



Government of Pakistan  
Ministry of Communications  
National Highway Authority

## FEASIBILITY STUDY & DETAILED DESIGN OF LAHORE EASTERN BYPASS PROJECT INCLUDING BRIDGE OVER RIVER RAVI ALONG WITH MODEL STUDY



# ENVIRONMENTAL IMPACT ASSESSMENT REPORT

(MARCH, 2017)



**Asif Ali & Associates (Pvt) Ltd**

*in association with*



**A. A. ASSOCIATES**

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## Executive Summary

### Introduction

This report presents the findings of “Environmental Impact Assessment (EIA) study of construction of Lahore Eastern Bypass connecting G.T Road (Kala Shah Kaku Interchange) to Lahore Ring Road near Mehmood Booti Junction, after crossing the River Ravi”. The EIA Study aims at the identification of the possible environmental and social impacts of the proposed project on its immediate surroundings on both short and long term basis, suggesting mitigation measures and identifying the responsible agencies to implement those measures. National Highway Authority (NHA), Ministry of Communications, Government of Pakistan, planned the construction of this project as per directive of Prime Minister of Pakistan. For this purpose, the NHA, after due invitation of tenders, appointed M/s Asif Ali & Associates (Pvt.) Ltd (AAA) in association with M/s AA Associates as Design Consultants to carry out this project.

The main objective of Lahore Eastern Bypass is to connect G.T Road (N-5), Lahore -Islamabad Motorway (M-2) and Lahore-Sialkot Motorway on one end to the Lahore Ring Road on the other end. It will also facilitate the traffic using N-5 and M-2, which is destined to the Eastern Lahore and southern parts of Lahore. The planned 6-lane bypass will largely contribute to the economic and social development of Lahore city.

### Policy, Legal & Organizational Outline

According to the Punjab Environmental Protection Act 1997 (Amended 2012) and its interpretation as per Review of IEE/EIA Regulations, 2000 for filing, review and approval of environmental assessments, the present project is categorized under Schedule II. The Section 4 states that “A proponent of project falling in any category specified in schedule II shall file an EIA.

The scope of the EIA Study includes environmental assessment of the project including collection and securitization of data related to physical, biological and socio-economic environment, assessment of impacts which may be caused by the project activities and mitigation measures for the abatement of potential environmental impacts along with the estimate of mitigation cost.

The Government of Pakistan (GOP) has promulgated laws/acts, regulations and standards for the protection, conservation, rehabilitation and improvement of the environment. PEPA-1997 is the apex law for mandatory EIA before project construction. The Act was promulgated on December 06, 1997 by repealing the Pakistan Environmental Protection Ordinance of 1983. In 2012, Punjab enacted Punjab Environmental Protection Act 1997 (amended 2012), adopting Pakistan Environmental Protection Act 1997, a federal legislation, to the framework of the Punjab. The newly enacted legislation allowed the Provincial Government to frame its own Environmental protection tribunal and appoint its members. Other relevant laws have also been discussed briefly in the report. In addition, Punjab Environmental Quality Standards (PEQs) are provided for the industrial/vehicular gaseous emissions and noise and for municipal/industrial wastewater discharges.



## **Project Description**

To meet the primary objectives of the project, five different alternative alignment options were studied. These alternatives were:

- Option-I: KSK Interchange to Amir Road Junction (On Lahore Ring Road)
- Option -II: KSK Interchange to China Road Junction (On Lahore Ring Road)
- Option -III: KSK Interchange to Amir Road Junction (On Lahore Ring Road)
- Option -IV: KSK Interchange to China Road Junction (On Lahore Ring Road)
- Option -V: KSK Interchange to Bund Road Junction (On Lahore Ring Road)

Considering advantages/dis-advantages of all the proposed options for alignments, the consultants recommended option-V that was later-on modified in light of Hydraulic Model Study carried out by IRI and to connect Lahore Eastern Bypass to Lahore-Sialkot Motorway.

The project is expected to be completed within fifteen (15) months. The estimated capital cost of the proposed project is Rs. 15.276 Billion. It is estimated that a total of approximately 7,617 Kanals of land will be acquired for the construction of the proposed project. The water consumption during the construction phase of the project is estimated to be 96,000 gallons/day for 1200 workers. The waste water generation is estimated to be 76,800 gallons/day during the construction phase of the project. The solid waste generation during the construction phase of the project is estimated to be 780.10 kg/day. The materials used in construction of the road for the proposed project would include coarse aggregates (crush), fine aggregates (sand), steel, water, asphalt, reinforcement, cement etc.

## **Environmental & Social Baseline**

The existing environment in and around the project area has been studied with respect to the physical, biological and socio-economic conditions. The area is plain and highly fertile, with lush grounds on the site and in surrounding areas. Topography revealed that site is almost levelled. As compared to surrounding area the site is low lying area. According to the tests performed, the sub-soil lithology comprises of top vegetative cover, underlain by Lean Clay/Silty Clay/Silty Sand up to maximum investigated depth of 1m below NSL.

Generally the climate of the area is dry and severe during summer season and moderately cold in winter. The average annual temperature in Lahore, Punjab, Pakistan is fairly hot at 24.3 degrees Celsius (75.7 degrees Fahrenheit). The length of the day varies significantly over the course of the year. The relative humidity typically ranges from 21% (dry) to 96% (very humid) over the course of the year, rarely dropping below 10% (very dry) and reaching as high as 100% (very humid). Study of the Meteorological Department Lahore reveals that 60% days of the year are calm and 33% days have mean speed of 1-3 knots. Only 6% days exhibit speed of 4-6 knots and higher.

The monitoring for ground water was done on 08-09-16 at two locations from the hand pumps. These locations were Kala Khatai Road near Usmania Mosque and from Chak No. 40. All the chemical and biological parameters were found within the permissible limits of NEQS. Ambient air is being polluted due to emission of fuel gases like Carbon Monoxide (CO), Nitrogen Oxide (NOx) and Sulphur Oxide (SOx) due to the vehicle exhaust. Air Quality was monitored from 07-9-16 to 08-09-16. The data was collected at three points along the proposed project route. The results indicate that all the parameters at the selected points are within the allowable limits of NEQS. A waste water sample was collected on 08-09-16 from Naala Bhed

(Chak 40) for laboratory analysis. The results indicate that all the parameters are well within the limits specified by NEQS. The noise level monitoring was conducted for 24 hours continuously on hourly basis at three locations from 07-09-16 to 08-09-16. The table shows that the noise levels were higher than the NEQS at two monitoring locations, may be due to honking of horns or traffic.

