from primary to university level. Most educational institutions are gender based from primary to university level. The most famous and prestigious school in Pakistan, Karachi Grammar School is located at Karachi. It is the oldest school in Pakistan and has educated many Pakistani businessman and politicians.

The Narayan Jagannath High School at Karachi was the first government school established in Sindh. It was opened in October 1855. Karachi has well known educational institutes of international standards. Most universities of Karachi are considered to be amongst the premier educational institutions of Pakistan. For 2004-05, the city's literacy rate was estimated at 65.26%, Highest in Pakistan with a GER of 111%[54]. The other well know schools are Little Folks Secondry School, Habib Public school etc.

The University of Karachi, simply referred as KU, is the largest university in Pakistan having one of the largest faculities in the world. Coincidentally it is located beside the NED University, the oldest engineering institute of Pakistan. Karachi is also host to the Institute of Business Administration (IBA), founded in 1955 is the oldest business school outside North America, Alumni of IBA include former Prime Minister Shaukat Aziz. Pakistan Navy Engineering College (PNEC) a part of NUST (National University of Sciences and Technology), offering a wide range of engineering programs including Electrical Engineering and Mechanical Engineering Pakistan

(Pakistan Engineering Council ranking), is also located in Karachi. Karachi is also home of Head Office of Institute of Chartered Accountants of Pakistan, which is the most prestigious institute of country producing Chartered Accountants who are leading the corporate sector of the country. The Institute was established in 1961 and has since produced over 5,000 members. Leading medical schools of Pakistan like The Aga Khan University and Dow University of Health Sciences have their campuses in Karachi.

5. Stakeholder Consultation

The participation of project stakeholders in project planning, design and implementation is now recognized as an integral part of environmental impact assessment universally. The Pakistan Environmental Protection Act 1997 (Section 12(3)) highlights that "every review of an environmental impact assessment shall be carried out with public participation."

United Nations Conference on Environment and Development (UNCED) in 1992 endorsed the process of stakeholder participation and consultation as one of the key documents of the conference—Agenda 21. Agenda 21 is a comprehensive strategy for global action on sustainable development and deals with issues regarding human interaction with the environment. It emphasizes the role of public participation in environmental decision-making for the achievement of sustainable development.

This section of the report outlines the stakeholder consultation approach adopted for this EIA study, identifies the concerned groups of stakeholders, and describes the consultation process carried out as part of this study.

5.1. Objectives of Stakeholder Consultation

The overall objectives of the public consultation process were as follows:

To provide information related to proposed project activities to stakeholders;

To facilitate and maintain dialogue and gain the consent of all stakeholders on carrying out project activities in the area;

To seek participation of all interested parties and identify stakeholder interests and issues;

To create solutions for addressing these concerns and integrating them into project design, operations, and management;

To enhance the project by learning from, and incorporating, the expertise of individuals, professionals, communities and organizations; and

To encourage transparency and inculcate trust among various stakeholders to promote cooperation and partnership with the communities, local leadership, and NGOs.

5.2. Stakeholder Consultation Process

Stakeholder's consultation is a continuous process that does not stop with the submission or approval of the EIA but continues into the project execution stage. Involving communities and all other stakeholders' values and recognizes the stakeholders right to information about the project,

as well as their right to voice their views and concerns. In keeping with this belief, consultations were conducted in the project area not only to satisfy the legal requirements of the EIA process in Pakistan but also to improve and enhance the social and environmental design of the project. Various steps involved in the consultation include following:

5.2.1 Stakeholders Identification

The identification of stakeholders is important for the sustainability of a development project and helps to evaluate and envisage the role of stakeholders. The influence or impact of stakeholders on the project can be elaborated in the form of a matrix and the mitigation measures are proposed accordingly. People, groups or institutions directly effected by the project and can influence the project outcome are stakeholder of the project. The stakeholders that are likely to be influenced by the project activities or would like to participate in the project will include residents of the surrounding areas. The residents of the area surrounding the project site were identified as stakeholders of the project.

5.2.2 Consultation and Findings

Stakeholder consultation is a two-way flow of information and dialogue between the project proponent and stakeholders, specifically aimed at developing ideas that can help shape project design, resolve conflicts at an early stage assist in implementing solutions and monitor ongoing activities. Various techniques are used world wide to carry out the stakeholder's consultation that includes discussions, meetings and field visits. Concerns of the primary stakeholders of the proposed project were solicited and collected in the following manner:

1. A field visit was arranged to contact the communities within 5 Km of the project area with a team of three personnel accompanied with a local person from Airport II Grid Station area..
2. The team was completely aware of the processes and environmental issues related to the proposed project.
3. A brief description of the proposed project was provided verbally to the stakeholders and they were asked to express their concerns regarding the proposed project.
4. Concerns, complaints and suggestions were recorded in the written form.

The concerns of stakeholders are included as Table 5.1 of the report.

Table 5.1: Consultation Findings

S.No	Interview Date	Name	Age	Occupation	Location	Comments
1.	03-Jul-09	Abdul Ghaffar	24	Labor	Malir UC-1, Gulshan-e-Ghazali	Education, health and basic amenities are available in the area. The respondent doesn't know about the project but he feels it's beneficial and will not face any problem from this project.
2.	03-Jul-09	Arif	15	Student	Malir UC-1, Gulshan-e-Ghazali	Education, health and basic amenities are available in the area. The respondent doesn't know about the project but he feels it's beneficial and will not face any problem from this project.
3.	03-Jul-09	Allah Baksh	22	Labor	Malir UC-1, Gulshan-e-Ghazali	Education, health and basic amenities are available in the area. The respondent doesn't know about the project but he feels it's beneficial and will not face any problem from this project.
4.	03-Jul-09	Sajjad	21	Labor	Malir UC-1, Gulshan-e-Ghazali	Education, health and basic amenities are available in the area. The respondent doesn't know about the project but he feels it's beneficial and will not face any problem from this project.
5.	03-Jul-09	Shah Nawaz	18	Labor	Malir UC-1, Gulshan-e-Ghazali	Education, health and basic amenities are available in the area. The respondent doesn't know about the project but he feels it's beneficial and will not face any problem from this project.
6.	03-Jul-09	Hussain	33	Farming	Malir UC-1, Gulshan-e-Ghazali	Education, health and basic amenities are available in the area. The respondent doesn't know about the project but he feels it's beneficial and will not face any problem from this project.
7.	03-Jul-09	Ahmed Ali	26	Farming	Malir UC-1, Gulshan-e-Ghazali	Education, health and basic amenities are available in the area. The respondent doesn't know about the project but he feels it's beneficial and will not face any problem from this project.
8.	03-Jul-09	Muhammad Nadeem	24	Labor	Malir UC-1, Gulshan-e-Ghazali	Education, health and basic amenities are available in the area. The respondent doesn't know about the project but he feels it's beneficial and will not face any problem from this project.