As climate of Lahore is semi-arid and subtropical, the vegetation of the area falls under scrub, dry, tropical thorn forest type as per phyto-geographical classification of the area.

The alignment in which our project area stands now, was once covered with native vegetation consisting, of trees like Karir (*Capparis deciduas*), Wan (*Salvadora oleoides*) and Jand (*Prosopis spicigera*). With the onslaught of civilization, this vegetation was cleared for agricultural purposes. There were no species reported by Forest and Wildlife Departments to be threatened, which are included in the IUCN Red Data Book. There is a reserve forest (Shahdrah Reserve Forest) in close proximity of the proposed alignment mostly comprising Eucalyptus trees. Common mammals found in the area are dogs, cats, house rats and bats. Small Indian Mongoose and Indian Palm Squirrel have also been reported. These are mostly seen in areas where houses have already been constructed or are under construction. House sparrow (*Passer domesticus*), House crow (*Corvus splendens*) and Mynah (*Acridotheres tristis*) are the most common sight in the area. No wildlife sanctuary or Game Reserve is located in the vicinity of the study area.

### **Public Consultation**

In order to evaluate the socio economic and environmental impacts, field surveys and involvement of stakeholders is extremely essential. Consultation with the community and their active participation plays a vital role in successful implementation of the project. To identify the different type of stakeholders and ascertain their perception about the construction of Lahore Eastern Bypass Project and its impacts, consultation was carried out. Stakeholders were consulted with the help of semi skilled guide and their observations were duly noted. Scheduled meetings were held in villages of Jabbu, Lakhudher, Karol, Nathokot, Kot Mulchand, Chak 42 and Chak 40. Commonly raised concerns by the stakeholders were related to land acquisition, bifurcation of agricultural land, construction activities and environmental pollution.

Grievances Redress Mechanism is an integral part of the Lahore Eastern Bypass Project planning and implementation mechanism. It aims at addressing public grievances arising from the work and work related activities. NHA will establish a Grievances Redress Committee (GRC) to facilitate resolution of complaints raised during implementation of the project. The GRC will address affected people concerns and complaints promptly using an understandable and transparent process.

### **Predicted Environmental Impacts & Mitigation Measures**

The proposed project will have both positive and negative impacts during the construction and operational phases, for which proper mitigation measures are necessary. During the field survey, significant efforts were made to identify the main social, cultural and environmental issues related to the project. Various government departments and agencies were also contacted for obtaining salient information along with area resident/ stakeholders. There are two (02) types of Project corridors which have been used for the environmental baseline information, impacts assessment and mitigation purposes. ROW of the proposed project is 100 m which will be considered as Corridor of Impact (COI-1). The limit for COI-2 for the proposed project was taken as 500 m on either side of the existing road for collection of baseline information, impacts

assessment and mitigation measures of physical, ecological as well as social resources. Following is the list of main issues and concerns which have been considered in the study report during the design, construction and operation phases of the project:

- Cutting of trees/bushes falling within the proposed corridor;
- Disturbance to the public movement during construction;
- Disturbance in the daily routine activities of local residents during construction;
- Air and noise pollution due to the operating of construction machinery during construction phase of the project;
- Solid waste generation during construction and operation;
- Oil spillages from construction machinery, resulting in soil and groundwater contamination;
- Health and safety issues of the workers and public;
- Contamination of water resources by the soil erosion and construction activities; and
- Land acquisition.

The related important mitigation measures included judicious compensation to the affectees prior to execution of the project, proper disposal of solid and construction waste, control and treatment of waste water, management of mucking material, avoidance of soil contamination, traffic diversion plans, plantation of trees, rehabilitation of excavated areas and implantation of HSE plans to avoid any incidents.

#### **Environmental Management & Monitoring Plan**

The summary of all the mitigation measures against the negative impacts, as suggested in the report are described in the Environmental Management Plan (EMP). EMP is prepared for all the identified environmental impacts during design, pre-construction, construction and operation stages. Assuming effective implementation of the mitigation measures and monitoring requirements as outlined in the Environmental Management Plan, the potential adverse environmental and social impacts of the proposed Project are likely to be within the acceptable limits. The estimated Environmental Mitigation and Monitoring cost will be Rs. 94,179,000 or Rs. 94.18 Million that comprises HSE equipment cost, tree plantation cost, environmental monitoring cost and hiring of HSE personnel.



## LIST OF ABBREVIATIONS

<u>Abbreviation</u>	<u>Description</u>
APHA	American Public Health Association
ASTM	American Society of Testing Materials
BDL	Below Detection Limit
BOD <sub>5</sub>	Bio-chemical Oxygen Demand
CC	Construction Contractor
CO	Carbon Monoxide
COD	Chemical Oxygen Demand
CoP	Conference of Parties
DCR	District Census Report
DO	Dissolved Oxygen
EE	Environmental Engineer
EIA	Environmental Impact Assessment
EMMP	Environmental Management and Monitoring Plan
EPA	Environment Protection Agency
EPD	Environment Protection Department
EPHE	Environmental & Public Health Engineering
GoP	Government of Pakistan
IEE	Initial Environmental Examination
LGO	Local Government Ordinance
mg/l	Milligrams per liter
MSL	Mean Sea Level
NCS	National Conservation Strategy
NEQS	National Environmental Quality Standards
NESPAK	National Engineering Services Pakistan
NHA	National Highway Authority
NO <sub>2</sub>	Nitrogen Dioxide
°C	Degree Centigrade
OH & S	Occupational Health and Safety
PEPA	Pakistan Environmental Protection Act
PEPC	Pakistan Environmental Protection Council
PGA	Peak Ground Acceleration
PM <sub>10</sub>	Particulate Matter
PPC	Pakistan Penal Code
SC	Supervision Consultant
SO <sub>2</sub>	Sulfur Dioxide
SOP	Standard Operating Procedures
SWM	Solid Waste Management
TSS	Total Suspended Solids



## SECTION – 1 INTRUDUCTION

### 1.0 General

This report deals with the Environmental Impact Assessment (EIA) Study being carried out for the construction of Lahore Eastern Bypass connecting G.T Road (Kala Shah Kaku Interchange) to Lahore Ring Road near Mehmood Booti Junction, after crossing the River Ravi. Total length envisaged for the Project is approx. 18.30 km.

The proposed bypass is located in the North-Eastern side of Lahore City. It will start at Kala Shah Kaku Interchange on G.T. Road, which links the G.T. Road with Motorway M-2. It will cross Shahdrah - Kala Khatai Road before crossing the River Ravi approx. 6 Km upstream of the existing Ravi Bridge and then connect with the Lahore Ring Road approx. 10.4 Km east of the Niazi Interchange and near Mehmood Booti. **Figure 1.1** shows the location of Lahore Eastern Bypass.

National Highway Authority (NHA), Ministry of Communications, Government of Pakistan, planned the construction of this project as per directive of Prime Minister of Pakistan. For this purpose, the NHA, after due invitation of tenders, appointed M/s Asif Ali & Associates (Pvt.) Ltd (AAA) in association with M/s A.A. Associates as the “Consultant” to provide “Consultancy Services for Feasibility Study & Detailed Design of 6-Lane Highway From Kala Shah Kaku to Lahore Ring Road (18.30 Km), (also termed as Lahore Eastern Bypass), including Bridge Over River Ravi, Model Study, Training Works & Formulation of Tender Documents.” The Contract Agreement for providing the aforesaid consultancy services was signed between NHA and the Consultant on June 10, 2014. This EIA study is carried out as part of this contract agreement.

### 1.1 Project Objectives

The main objective of Lahore Eastern Bypass is to connect G.T Road (N-5), Lahore - Islamabad Motorway (M-2) and Lahore-Sialkot Motorway on one end to the Lahore Ring Road on the other end. It will also facilitate the traffic using N-5 and M-2, which is destined to the Eastern Lahore and southern parts of Lahore. Thereby, it will reduce





the traffic load on existing Ravi Bridge and on the section of N-5 between Shahdara and Kala Shah Kaku.

## **1.2 Scope of the Project**

The project comprises construction of 6-lane divided motorway, with allied facilities. It will be a limited access facility with a new 6-lane bridge over River Ravi. There will be river training works associated with the bridge construction. The existing interchange at start of the project at KSK will have to be modified to accommodate the new link. Three new interchanges are also envisaged; first at start of Lahore Sialkot Motorway, second at Kala Khatai Road Junction and the third at the end of the project road on the Lahore Ring Road near Mehmood Booti.

## **1.3 Project Significance**

The planned 6-lane bypass will largely contribute to the economic and social development of Lahore city. It will boost tourism and will bring more population into the stream of benefits, which in turn will change the social complexion of people around this area. Various industries in the area will directly benefit from an improved transportation system and the resulting uplift of economic condition of local community. It will also connect Lahore City to the under construction Lahore-Sialkot Motorway.

## **1.4 Objectives of the EIA Study**

The overall objective of the study is to anticipate important possible effects of proposed activities on the natural system (water, soil, air, biological system, and human health), anthropogenic systems (settlements and infrastructure), social and economic systems (work, education, recreation, health services) and cultural systems (beliefs, art, literature). The specific objectives of EIA Study are:

- Ensuring environmental factors are considered in the decision-making process;
- Ensuring that possible adverse environmental impacts are identified and avoided or minimised;
- Informing the public about the proposal; and



- Identification and review of various legal / statutory requirements set forth by the Punjab Environmental Protection Act, 1997 (Amended 2012) and the guidelines for the preparation of IEE/EIA reports and existing regulatory framework in the country related to the project;

## 1.5 Need for Environmental Impact Assessment

According to the Punjab Environmental Protection Act 1997 ((Amended 2012) and its interpretation as per Review of IEE/EIA Regulations, 2000 for filing, review and approval of environmental assessments, the present project is categorized under Schedule II. The Section 4 states that “A proponent of project falling in any category specified in schedule II shall file an EIA. Copy of the Schedule II is attached as **Annexure I**. The following projects relating to ‘transport sector’ fall in the Schedule II:

- i. Airports;
- ii. Federal or provincial highways or major roads (except maintenance rebuilding or reconstruction of existing roads) with a total outlay of Rs. 50.0 Million or above;
- iii. Ports and harbour development for ships of 500 gross tons or above; and
- iv. Railway works.

The project under study falls in subsection – ii of the ‘transport sector’.

## 1.6 The Proponent and Consultant

The addresses of the proponent and consultant are:

### i) The Proponent Contact Address

General Manager (Design),  
National Highway Authority (NHA),  
27 Mauve Area, G-9/1, Islamabad,  
Phone: +92 – 51 9032901,  
Fax: +92-51 9032605



**ii) The Consultant Contact Address**

Asif Ali & Associated (Pvt.) Ltd.  
139-G, First Floor, Commercial Area,  
Phase-I, DHA Lahore.

**1.7 The Study Team**

A multi-disciplinary team was constituted to conduct this EIA study. The team comprises of the following team members:

Salman Akhtar	:	Team Leader
Dr Javed Anwer Aziz	:	Senior Environmental Expert
Farooq Alam	:	Quality Assurance Expert
Abdul Waheed Sheikh	:	Biodiversity Expert
Shafqat Niaz Kang	:	Ecologist
Mujib Ur Rehman	:	Environmental & Social Expert
Atif Aslam	:	Sociologist
Safdar Hussain	:	Environmental Engineer

**1.8 EIA Technical Approach**

The EIA will follow the following technical approach:

- Meeting of environmental experts to discuss and imagine the major potential environmental Impacts and major environmental issues in the light of project scheme and present environment setting;
- Carry out baseline evaluation to identify the present environmental conditions in the study area on the basis of available data, field investigations and monitoring;
- Stakeholder consultation to perceive their point of view about the project;
- Evaluate the environmental impacts caused by the project according to relevant laws, regulations and standards;
- Put forward remedial measures to avoid or reduce the probable environmental impacts; and
- Make environmental management and monitoring plan to evaluate the actual environmental impacts and the effectiveness of remedial measures.



## **SECTION 2**

### **POLICY, LEGAL & ORGANIZATIONAL OUTLINE**

#### **2.0 General**

This section discusses the related policy, legal and administrative outline/structure applicable in Punjab for carrying out the EIA of Lahore Eastern Bypass. Since the project is located in Punjab, therefore its EIA procedure will be governed by the existing policies, legislation and administrative framework in place in Punjab. Though, after the eighteenth amendment, the subject of ecology and pollution has been devolved to provinces and Punjab has enacted its own environmental protection act, yet the policies, guidelines and regulations framed prior to devolution at the federal level are still relevant and obligatory to meet in Punjab.

National Highway Authority (NHA), the project proponent is under obligation to carry out the EIA in conformity with the policy, legal and administrative framework in Punjab.