Figure 5.1 : EIA(132 KV Airport II Hybrid Grid Station and Overhead Transmission line to Korangi East Project) Respondents

ABDUL GHAFFAR 	**ARIF** 
ALLAH BAKSH 	**SAJJAD** 
SHAH NAWAZ 	**HUSSAIN** 
AHMAD ALI 	**MUHAMMAD NADEEM** 

6. Impacts Assessment and Mitigation

This section of report identifies the significant potential environmental, socio-economic, and health and safety issues which could arise during the complete life cycle of the proposed Project. The appropriate environmental management measures to handle these issues are also discussed in this report.

There are several methods used for identifying the environmental impacts including the Checklists, Thinking through the stages of the project, Matrices, Networks, Overlays and GIS and Computer Expert Systems. These all methodologies are commonly employed to ensure that all significant impacts are identified. In this report, we will use the Checklist method for impact identification and assessment, which is the most common method. This method is used to visually express the changes in environmental impacts in terms of their:

Nature

Magnitude

Consequence

Significance

6.1. Impacts during Construction Phase

The most probable impacts may be expected due to the construction of Overhead transmission lines and Grid stations are given below along with their subsequent and practicable mitigation measures:

6.1.1 Topography and Land use

The construction site for the proposed grid station is plain consisting of open space with brick kiln next to the site and households of Shah Faisal Colony in the vicinity. The area opposite to the site is left for housing colony by government Department which is presently used for agricultural purpose. The construction of the proposed grid station and overhead transmission line will not involve major change in landscape and topography. The proposed transmission line passage is a scarcely populated area with cultivation land and fruit orchid. The topography of the soil is uneven with high and low plains covered with agricultural fields and wild vegetation at places. The only change in land use during installation of the overhead transmission and towers will be at the position of tower installations where the vegetation will be removed to make it clears for

installation of towers. The impact on topography and land use will be minimal as the existing landscape will be utilized for the proposed project.

Mitigation Measures

The proposed project will make use of existing topography not deforming the landscape of the project area.

The over head transmission lines will be kept at a standard distance from the earth surface to reduce its impacts.

The vegetation cover of the project area will be protected to the extent possible and offsets will be provided at the high-density vegetative area.

Construction workers will be provided instructions not to damage plants unnecessarily near the tower locations and transmission line.

6.1.2 Dust Emission

Construction activities such as soil excavation and removal may result in deterioration of ambient air quality and be a nuisance to anyone exposed to it. After removal of top soil and vegetation cover, soil does tend to have erosion and dispersive potential which is proportional to environmental risk.

Impact Evaluation

During construction of grid station and overhead transmission line, site preparation activities (excavation work, earth works, storage of exposed piles, truck dumping, hauling and vehicle movement) would be carried out which will remove the vegetation cover from the proposed development areas and expose the soil. As the said activities would be limited to construction phase and will be performed according to Environmental Management Plan (EMP) included in this report, therefore there would be insignificant rise in fugitive dust emission and alteration of soil quality from removal of top soil.

The quantity of dust that may generate on a particular day of construction phase will depend on the magnitude and nature of activity and the atmospheric conditions prevailing on that day. Due to the uncertainty in values of these parameters, it is not possible to calculate the quantity from a 'bottom-up' approach, that is, from adding PM_{10} emissions from every activity on each construction site separately.

Mitigation Measures

The following mitigation measures would be implemented in construction areas to control the dust emissions:

1. Water will be sprinkled when there is an obvious dust problem on all exposed surfaces to suppress emission of dust. Frequency of sprinkling will be kept such that the dust remains under control;
2. Dust emission from soil piles and aggregate storage stockpiles will be reduced by appropriate measures. These may include keeping the material wet by sprinkling of water at appropriate frequency, and erecting the windshield walls on three sides of the piles;
3. Vehicular movement will be restricted to a specific time for dumping of supplies and construction material;
4. Workers and drivers should wear dust masks and safety goggles, especially during dry and windy weather conditions to avoid health risk.

6.1.3 Vehicle and Equipment Exhaust Emissions

Exhaust emissions due to combustion process in vehicles and other construction equipments/machines may affect the ambient air quality of the project site and surrounding areas and may be injurious to human health.

Impact Evaluation

The impact of gaseous emission on project workers and other people in vicinity will be small, as construction vehicles and machineries operations will be limited to construction phase and as soon as construction activities would be ended, this impact will minimize. During construction phase, following will be the sources of gaseous emission:

Emission from the exhaust of vehicles

Emission from the construction equipment, power generators and moving plants/equipments.

The pollutants that may generate from the combustion of hydrocarbon may include the CO, CO_2, SOx, NOx and PM_{10}. These pollutants could cause adverse effect to human health if in high concentration and may also cause vegetation damage by clogging the photosynthesis process in plants.

There is no justification to measure the above mentioned gaseous emissions in the absence of information such as engine rating, number of units and operation hours for both continuous and intermittently operating equipment.

Recently Pakistan Environmental Protection Agency has set the draft standards for industrial and vehicular gaseous emission. These standards and current practices for gaseous emissions will be used as criteria of compliance during construction phase of project.

Mitigation Measures

The following mitigation measures will be incorporated to prevent any adverse impact on the ambient air quality:

1. All vehicles, generators and other equipment used during the construction will be properly tuned and maintained in good working condition in order to minimize emission of pollutants;
2. Emissions from the machinery and vehicles will be monitored on regular basis to ensure compliance to NEQS.
3. Occupational health, Safety and Environment policy of KESC will be followed.
4. Masks will be provided to construction workers by the contractors.
5. Standby generators for power supply will be kept away from pathways and will be placed at locations where probabilities of human intervention are limited.
6. The stack height of the generators used, if any, will be at least 3 m above the ground.

6.1.4 Noise

Noise is also one of the aspects which may cause hearing impacts on workers associated with construction activities and communities in immediate vicinity, especially during early morning and night time construction work activities.

Impact Evaluation

It is anticipated during impact evaluation process that activities associated to Overhead transmission line and Hybrid grid station construction will be for short span of time, therefore noise impact would be very small. During construction phase, noise may emit from the following activities.

Material loading/offloading vehicles and other transport used by Contractors

Construction and excavation work such as heavy earth moving equipments, pilling works, welding, cuttings, drilling, grinding etc;

Back-up power generators for supply of electricity;

Use of pressure horn.

According to World Bank guidelines, sound level should not exceed 70 dB (A) in the industrial/commercial areas and 55 dB (A) in the residential areas during day time. Similarly it should not exceed 70 dB (A) and 45dB (A) respectively, during night time. The area for overhead transmission lines is scarcely populated with cultivation land and fruit orchids. The impact of noise will only be due to the construction of grid station as the settlements are nearby the project site for grid station This impact will be moderate because it is not a large construction activity involving widespread area. The mitigations mentioned below will be followed to keep the noise levels within limits.

Mitigation Measures

The following measures will be followed by project management in order to minimize the impact of noise on construction workers and people in close proximity.

1. Manage the specific daytime working hours for movement of earth moving equipment and other machinery for construction;
2. Site labor working in high noise area such as where noise level exceeds 80 dB (A), should wear earplugs.
3. The stationary sources of noise such as concrete mixers, batching plant, power generators and pumps will be selected and segregated from work area;
4. Use of adequate muffler for all exhaust systems will be mandatory;
5. Blowing of horn by the project related vehicles will be strictly prohibited;
6. Occupational health, safety and environmental procedures of KESC and Environmental management plan for proposed project would be followed.

6.1.5 Flora and Fauna

Construction and maintenance activities of overhead transmission line and hybrid grid station may destroy the plants and animals or may alter their habitat so that these activities become unsuitable for them. For example, trees used by rare birds for nesting may be cut down or soil erosion may degrade rivers and wetland that required habitat.

Impact Evaluation

In order to find the impacts of proposed project on flora and fauna, field investigations have been undertaken around the proposed grid station and along the ROW of overhead transmission line, with specific focus on endangered species of ecosystem. The endangered species of ecosystem is not found along the proposed areas of construction, however, some species of flora and fauna of common nature were found.

Construction of proposed project may slightly damage the ecosystem on and around the construction areas of proposed project, however this impact would be moderate as all activities would be limited and strictly carried out on the transmission lines ROW and designated areas of grid station.

Mitigation Measures

The following mitigation measures would be taken in order to minimize the impact on flora and fauna:

1. The route will be marked in such a manner that minimal clearing of the vegetation is required as to reduce the damage on large area;
2. The animals encountered during the construction will not be harmed and will be dragged back to their environment.
3. Birds will not be affected as they will move to adjacent suitable habitats.
4. By using the best practice for vegetation clearing and disposal practices will minimize the environmental risk associated with clearing and disturbance of vegetation communities.
5. Restricting vegetation clearing to only that necessary for safe construction, operation and maintenance of the proposed projects.

6.1.6 Solid Waste

Solid waste may be generated during the construction activities of project. The nature of construction waste could be metal and wooden pieces, pieces of wires, excavated soil, plastic sheets, used oil etc. This waste if not disposed of properly in environmental friendly manner, would cause some nuisance to living environment.

Impact Evaluation

Solid waste during development of proposed project may be generated from the following activities.

Debris, vegetation, excavated soil, scraps metal from the equipment fabrication;

Recyclable waste such as cartons, wooden pieces, copper or aluminum wires pieces, iron pieces etc.;

Waste of domestic nature from the worker activities in construction camps.

Mitigation Measures

The above mentioned waste will be handled through the following mitigation measures:

1. Construction activities generate considerable waste and provision must be made for suitable separation and storage of waste in designated and labeled areas on the camp site and near each construction area;
2. Collection of waste by third party contractors and disposal at the Landfill sites;
3. Any hazardous waste should be separated and stored in areas clearly designated and labeled, and disposal in environmental friendly manner.
4. Workers should be trained on how to dispose of food and drink containers emphasizing the need to protect the areas in vicinity of projects.
5. Construction camps along the ROW of proposed overhead lines and hybrid grid stations must be adequately equipped with portable toilets.

6.1.7 Traffic

The Overhead transmission line will pass through the scarcely populated area not encountering excessive traffic flow. The access to the proposed grid station would also be from the same dirt track and Shah Faisal colony which is populated settlement. The construction material supply vehicles will follow the route of less busy road to avoid any major impact on traffic flow. Therefore, there will be minimal impact on traffic flow at the route of transmission lines.

6.1.8 Water Quality

Clearing of vegetation and the subsequent exposed soil during construction activities have greatest potential risk to water quality.

Impact Evaluation

The proposed Overhead transmission lines construction activities may slightly affect the water quality of Malir River. There will be slight offsite movement of soil during excavation and vegetation removal activities of transmission lines, which will be constructed along the Malir River.

Construction activities of Hybrid grid station will not affect the water quality in the vicinity as these activities will be limited to designated areas of grid station and will not close to Malir River. Malir River is highly polluted with sewerage and industrial waste. The contribution of the pollution by construction of Overhead transmission line will be minor not affecting the water quality significantly.

Mitigation Measures

There will be minimal clearing of riparian verges for the overhead transmission line, and any crossing of drainage lines by machinery/vehicles to access construction areas will be in accordance with proposed EMP to ensure that water quality is not compromised.

1. There will be no excavation or fill placement activities will be carried in any waterway;
2. KESC will use the backfill, resurface and contouring methods for gully erosion, to provide the erosion resistance and reduce overland flow velocity;
3. Different strategies will be utilized to minimize the release of sediment to waters. These strategies shall include but not limited to the construction of diversion banks/drains, where necessary, along the elevated perimeter of the works to prevent uncontaminated storm water from contracting areas of disturbance and installation of temporary sediment fences below areas of earthworks.

6.1.9 Archaeological and Historical Sites

No archaeological and historical sites were found during survey of proposed project, located in their close proximity.

Mitigation Measures

No mitigation is required.

6.1.10 Health and Safety

Construction workers may get injured during construction activities. There may be either minor or major accidents due to different activities of construction phase.

Mitigation Measures

The following measures will be adopted in order to minimize the above impact:

1. A lead person should be identified by the contractor concerned and appointed to be responsible for emergencies occurring on the ROW and grid station construction site. This person should be clearly identified to the construction workers.

2. Make prior arrangements with the health care facilities such as a Health Centre in proximity, a private doctor or Hospital to accommodate any eventualities.
3. Emergency response plan should be prepared by the contractor and implemented during entire phase of construction.

6.1.11Employment

During this phase, an average of approximately 150-200 persons will be employed on contract basis which will put the positive impact on the socio-economical status of Karachi city.