#### **2.1 Policy Outline**

##### **2.1.1 National Environmental Policy, 2005**

Government of Pakistan launched National Environmental Policy in 2005, which provided an overarching framework for addressing the issues facing Pakistan, particularly pollution of fresh water bodies and coastal waters, air pollution, lack of proper waste management, deforestation, natural resources and climate change. The policy gives direction for addressing the cross sectoral issues and underlying causes of environmental degradation in the country. The policy stresses on the incorporation of environment into the development planning and emphasizes that environmental considerations would be integrated into sectoral policy and plans. Moreover, an EIA related provisions of the Environmental Protection Act 1997 would be diligently enforced for all development projects.

The policy in one of its sub-sections emphasizes upon the development of efficient transport for the protection of environment. The policy provides broad guidelines to the federal government, provincial government, federally administered tribal areas



and local governments for addressing environmental concerns and effective management of their environmental resources.

## 2.2 Statutory Framework

A number of laws exist in Pakistan containing a number of clauses concerning protection of the environment. However, the first legislation on environmental protection was issued in 1983. The Pakistan Environmental Protection Ordinance, 1983 was the first legislation promulgated for the protection of environment.

Pakistan Environmental Protection Agency was established in 1984. No significant environmental policy, guidelines and regulations were made till early 1990s. The National Conservation Strategy was developed and approved by the federal cabinet in 1992. Provincial Environmental Protection Agencies were also established in 1992-1993. National Environmental Quality Standards (NEQS) were established in 1993. Detailed environmental guidelines were issued in 1996. The National Assembly and the Senate conferred Pakistan Environmental Protection Act in 1997.

In 2010, Nation Assembly passed eighteenth amendment and environment and ecology became the sole legislative domain of the provincial assemblies. The subject earlier found in the concurrent list of the constitution. The devolution provided provincial governments the opportunity to respond to the environmental challenges faced in the provinces.

In 2012, Punjab enacted Punjab Environmental Protection Act 1997 (amended 2012), adopting Pakistan Environmental Protection Act 1997, a federal legislation, to the framework of the Punjab. The newly enacted legislation allowed the Provincial Government to frame its own Environmental protection tribunal and appoint its members. The Act is applicable to a broad range of issues and extends to air, water, soil, marine and noise pollution, as well as the handling of hazardous waste. Section 12 of the Act deals with the Environmental Impact Assessment / Initial Environmental Examination which states;

**Section-12(1):** *“No proponent of a project shall commence construction or operation unless he has filed with the Environmental Protection Agency (EPD in case of*

*Punjab) an Initial Environmental Examination (IEE) or, where the project is likely to cause adverse environmental effect, an Environmental Impact Assessment (EIA), and has obtained the approval in respect thereof”.*

### **2.2.1 Pak - EPA Review of IEE/ EIA Regulations, 2000**

The Pakistan Environmental Protection Agency Review of IEE and EIA Regulations provide the necessary details on preparation, submission and review of the IEE and EIA.

The regulations categorize the projects on the basis of the degree of environmental impacts. Project types that are likely to have adverse impact are listed in Schedule II of the regulations and require an EIA. Projects that are not likely to have significant adverse impacts are listed in Schedule I and require an IEE to be prepared, rather than a full-fledged EIA, provided that the project is not located in an environmentally sensitive area. Other features of the EIA Regulation 2000 relevant to the proposed project are listed below:

- A fee is payable to EPA Punjab for review of IEE - EIA.
- EPD is bound to conduct preliminary scrutiny and reply within 10 days of the submittal of a report a) confirming completeness, or b) asking for additional information, if needed, or c) returning the report requiring additional studies if necessary.
- EPA is required to make every effort to complete the EIA review process within 90 days of the issue of confirmation of completeness.
- EIA approval is valid for three years from the date of its accord.
- The submittal is to be accompanied by an application in prescribed format included as Schedule-IV of the Regulations.
- When EPA accord their approval subject to certain conditions, the following procedure will be followed:
  - Before commencing construction of the project, the proponent is required to submit an undertaking accepting the conditions; and



- Before commencing operation of the project, the proponent is required to obtain from the EPA a written confirmation of compliance with the approval conditions and requirements of the IEE/EIA.
- A monitoring report must be submitted to the EPA after the completion of construction followed by annual monitoring reports during operations.
- In case the project is not approved, the project would be redesigned and EIA resubmitted for review and approval.

### **2.3.2 National Environmental Quality Standards (NEQS)**

Pakistan Environmental Protection Council (PEPC) first approved these standards in 1993. They were later revised in 1995 and 2000. They furnish information on the permissible limits for discharges of municipal and industrial effluent parameters and industrial gaseous emissions in order to control environmental pollution.

#### *a) Air Quality Standards*

In pursuance of the statutory requirement under clause (e) of sub-section (1) of section (6) of the Pakistan Environmental Protection Act, 1997(XXXIV of 1997), the Pakistan Environmental Protection Agency with prior approval of the Pakistan Environmental Protection Council, has published the NEQs for Ambient Air in 2010.

#### *b) Noise Quality Standards*

In pursuance of the statutory requirement under clause (c) of sub-section (1) of section (6) of the Pakistan Environmental Protection Act, 1997(XXXIV of 1997), the Pakistan Environmental Protection Agency with prior approval of the Pakistan Environmental Protection Council, has published the NEQs for Noise. These standards are established and improved in 2010. These standards are established for the four different categories which include residential area, commercial area, industrial area and silent zone. These standards vary according to the day and night time.



*c) Drinking Water Quality Standards*

In pursuance of the statutory requirement under clause (c) of sub-section (1) of section (6) of the Pakistan Environmental Protection Act, 1997(XXXIV of 1997), the Pakistan Environmental Protection Agency with prior approval of the Pakistan Environmental Protection Council, has published the National Standards for Drinking Water Quality. These standards are established and improved in 2010.

The ambient air, noise and drinking water quality standards are attached as **Annexure-II**.

### **2.3.3 Wild Life Management**

The Punjab Wildlife (Protection, Preservation, Conservation & management) Act 1974 and rules 1974 empower the government to declare certain areas reserved for the protection of wildlife and to control activities within these areas. It also provides protection to wild life species declared endangered / threatened and rare. With a view to the protection and preservation of flora and fauna in natural state, Government may declare any area to be a national park and may demarcate in a manner as prescribed.

### **2.3.4 Cutting of Trees (Prohibition Act), 1975**

The act prohibits cutting and chopping of trees without permission of the Forest Department. Section 3 of the act states “No person shall, without prior approval of the local formation commander or an officer authorized by him in this behalf , cut fell or damage or cause to cut, fell or damage tree”.