6.2. Impacts during Operational and Maintenance Phase

The most focusable area in the impact assessment process of proposed project is operation and maintenance activities of Overhead transmission line and Hybrid grid station as impacts may generate during these phases may have long term and continuous affects. During scoping exercise, following probable impacts have been evaluated with their appropriate mitigation measures:

6.2.1 Electric and Magnetic Fields

Electromagnetic field (EMF) is the term used to describe electric emanations and the resultant magnetic fields caused by the movement of electrical current. The magnetic fields depend on many parameters like height and tower configuration for over head line and depth and cable arrangement for underground cable.

Generally, the maximum magnetic field under an overhead line and above a buried cable are of the same order of magnitude, the difference being that distance causes it to decrease much more slowly for the overhead line (OHL) than for the buried cable. The field is at its maximum closet to the conductor and the intensity drops away from the conductor. EMF is both a natural phenomena and a consequence of anthropogenic sources (e.g. electrical generation, transmission, distribution and use of electrical equipment). According to some research that EMF can have number of adverse health effects. These include but are not limited to childhood leukemia, Alzheimer's adult leukemia, breast cancer, neurodegenerative diseases, miscarriage and clinical depression.

Impact Evaluation

In Hybrid grid stations, the impact of electric field will be blocked by most of the objects around them such as walls, trees and distance from the living object. The overhead transmission line is installed in scarcely populated area, for areas with high population density underground transmission line is selected. The project area for the line comprise of cultivation land with hardly any population. The effect EMF reduced with distance, the line is installed at a reasonable distance

(according to best practises worldwide) from the earth surface to reduce the impact. The transmission line is also arranged in such a manner that the magnetic fields created cancel out effect of each other and do not reach the ground level, hence, reducing electromagnetic fields.

Mitigation Measures

1. Adopt the principles of careful avoidance to ensure exposure levels are well below of generally accepted standards.
2. Design the transmission line to ensure that electric and magnetic fields are minimised, given the voltage and load requirements.
3. Liaise with nearby residents and undertake EMF monitoring with them.

6.2.2 Gaseous Emission

The main air impacts during the operational phase of any project could be the gaseous emissions from the employee's vehicular exhaust, distant industrial facilities, project's different operations and standby power generators.

Impact Evaluation

The hybrid grid station is generally called no man grid station. There will be no source of atmospheric pollution from the proposed overhead cable and hybrid grid station except emissions from the KESC employee's vehicles and vehicles will be used for project maintenance. These emissions in contrast with the emissions emit by the vehicular traffic on road of Karachi city will be very low. It will also well dissipate in the open atmosphere and there will be no cumulative effect from the project.

Mitigation Measures

1. All vehicles, power generators and other equipment used during the maintenance work will be properly tuned and maintained in good working condition in order to minimize emission of pollutants;
2. Emissions from the machinery and vehicles will be monitored on regular basis to ensure compliance to NEQS.
3. Masks will be provided to maintenance workers.

6.2.3 Noise

Pumps, high speed compressor, fans, back up power generators, transport vehicles and maintenance activities could be the sources of noise emission during operational phase in any project area.

Impact Evaluation

The hybrid grid station do not emit noise levels reaching outside the site boundary. Maintenance activities during operational phase of project could produce noise emissions, however, this impact would be minimum and within the permissible limits of WHO and NEQS, as maintenance activities would be carried out for short period of time.

Mitigation Measures

The recommended measures for reducing the impact of noise are given below:

1. Ensure vehicles and other maintenance equipments comply the NEQS and other international standards for noise and are maintained to meet standards;
2. Compressor should be regularly tested and monitor for any mechanical fault, as mechanically unfit or un-maintained compressors generally cause high noise;
3. Back-up power generators should be maintained regularly as they will use to facilitate the maintenance work of overhead transmission lines.

Solid Waste

The operation and maintenance activities of proposed project may generate solid waste which, if not disposed of properly could have adverse impacts on the environment.

Impact Evaluation

The operational phase of proposed project will generate some waste which if not disposed of properly could have impacts on surrounding. These wastes will include the wires, transformer oil, wild vegetation, excavated soil and domestic waste of maintenance workers.

Mitigation Measures

The mitigation measures for above impact could be:

1. Ensure that all solid waste collected during operational or maintenance work is disposed of in an appropriate disposal site in the locality;

2. Municipal waste should also be collected by third party contractor through carts/dump trucks and then disposed of in landfill site.

6.2.5 Property and Aesthetic Value

Post construction issues such as aesthetics and property values are usually a concern for overhead lines as they pose a viable effect on the landscape thus posing impact on property and aesthetics of the area after construction. The land on which the grid station to be constructed and land surrounded by grid station is a valuable due the presence of residential area close to it. However the area is already disturbed due to presence of brick kiln and human activity. In the case of proposed project, this impact would be moderate as the residing population is impoverished and current land users in Karachi city generally do not rely on the visual and aesthetic environments. However, the passage of the overhead transmission line has a lush green landscape due to presence of cultivation land and fruit orchids, the over head line passing over the area will devalue the property at the passage.

Mitigation Measures

The mitigation measures could be used to reduce the potential visual impacts is following:

1. The construction area must be rehabilitated and re-vegetated immediately after the completion of construction activities. Progressive reinstatement should be applied.
2. To reduce the visual intrusion, the colour selected for roofing and walls must be of a nature, which will help to visually break up the surfaces of the buildings. Matt finishes must be used. Importantly, the roofs of buildings must not reflect or deflect sunlight or artificial light during the day or night by their colour or texture.
3. The removed vegetation should be restored at the passage way to provide a reflective look to the area.

6.2.6 Emergencies and Accidents

Emergencies and accidents with the electrical equipment may occur at the grid station, for example transformer can become overloaded and blow up and switchgear equipment can explode. Each of these kinds of incidents can have knock on effects and can place humans, animals and the natural environment at risk. The risks related to fire, natural disasters, invasion due to political instability, vandalism and oil spillage from the transformer may have devastating impacts.

Mitigation Measures

The proposed mitigation measures for said impact are following:

1. A repair on live grid station is possible as the station is fitted with busbars via which current can be redirected, thereby minimizing interruptions to the transmission network.
2. In the case of an explosion, unless on site within the grid station, the risk of human or animal injury is small. Apart from the security fence, no additional mitigation measures are required.
3. Oil containing equipment in the grid station should be fitted within a bunded oil sump of sufficient size to capture all oil within a particular piece of equipment.
4. The grid station's operational controls will be well maintained to avoid impacts of the natural disaster or fire.
5. The watch guard will be provided training for the emergency response in case of any unusual situation.

6.3. Summary of Impacts during Construction, Operation and Maintenance Phases of Project

According to impacts discussed in previous sections, the proposed project has both positive and negative impacts. Summary of these impacts in terms of their nature, magnitude, consequence and significance are presented in Table 6.1 and Table 6.2.

Table 6.1: Summary of Environmental Impacts during Construction Phase

Impacts	Nature	Magnitude	Consequences	Significance
Dust emission	Negative	On-site and in vicinity	Air quality and health effects	Slight
Vehicle and equipment exhaust emission	Negative	On-site and in vicinity	Air quality and health effects	Slight
Noise	Negative	On-site and in vicinity	Health effects to workers	Slight
Flora and Fauna	Negative	Onsite and in vicinity	Effect on flora and fauna	Slight
Solid Waste	Negative	On-site	Effects on workers and micro-environment	Slight
Traffic	Negative	On-site and close proximity	Road accidents and wastage of fuel	Slight
Water Quality	Negative	Onsite and vicinity	Surface and ground water contamination	Slight
Archaeological and Historical sites	None	None	None	None
Health and Safety	Negative	On-site and in vicinity	Effects on workers and property	Significant
Employment	Positive	Local	Socio-economic benefits	Significant

Table 6.2: Summary of Environmental Impacts during Operational and Maintenance Phase

Impacts	Nature	Magnitude	Consequences	Significance
Electrical and magnetic field	Negative	Onsite and neighborhood	Health problems to workers and people live in neighborhood	Slight
Gaseous Emission	Negative	On-site and in vicinity	Air quality and health effects	Slight
Noise	Negative	On-site and in vicinity	Health effects to workers	Slight
Solid Waste	Negative	On-site	Nuisance to micro-environment and health problems to workers	Slight
Property and Aesthetics Value	Negative	Close vicinity	Impact on property value	Slight
Emergencies and Accidents	Negative	On-site and its vicinity	Damage to health and property	Moderate

7. Environmental Management Plan

This section provides an Environmental Management Plan (EMP) for managing and monitoring the environment related issues and describes the institutional framework for environmental management and resource allocations to be carried out by the Karachi Electric Supply Company Limited for mitigating the negative impacts of the proposed project.

7.1. Objectives of Environmental Management Plan

The Environmental Management Plan will address the upcoming adverse environmental impacts of the proposed project, enhance the project's overall benefits and introduce the standards of good environmental practice. The primary objectives of the EMP are to provide:

A framework to mitigate any potential environmental impacts of the construction, maintenance or operation phase of the Project, through environmentally aware planning and design strategies;

- Define the responsibilities of the Project proponents in accordance with the three phases (construction, operation and maintenance);
- Facilitate the implementation of the mitigation measures by providing the technical details of each Project impact, and proposing an implementation schedule of the proposed mitigation measures;
- Define a monitoring mechanism and identify monitoring parameters to ensure that all proposed mitigation measures are completely and effectively implemented;
- Identify training requirements at various levels and provide a plan for the implementation of training sessions;
- Identify the resources required to implement the EMP and outline corresponding financing arrangements.

7.2. Role of Functionaries for Implementation of EMP

This sub section describes the role of functionaries for the implementation of EMP. In these functionaries, the executing agency of the Project would be KESC. In KESC, the environmental performance is supervised by Top management while the daily management is performed under the direction of GM (Corporate Safety). Under Top management, environmental management during different phases of proposed project would be performed by contractors and KESC project implementation team will monitor the performance of the project contractor. The EMP will be made a part of the construction activities and the contractor will ensure that all activities during construction stage are in compliance with the EMP and NEQS. The brief Organizational structure for Environmental management is given in **Figure 7.1**.

7.3. KESC Top Management

Top management of KESC would perform the following role and responsibilities:

- To react the issues and consider the solutions proposed by the Corporate Safety Department;
- To cooperate and consult with relevant environmental agency in order to perform in better way;
- To evaluate the progress of development and implementation of this management plan;
- To approve any change in decision making and authorities in consultation with GM Corporate Safety, if appropriate.

7.4. GM (Corporate Safety)

In management plan, HSE team role is always considered vital. They make an EMP successful. Hereunder some roles and responsibilities of HSE team are provided:

- To improve the coordination and exchange of information between top management, employees, contractors etc.;
- To identify issues and where possible propose solutions for inclusion in the management plan review process;
- To ensure that the points of views of staff, contractors HSE officers/engineers are considered and placed in the EMP accordingly;
- To review EMP every year, tracking issues and change the EMP accordingly with the solutions and suggestions;
- To contribute towards the actions to deliver the management plan and ensure its continued development;
- To monitor the progress of development and implementation of this management plan.

7.5. HSE Officer/Engineer

HSE officer or engineer always works under the oversight role of corporate safety. The role of this position in any environmental management plan could be following:

- To provide professional guidance on questions relating to the environment management and issues raised by contractors/relevant personals;
- To integrate the aims and objectives of different users within an agreed plan;
- To maintain a balanced, holistic approach to the solution of concerned issues in accordance with the compliance to the legislative requirements;
- To progress the EMP process through development towards implementation.

7.6. Contractor

The contractor is responsible for following points:

- To conduct their activities in accordance with relevant legislative requirements of the country, project EMP and any pertinent licences or agreements;
- To exercise a duty of environmental care and notifying the GM (Corporate Safety) or Project Construction Manager of any environmental incident;
- To nominate a site HSE officer with the authority to ensure that the EMP is implemented with respect to any activity for which they are entirely responsible;
- To inform the project construction manager immediately of any complaints received in relation to the construction activities from Statutory Authorities or other stakeholders and local residents.
- To ensure that all site staff have attended an Environmental induction.

Note: The Contractor is not directly responsible for complaint resolution and should direct any complaints or inquiries from stakeholders (government or stakeholders) to the Project Manager. However, the Contractor shall comply with the reasonable directions of the Project Manager or OHSE Head to resolve any complaints.

7.7. Environmental Impacts Management

The environmental impacts management is a key component of the EMP. It ensures that the project is designed, constructed, implemented and maintained in the manner described in the EIA report. The impacts management for the proposed project activities in AirportII Hybrid Grid Station is presented in **Table 7.1 and Table 7.2.** The contents of these tables would be following:

Impacts: Identified impacts that may occur if not managed appropriately;

Mitigation Measures: Actions that will be implemented to achieve the objective and performance criteria;

Monitoring Frequency: Frequency for monitoring mitigation measures

Responsibility: Responsibility for undertaking control measures.

7.8. Environmental Training

Environmental impacts from the proposed Project would be managed by qualified and experienced personnel. All staff would receive the environmental induction training prior to commencement of work on Grid station. This training program will help in ensuring that the requirements of the EIA and EMP are clearly understood and followed by all project personnel throughout all phases of project. In induction training plan, Pakistan environmental policy/regulations, EMP and other environmental duties will be focussed.