### **2.3.5 Occupational Health and Safety Regulations**

Quantitative national standards with respect to the occupational health and safety of workers have yet to be developed in Pakistan, however, following laws and regulations directly or indirectly govern the occupational health and safety issues during construction and operations of the project:

- Factories Act, 1934 (Pakistan Factories Rules 1962)
- Labour laws Amended, 1972
- Mines Act, 1923
- Natural Gas Safety Rules, 1960.

*Sujid*



- Gas Cylinder Rules, 1940.
- Law of Explosives, 1940
- Explosive Rules, 1944
- Electricity Rules, 1937

### **2.3.6 Antiquities Act, 1975**

The Antiquities Act, 1975 ensures the protection of Pakistan's cultural resources. The act defines antiquities as ancient products of human activity, historical sites, sites of anthropological or cultural interest, national monuments, etc. The act is designed to protect these antiquities from destruction, theft, negligence, unlawful excavation, trade and exports. The law prohibits new construction in the proximity of protected antiquity and empowers the government to prohibit excavation in any area that may contain articles of archaeological significance. Under this act, the project proponents are obligated to:

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

### **2.3.7 Pakistan Penal Code 1860**

This law defines penalties for violations concerning public or private properties or intentional or accidental misconduct of an individual or a body of people affecting human lives. In the context of the project, the following clauses of the penal code hold significance:

- Section 268 deals with penalties for violations concerning pollution of air, water bodies and land. "A person is guilty of a public nuisance who does any act or is guilty of an illegal omission which causes any common injury, danger or annoyance to the public or to the people in general who dwell or occupy property in the vicinity, or which must necessarily cause injury, obstruction, danger or annoyance to person who may have occasion to use public right".



### **2.3.8 Highway Safety Ordinance, 2000**

This law provides legal basis for establishing National Highway & Motorway Police for regulating and controlling traffic on the national highways and strict enforcement of traffic laws. The law also provides for axle load limits for commercial vehicles and legal framework for its enforcement and includes provisions for licensing and registration of vehicles and construction equipment, offences and penalties for traffic violations.

### **2.3.9 Motor Vehicle Rules, 1969**

The law establishes motor vehicle examination and inspection system and provides legal basis for motor vehicle fitness, examination, fitness certification and the powers and responsibilities of the Motor Vehicle Examiners. The key responsibilities of the Motor Vehicle Examiner include:

- Inspection and certification for granting / renewing fitness of vehicles;
- Monitoring traffic for violations of Motor Vehicle Ordinance 1965;
- Prosecuting motor vehicles emitting smoke; and
- Prosecuting motor vehicles being operated in unsafe conditions.

### **2.3.10 Land Acquisition Act, 1894**

Land Acquisition Act, 1894 allows government to acquire private land for public interest purposes after paying compensation to cover the losses incurred by landowners from surrendering their land to the concerned governmental agency. There are 55 sections in this act mainly dealing with area notifications, surveys, objection and confirmation, acquisition, compensation, claim and award, apportionment, Reference to Court, disputes resolution, penalties and exemptions.

### **2.3.11 Canal and Drainage Act, 1873**

Canal and Drainage Act, 1873 is the main legislation relating to the management of irrigation system in Punjab. Under the act almost all the irrigation network has been entrusted to the provincial government through its officers.



Under the act fouling of irrigation channels that renders the irrigation water less fit for irrigation is less is strictly prohibited and is a punishable offence with sentence up to three months imprisonment.

### **2.3.12 Guidelines for the Preparation & Review of Environmental Reports, 1997**

Pakistan Environmental Protection Agency (Pak - EPA) formulated guidelines for project proponents and concerned agencies for the preparation and review of environmental reports in 1997. These guidelines include various sections on commencing EIA, assessing impacts, mitigation and impact management, Public consultation, Environmental Management Plan and other main features of environment reports (IEE and EIA reports) as well as the qualities of the interdisciplinary assessment EIA team members and role of stakeholders.

## **2.4 Organizational Framework**

### **2.4.1 Punjab Environmental Protection Agency**

Punjab Environmental Protection Agency (EPA) is a regulatory body responsible for the enforcement of Punjab Environmental Protection Act 1997 (Amended 2012) and rules and regulations made under the act. Pursuant to Section 3 (1) of the Environmental Protection Act, government has constituted inter-ministerial, multi - sectoral and multi stakeholder's body under the chairmanship of the Chief Minister. The council will serve as the apex body at the provincial level for decision making on environmental issues and promotion of sustainable development in the province. Since December, 1996 EPA functions as a separate administrative and functional unit of the Government of Punjab.

Punjab EPA has the following roles to perform:

- To review the IEE / EIA reports of the project submitted for issuance of No Objection Certificate (NOC)
- To conduct public hearing of the EIA
- To issue Environmental approvals
- To monitor the conditions of environmental approval
- To initiate actions against the proponent in case of non-compliance of the conditions of the environmental approval.



### **2.4.2 Punjab Forest Department**

Punjab Forest Department is an attached department of the Punjab Forest, Wild Life and Fisheries Department. The department is responsible to develop, maintain conserve and maximize forestry sector resources in the province of Punjab for sustainable development, biodiversity and environmental conservation. Its main functions include management of existing forests, creation of new forest resources and educate public and other government departments on the need of tree plantation in the province. The department provides scientific based guidance to general public and other governmental departments on the feasibility of plants categories in different regions of the province.

Forest Act 1927 and amended 2010 empowers the provincial forest departments to declare any forest area reserved or protected. The act also empowers the provincial forest departments to prohibit the clearing of forests for cultivation, grazing, hunting, removing forest produce, quarrying, felling, and looping. Forest Department is headed by Director General and assisted by District Forest Officers posted in almost all districts of Punjab.

The project implementation will involve cutting of trees and clearing of vegetation within the Right of Way (ROW). The project contractors will be responsible for acquiring No Objection Certificate (NOC) from the Forest Department on the basis of approved EIA. On completion of the project, tree avenue plantation will be carried out by the NHA itself or through work awarded to Punjab Forest Department. NHA will be responsible for liaising with the Punjab Forest department on the type of trees to be planted as one of the environmental mitigation measures.

### **2.4.3 Punjab Wildlife Department**

Punjab Wildlife and Parks Department is responsible for the protection and conservation of wildlife in Punjab. The department draws authority from the enforcement of Punjab Wildlife Protection, Preservation, Conservation & Management Act, 1974 (Amended upto 2007 and Rules amended upto 2010). The department is also responsible for the management of Protected Areas and regulates sports hunting in the province. The Department is headed by Director General and assisted by one Director and ten Deputy Directors in the province.

NHA and the contractors will need to maintain liaison with the Wildlife Department to resolve the wildlife related issues that may arise at all stages of the project in consultation with the District Wildlife Officer.