All level of staff, ranging from the top management and supervisory to the skilled/unskilled categories will be covered in this training plan. The construction/commissioning staff will be

provided induction training through their managers. The tentative environmental training program, which will be finalized before the commencement of project is provided in **Table 7.3**.

7.9. Environmental Monitoring

Monitoring of all project activities will be undertaken to determine the impact on the environment as a consequence of construction, operation and maintenance of the proposed project. Therefore, self monitoring techniques will be adopted to carry out the monitoring as per EPA rules and regulations. General monitoring will be conducted weekly throughout the construction stage; inspections will be conducted annually during the operation and maintenance phase.

During monitoring activities, HSE officer or engineer from the contractor side will coordinate with the GM (Corporate Safety), who will be responsible for monitoring procedures. HSE team will identified the monitoring techniques and the frequency of selected parameters, monitoring will be conducted according to monitoring plan, given in **Table 7.4**. Corporate Safety will keep the record of all non-compliances observed during monitoring and will report these along with the actions to higher management for further action.

- Any recommendations relating to construction activities during monitoring process would be considered by the contractor.
- Staff will be responsible for undertaking the environmental monitoring, will maintain all monitoring and non compliance records and be responsible for scheduling follow up inspections to ensure that corrective actions are being implemented for any non-compliance detected.

7.10. Reporting

The monitoring department would present its data and findings in the form of formal report to the top management at a frequency as deemed fit by the management. The purpose of reporting would be essentially to provide necessary information enable effective decision making by the management. The monitoring report presented to the project management and may take any formal format, however, in terms of content, it must contain the following:

- Summary of the environmental impacts, mitigation measures and monitoring record;
- All incidents and their remedial measures recorded to ensure that the emergency situations are responded in accordance to the Emergency response plan.

Based on this information, the project management and local environmental agency would take decisions for performance improvement. In every subsequent monitoring report, the performance and efficacy of measures undertaken by the management in the previous review process would also be evaluated.

Figure 7.1: The Organizational Structure of Environmental Management

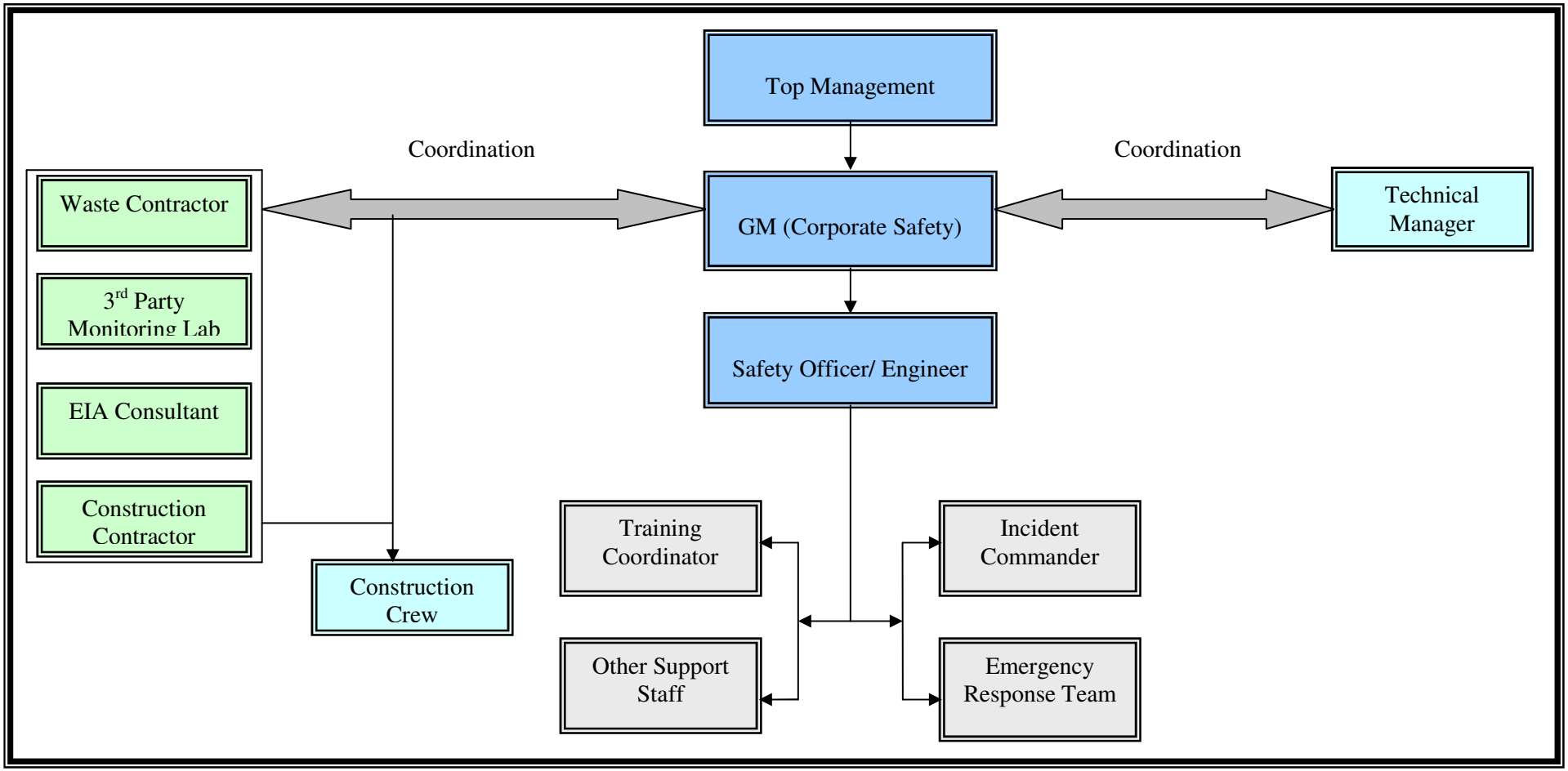

Table 7.1: Environmental Management Plan for Construction and Commissioning Phase

Area	Aspect	Mitigation Measures	Monitoring Frequency	Responsibility
Air Quality	Dust and Gaseous Emission	In order to suppress the dust emission on exposed surfaces, water will be sprinkled daily with an appropriate frequency.	Daily and as per requirement	Contractor
		Dust problem in soil and stock piles will be reduced by erecting the windshield walls on three sides of the piles.	Daily and during windy conditions	Contractor
		Vehicular movement will be restricted to a specific time for dumping of supplies and construction material.	Daily	Contractor HSE Officer
		Workers and drivers should use the dust masks and safety goggles, especially during dry and windy weather conditions to avoid health risk.	Daily and as per requirement	Contractor HSE Officer
		For controlling the emission of pollutants from the generators and other equipments, they will be properly tuned and maintained in good working condition.	Weekly	Contractor HSE Officer
		Emissions from the machinery and vehicles will be monitored on regular basis to ensure compliance to NEQS.	Weekly	Contractor HSE Officer
		Standby generators for power supply will be kept away from pathways and will be placed at locations where probabilities of human intervention are limited.	At time of installation	Contractor HSE Officer
		The stack height of the generators used, if any, will be at least 3 m above the ground.	At time of installation	Contractor HSE Officer

Table 7.1: Environmental Management Plan for Construction and Commissioning Phase (Contd.)

Area	Aspect	Mitigation Measures	Monitoring Frequency	Responsibility
Flora and Fauna	Damage to Flora and Fauna in Project Area	Vegetation should be cleared on phase basis in order to save the large project area from damage.	At the start of construction activities	Contractor HSE Officer
		Where possible, verges should be replanted with trees and shrubs for providing of airshed functions of purification.	After construction activities	HSE Officer /Project Manager
		Trees of national interest, flowering trees, shrubs and habitat suitability should be considered during plants selection for landscaping.	After construction activities	KESC
		The appropriate measures during construction activities would help in protecting the plant and animal communities in immediate neighboring.	Weekly	Contractor HSE Officer
		Birds will not be affected during construction phase and they will relocate to adjacent suitable habitats.	N/A	N/A
		Restricting vegetation clearing to only that area necessary for safe construction, operation and maintenance of the proposed project.	At the start of construction activities	Contractor HSE Officer
		By using the best practice for vegetation clearing and disposal practices will minimize the environmental risk associated with clearing and disturbance of vegetation communities.	At the start of construction activities	Contractor HSE Officer

Table 7.1: Environmental Management Plan for Construction and Commissioning Phase (Contd.)

Area	Aspect	Mitigation Measures	Monitoring Frequency	Responsibility
Noise	Disturbance to Workers and People Live in Vicinity	Stationary sources of noise such as concrete mixers, batching plant, power generators etc. will be segregated from the work area.	At the start and during construction activities	Contractor HSE Officer
		Ear plugs and other noise protecting equipments will be used by workers, operate in high noise emitted areas such as 85 dB (A).	Daily	Contractor HSE Officer
		Manage the specific daytime working hours for movement of earth moving equipment and other machinery for construction.	Daily	Contractor HSE Officer
		Use of adequate muffler for all exhaust systems will be mandatory.	Weekly	Contractor HSE Officer
		Blowing of horn by the project related vehicles will be strictly prohibited.	Daily	Contractor HSE Officer
		Occupational health, safety and environmental instructions / procedures of KESC would be followed. strictly	Daily	Contractor HSE Officer

Table 7.1: Environmental Management Plan for Construction and Commissioning Phase (Contd.)

Area	Aspect	Mitigation Measures	Monitoring Frequency	Responsibility
Water Quality	Water Quality Impact	No mitigation measure is required for this impact.	N/A	N/A
Solid Waste	Solid Waste Generation and Disposal	All construction waste would be segregated and stored in designated and labeled areas on the construction site.	Weekly	Contractor HSE Officer
		Waste will be collected by certified third party contractors and disposed of at the landfill site.	Weekly	Contractor HSE Officer
		Any hazardous waste should be separated and stored in areas clearly designated and labeled, and dispose of in environmental friendly manner.	Weekly	Contractor HSE Officer
		Workers should be trained on how to dispose of food and drink containers emphasizing the need to protect the areas in vicinity of project.	Weekly	Contractor HSE Officer
		Construction camps in project area would be adequately equipped with portable toilets.	At the start of construction activities	Contractor HSE Officer

Table 7.1: Environmental Management Plan for Construction and Commissioning Phase (Contd.)

Area	Aspect	Mitigation Measures	Monitoring Frequency	Responsibility
Traffic	Traffic Management Problems	Truck and other equipment movement during construction activities would be limited to the working hours 0800 am to 04:30 pm per day.	Daily	Corporate Safety/Contractor
		Heavy equipment would be transported early morning (I am to 5 am).	Daily	Corporate Safety /Contractor
		Appropriate road signs should be erected to warn road users around the site of proposed project. For instance, reduce speed near the entrance roads.	Weekly	Contractor
		Raw materials within the trucks should be adequately covered in order to prevent any release into the air along the roadway.	Daily	Contractor
		Traffic management plan should be developed and implemented during the construction phase.	Weekly	Corporate Safety (KESC)
		Vehicles will be maintained regularly to reduce the exhaust emissions.	Weekly	Contractor
		Any complain launched by community member should be responded and appropriate action will be taken to avoid it in future.	Daily	Corporate Safety (KESC)

Table 7.1: Environmental Management Plan for Construction and Commissioning Phase (Contd.)

Area	Aspect	Mitigation Measures	Monitoring Frequency	Responsibility
Archaeological and Historical Sites	Impact on Archaeological and Historical Sites	No archaeological and historical sites were found during Grid station survey, therefore no mitigation is required.	N/A	N/A
Employment	Socioeconomic Impact	This impact is positive; therefore no mitigation is required for this impact.	N/A	N/A
Health and Safety	Health and Safety Issues	A lead person should be identified and appointed to be responsible for emergencies occurring in the construction site. He/She will also be introduced to construction workers.	Weekly	Contractor HSE Officer
		Make prior arrangements with the health care facilities such as Health Centre in proximity, a private doctor or Hospital to accommodate any eventualities.	N/A	Contractor
		Emergency response plan should be prepared and implemented during entire phase of construction.	Monthly	Contractor HSE Officer

Table 7.2: Environmental Management Plan for Operation Phase

Area	Aspect	Mitigation Measures	Monitoring Frequency	Responsibility
Electromagnetic Field	Impact on Living Environment	In order to bring the exposure levels of EMF well below the accepted standards, appropriate measures would be taken.	Quarterly	Engineering Division (KESC)
		Design the Grid station in such a way to ensure that EMFs are minimized by adjusting the voltage and load requirements.	Quarterly	Engineering Division (KESC)/ Project Manager
		Distance of Grid station from living environment will provide a reduction in EMF exposure.	At the time of installation	Engineering Division (KESC)
		Liaise with nearby residents and undertake EMF monitoring with them. Further, maintain the complaints register and supply up to date information to the community upon request regarding EMF.	Monthly	Engineering Division (KESC)

Table 7.2: Environmental Management Plan for Operation Phase (Contd.)