#### **2.4.4 Punjab Revenue Department**

Punjab Revenue Department is one of the constituent department / functional unit of the Board of Revenues. The land acquisition process is initiated by the Board of Revenue / Revenue Department in coordination with the concerned federal / provincial department (NHA for this project) who intends to acquire private land for undertaking public interest project. Generally, land acquisition is initiated when the feasibility report of the project has been finalized.

The concerned department (NHA for this project) lodges application with the Board of Revenue/ Revenue Department identifying land for acquisition. Board of Revenue deposes Land Acquisition Collector (LAC) who could be District Officer (EDO) or any other officer appointed by the Board of Revenue or Executive District Officer (Revenue) to perform the functions of a Collector and distribution of compensations. Apart from Revenue Department, land acquisition process involves many departments depending on the characteristics and category of land to be acquired. Category of land is based on the type of land and type of built up structure etc.

#### **2.4.5 District Officers Environment**

Offices of District Officers (Environment) were established under the Provincial Local Government Ordinance 2001 with the aim to perform environmental control, including control of air, water and soil pollution in accordance with federal and provincial laws and standards at the district level. District Officers (Environment) are currently functioning as the arm of the Director General, Punjab Environmental Protection Agency for the enforcement of the Punjab Environmental Protection Act 1997 (Amended 2012) in their respective Districts.

District Officer (Environment) provides guidance and assistance to the proponent of the projects in submission of the EIA Report to Director General, Punjab EPA. Subsequently, Environmental Assessment Reports submitted to the DG for the



issuance of No Objection certificates (NOC) are referred to respective District Officer (Environment) for scrutiny and verification of the project details mentioned in the report.

The District Officer (Environment) is also responsible for the environmental monitoring of the projects under execution in the district and regular submission of progress reports to the Director General, Punjab EPA. In case of the initiation of construction of the projects in the district without prior issuance of IEE/ EIA as the case may be, District Officer (Environment) issues notices to the violators for complying with the provisions of the Punjab Environmental Protection Act 1997 (amended 2012).

#### **2.4.6 National Highway Authority (Ministry of Communications), GOP**

The implementing agency of the proposed Project is National Highway Authority (NHA) Ministry of Communications, Government of Pakistan (GOP). The management of NHA will ensure that all the proposed measures are effectively implemented at the design, construction and operational stages of the project.



## SECTION - 3

### PROJECT DESCRIPTION

#### 3.1 Rationale of the Project

Lahore, the provincial capital of Punjab, is the second largest city in Pakistan with a population of 10 million. It is ranked 42 in the most populated urban areas in the world and the 8<sup>th</sup> largest city within the Organisation of Islamic Cooperation. The city's Population has been growing at a growth rate of about 3% per annum. Lahore has expanded almost double area-wise in the last 14 years. Looking at the expansion rate of the city and the amount of visitors visiting the city from M-2 Motorway and G.T Road, the proposed project seems to be a feasible option to ease the traffic congestion at the Lahore entrance.

The Project comprises Construction of 6-lane divided motorway, with allied facilities. It will be a limited access facility with a new 6-lane bridge over River Ravi. The Lahore Eastern Bypass will connect G.T Road (N-5) and Lahore – Islamabad Motorway (M-2) on one end to the Lahore Ring Road on the other. The proposed project will greatly benefit the road users by reduction in the vehicle operating cost due to less traffic congestion, better pavement surface and improved geometry.

#### 3.2 Benefits of the Project

The planned 6-lane bypass will largely contribute to the following:

- Economic and social development of Lahore city;
- Various industries in the area will directly benefit from an improved transportation system and the resulting uplift of economic condition of local community;
- Reduced travelling time;
- Reduced fuel consumption and transportation cost;
- Create job opportunities for laborers and semi-skilled staff during construction and operational phase; and
- It will also connect Lahore City to Lahore-Sialkot Motorway.



### 3.3 Project Alternatives

To meet the primary objectives of the project, five different alternative alignment options were studied. The detail of these alternatives is given below:

- a) Option-I: KSK Interchange to Amir Road Junction (On Lahore Ring Road)
- b) Option -II: KSK Interchange to China Road Junction (On Lahore Ring Road)
- c) Option -III: KSK Interchange to Amir Road Junction (On Lahore Ring Road)
- d) Option -IV: KSK Interchange to China Road Junction (On Lahore Ring Road)
- e) Option -V: KSK Interchange to Bund Road Junction (On Lahore Ring Road)

#### a) Option - I

##### **KSK Interchange to Amir Road Junction (On Lahore Ring Road)**

It starts at KSK interchange and passes in between Chak 39 and Chak 40. Then it crosses Main Bazar Jamil Park Road where the road from Barrath village meets it. After that the alignment crosses the Kala Khatai Road at about 0.5 Km from Haji Kot (Town on Kala Khatai Road). It then traverses through open fields, crosses River Ravi at about 4 Km from Haji Kot and meet Bhamma at about 5 Km from Haji Kot. It then follows Bhamma Road and finally meets Amir Road Junction on Ring Road. Its length is about 12.92 km.

#### b) Option – II

##### **KSK Interchange to China Road Junction (On Lahore Ring Road)**

It starts at KSK interchange and passes between Chak 39 and Chak 40. Then it crosses Main Bazar Jamil Park Road where the road from Barrath village meets it. After that the alignment crosses the Kala Khatai Road at about 1.0 Km from Haji Kot (Town on Kala Khatai Road). Then it traverses through open fields, crosses River Ravi at about 4 Km from Haji Kot and passes close to Jhugguan Jodha at about 6.0 Km to finally meet China Road Junction on Ring Road. Its length is about 13.55 km.

#### c) Option - III

##### **KSK Interchange to Amir Road Junction (On Lahore Ring Road)**

It starts at KSK interchange and passes between Chak 39 and Chak 40, then it crosses Main Bazar Jamil Park Road where the road from Barrath village meets it. After that the alignment crosses the Kala Khatai Road at about 0.5 Km from Haji Kot ( Town on





Kala Khatai Road), then it traverses through open fields crosses River Ravi at about 4 Km from Haji Kot and finally meets Amir Road Junction on Ring Road at about 7.0 km from Haji Kot. Its length is about 14.20 km.

**d) Option - IV**

**KSK Interchange to China Road Junction (On Lahore Ring Road)**

It starts at KSK interchange and passes between Chak 39 and Chak 40. Then it crosses Main Bazar Jamil Park Road where the road from Barrath village meets it. After that the alignment crosses the Kala Khatai Road at about 0.5 Km from Haji Kot (Town on Kala Khatai Road), then it traverses through open fields crosses River Ravi at about 4 Km from Haji Kot and finally meets China Road Junction on Ring Road at about 7.5 Km from Haji Kot. Its length is about 14.30 km.

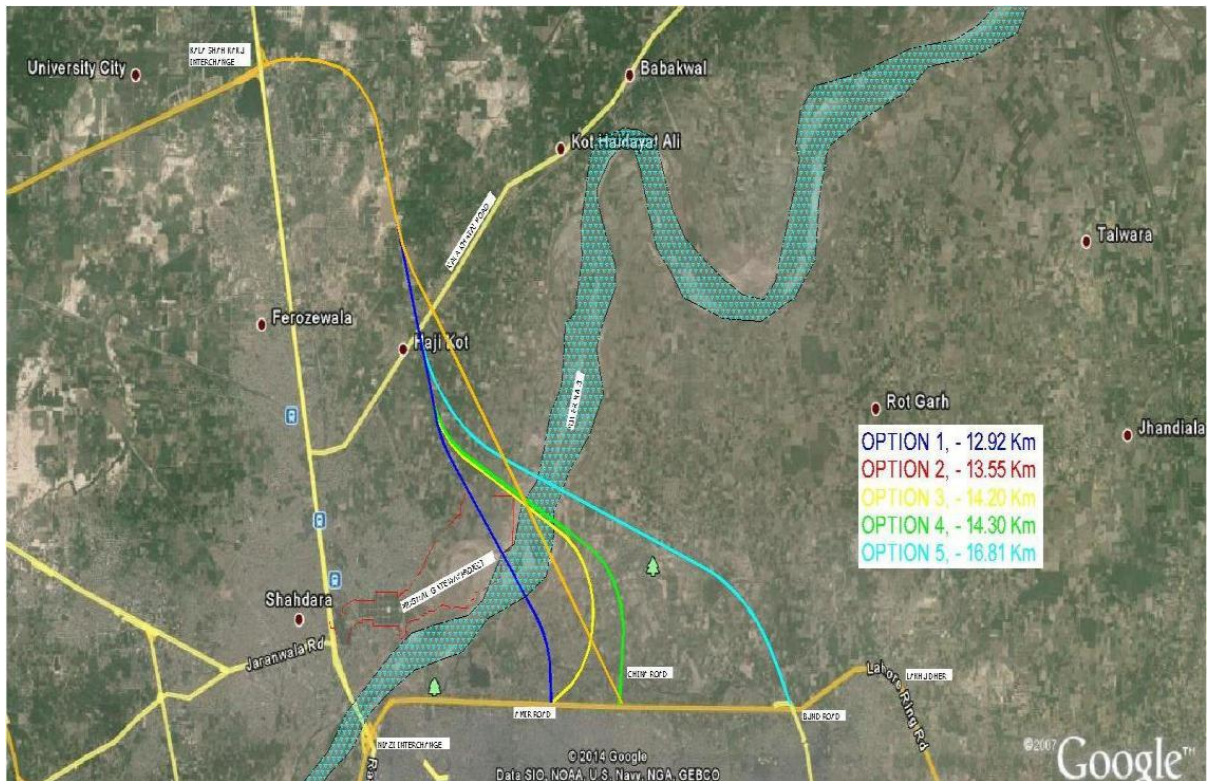
**e) Option - V**

**KSK Interchange to Bund Road Junction (On Lahore Ring Road)**

It starts at KSK interchange and passes between Chak 39 and Chak 40. Then it crosses Main Bazar Jamil Park Road where the road from Barrath village meets it. After that the alignment crosses the Kala Khatai Road at about 0.5 Km from Haji Kot (Town on Kala Khatai Road), then it traverses through open fields crosses River Ravi at about 4 Km from Haji Kot and traverses close to Jabbo village about 5.0 Km and finally meets Bund Road Junction on Ring Road at about 10.0 Km from Haji Kot. Its length is about 16.81 km.

A location map of all the possible alignment options is shown in **Figure 3.1**.



**Figure 3.1: Location Map of Eastern Bypass - Alignment Options**

### CONSULTANT'S RECOMMENDATION

Considering advantages/disadvantages of all the proposed options for alignment, the Consultants recommended Option 5 based on the following facts:

- Its bridge length on river Ravi is lesser than all options
- It is away from populated area north of Ring Road & involves minimum relocation of local population
- It is away from waste water drainage point of Shahdara
- The proposed junction is away from Shahdara crossing, and it will be of much advantage to the large population in eastern and southern Lahore
- The Alignment report giving the details of these options was submitted to NHA on June 28, 2014.

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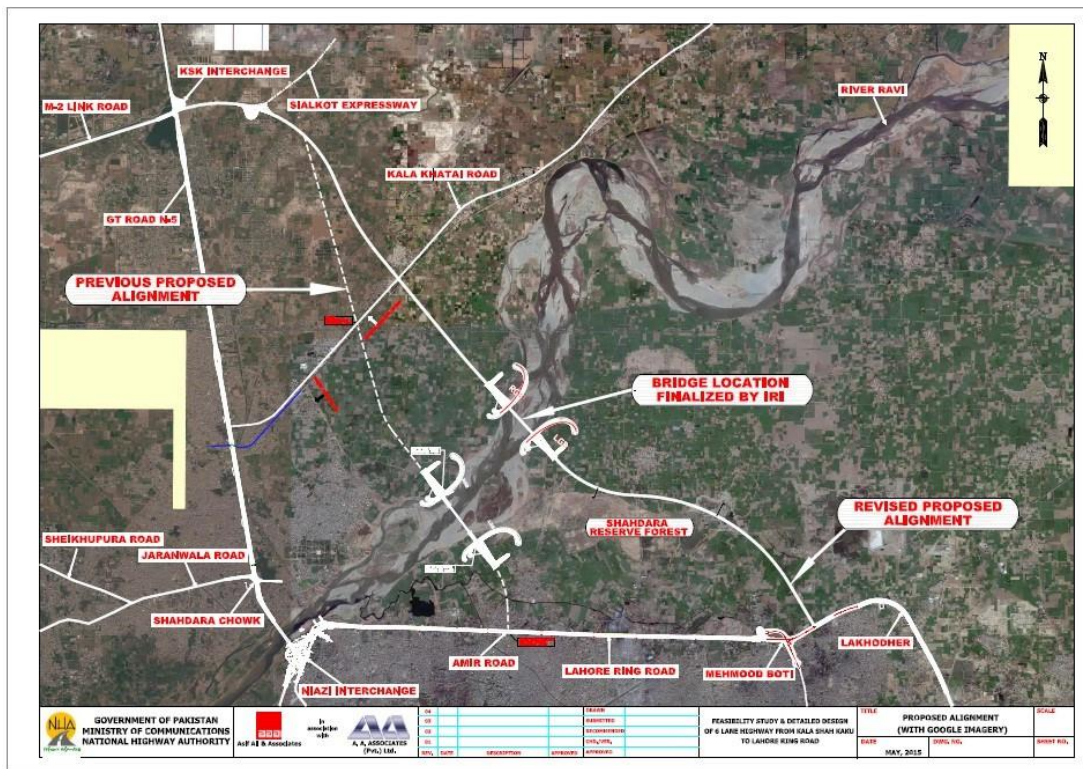
### HYDRAULIC MODEL STUDY & REVISION OF ALIGNMENT