Area	Aspect	Mitigation Measures	Monitoring Frequency	Responsibility
Gaseous Emission	Impact on Ambient Air	Equipments and vehicles used during the operation and maintenance works will be properly tuned and maintained in good working condition in order to minimize the gaseous emissions.	Quarterly	Fleet management/G&T (KESC)
Noise	Disturbance to Workers and People Live in the Vicinity	Operational and maintenance staff should wear mufflers/earplugs while working in high noise emission areas.	Monthly	Transmission Division (KESC)
		It will make sure that all vehicles and other maintenance equipments should comply the NEQS and other international standards for noise.	Quarterly	Transmission Division (KESC)
		All noise complains should be recorded and investigated;	Monthly	Transmission Division (KESC)
		Restrict noise generating activities to within the hours of 7:30 pm to 06:30 am, Monday to Saturday.	Monthly	Transmission Division (KESC)
		If possible, all noise generating equipments are locked up by acoustic barrier to minimize the extent of impact area;	At the time of installation	Transmission Division (KESC)

Table 7.2: Environmental Management Plan for Operation Phase (Contd.)

Area	Aspect	Mitigation Measures	Monitoring Frequency	Responsibility
Waste Impact	Solid Waste Generation	It will make sure that all solid waste during operational and maintenance phase will be disposed of in an appropriate landfill site in the locality.	Quarterly	Transmission Division (KESC)
		If sewerage waste transportation system is not exist in the locality then all municipal waste should be collected by third party contractor and then disposed of in Landfill site.	Quarterly	Transmission Division (KESC)
Property Values and Aesthetics	Impact on Property Values	Progressive reinstatement should be applied, for instance construction area should be rehabilitated and re-vegetated immediately after the completion of construction activities.	After completion of construction activities	Transmission Division (KESC)
		To reduce the visual intrusion, the colour selected for roofing and walls must be of a nature, which will help to visually break up the surfaces of the buildings. Matt finishes must be used. Importantly, the roofs of buildings must not reflect or deflect sunlight or artificial light during the day or night by their colour or texture	Right after construction activities	Transmission Division (KESC)

Table 7.2: Environmental Management Plan for Operation Phase (Contd.)

Area	Aspect	Mitigation Measures	Monitoring Frequency	Responsibility
Emergency Situation	Health and Safety Issues	Due to presence of busbars, grid station would be secured as busbar will help in redirecting the current at the time of live Grid station repairing and this is how interruptions to transmission network would minimum.	Quarterly	Project Engineer
		The risk of human or animal injury in Grid station would minimum in the case of fire or explosion, unless someone present on site. There is no additional mitigation measures are required beside the security fence.	N/A	N/A
		Oil containing equipment in the Grid station should be fitted within a bunded oil sump of sufficient size to capture all oil within a particular piece of equipment.	Quarterly	Project Engineer
Soil and Ground Water	Impact on Soil and Groundwater Quality	Area around transformer should be paved before Grid station operations for avoiding infiltration of oil into soil and groundwater	Before operations of Grid station	Transmission Division(KESC)
		Transformer should be installed or fitted within a bunded oil sump of sufficient size to capture all oil during any leakage or spill.	At the time of installation and during operation phase	Project Engineer
		Wastewater generates after fire fighting will be handled through drains and disposed of in environmental friendly manner.	Quarterly	Transmission Division(KESC)

Table 7.3: Training Plan

Staff	Responsibility	Areas	Schedule
Project staff from KESC and Contractor	Contractor /Project management	▪ Findings of EIA ▪ Mitigation Measures ▪ EMP ▪ Waste disposal procedures ▪ Camp Operation ▪ Social and Cultural values of the Project areas	Prior to start of Project activities
KESC Staff	Safety Officer/Engineer	▪ Environmental sensitivity of the Project area ▪ Flora and Fauna of the area ▪ Mitigation Measures ▪ Emergency Response Plan ▪ Community Issues ▪ Social and Cultural Values	Prior to start of the Project activities
Drivers	Fleet management (KESC)	▪ Road safety ▪ Road restrictions ▪ Defensive driving	Before and during field operations
Camp Staff	Safety Officer/Engineer	▪ Waste Disposal ▪ Housekeeping	Before and during field operations

Table 7.4: Monitoring Plan for Key Environmental Impacts

Monitoring Parameters	Monitoring Locations	Frequency	Monitoring Method/Equipment	Project Phase	Responsibilities
Dust	♦ Construction Site ♦ Contractor Camp Site	Weekly	Visually/Particulate Matter Measurement	Construction	Contractor
Noise	♦ Ambient Air ♦ Construction Site ♦ At Source ♦ Vehicle/Equipments	Monthly	Noise Meter	Construction	Contractor HSE Officer
Vehicular Emissions (Smoke, CO)	Vehicles at the Construction Site	Monthly	Gas Analyzer	Construction	Contractor HSE Officer
Solid Waste (Domestic and other waste)	Collection, Handling & Disposal Areas	Monthly	Visually	Construction & Operation	Contractor /HSE Officer
Electromagnetic Field	Near Electrical equipments and at boundaries of Grid station	Quarterly	EMF Meter	Operation	Grid & Transmission Dept. (KESC)
Occupational Health & Safety	♦ Grid station different units installation time ♦ Loading & offloading of Equipment ♦ Project Operations	As per requirement during construction phase and monthly during operation phase	Visual observation and by accident records checking	Construction & Operation	Transmission Division

8. Conclusion

This Environmental Impact Assessment study was carried out to identify the environmental and socioeconomic soundness of the proposed Hybrid Grid Station and overhead transmission lines. This study was done in keeping the views of Pakistan international legislation and guidelines.

During study, environmental and socioeconomic baseline information was collected from variety of sources including visit of project area, previous environmental reports and studies conducted in the area, published literature and field surveys. All these information were used to compose the profile of the physical and biological environment of the area which is likely to be affected by the proposed project activities. Information for the project description was provided by the project management and their contractor.

On the basis of baseline and project description, potential environmental impacts were identified on the project's physical, biological and socioeconomic environments. The potential impacts during the construction phase of the proposed project were included the dust and gaseous emissions, noise, waste, water quality, flora and fauna, health and safety and socioeconomic benefits. Similarly, the key environmental and social issues during the operation phase were included the Electromagnetic field, gaseous emissions, waste, soil and ground water quality deterioration, aesthetic and property values and emergency situation.

After assessing above potential impacts, it has been concluded that if all project activities are carried out as described in this report and suggested mitigation measures and Environmental management plan are implemented, the project will not have the significant impact on the project area's physical, biological and socioeconomic environments. The project will also comply with all the statutory requirements pertaining to project and NEQS.

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