Keeping in view the importance of the project, NHA asked to carry out Hydraulic Model study of River Ravi in Irrigation Research Institute (IRI) Nandipur, before finalizing location of the bridge and eventually the alignment.

Accordingly this study was undertaken by IRI, but unfortunately due to various problems and issues, this study was completed in 10 months and Hydraulic Model Study report was submitted in April,2015.

Based on the location finalized by IRI and NHA instructions to consider the take-off point for Lahore-Sialkot Motorway as proposed by M/S Prime Consultants, the revised proposed alignment was submitted on May 22, 2015 for approval. This alignment is presented in Fig.3.2 given below.

**Fig.3.2 Approved Revised Alignment**



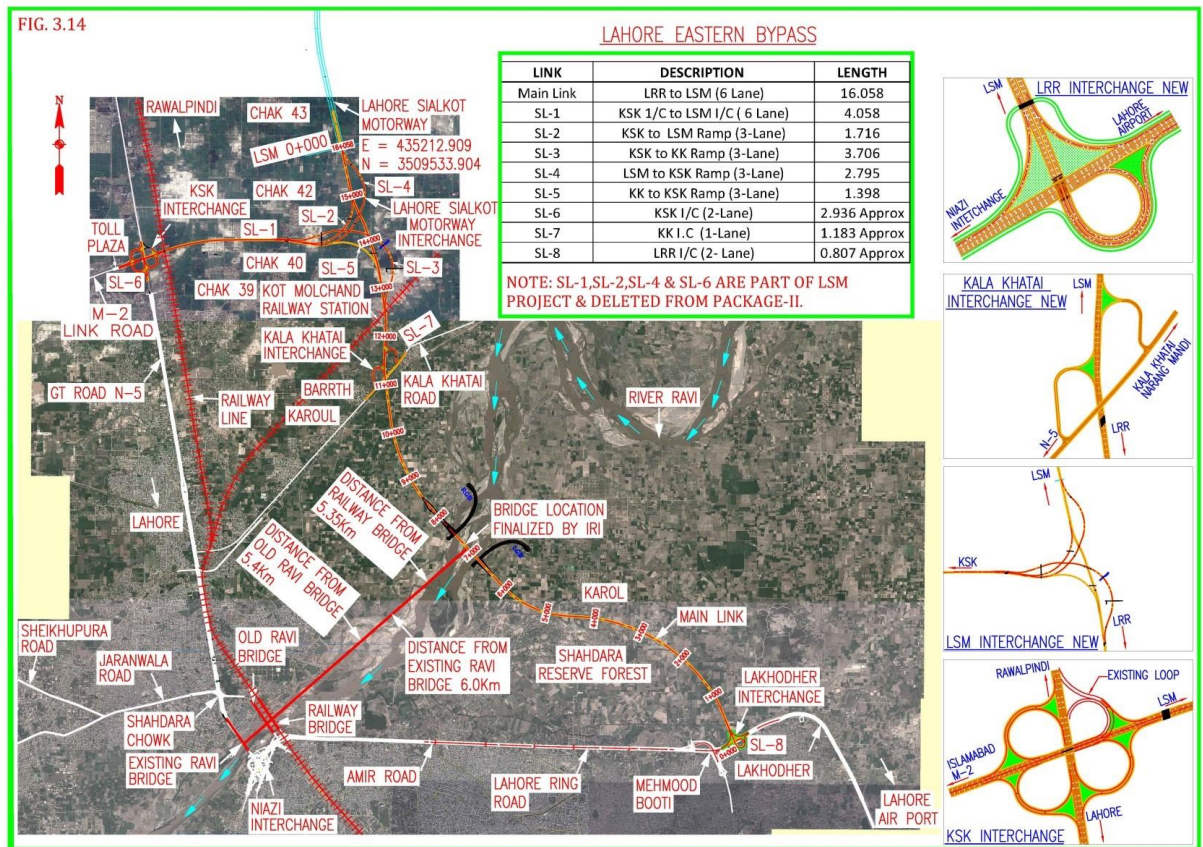
This approval for the revised alignment was conveyed by NHA on March 11, 2016 and accordingly topographic survey & other related design activities were carried out.

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## MODIFICATION OF REVISED ALIGNMENT

Later on, NHA required introducing a high speed directional-T interchange for Lahore-Sialkot Motorway interchange. Accordingly, alignment was modified with inclusion of this interchange, which is presented in Fig.3.3 given below.

Fig.3.3 Finalized Alignment



## DIVISION INTO PACKAGES

In September 2016 as per instruction of NHA, the project was divided into following two packages:

**Package I:** From Lahore Ring Road to Kala Khatai Road including Bridge over River Ravi & Lakhudher Interchange

**Package II:** From Kala Khatai Road to Lahore Sialkot Motorway including Kala Khatai Interchange

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As per directions of NHA, 6-lane link connecting KSK interchange & Lahore Sialkot Motorway Interchange (LSM) of about 4.0 Km including two Ramps of LSM Interchange were delinked from Lahore Eastern Bypass and made part of the Lahore Sialkot Motorway.

### **Selected Option for EIA Study**

This EIA report addresses the potential environmental impacts of alignment duly approved by NHA as described above.

### **3.4 Project Administrative Jurisdiction**

The project bypass is located on the North-Eastern side of Lahore. It will be operational under the administrative jurisdiction of National Highway Authority.

### **3.5 Project Implementation Schedule**

The project is expected to be completed within fifteen (15) months.

### **3.6 Cost of the Project**

The estimated capital cost of the proposed project is Rs. 15.276 Billion.

### **3.7 Land Acquisition**

It is estimated that a total of approximately 7,617 Kanals of land will be acquired for the construction of the proposed project.

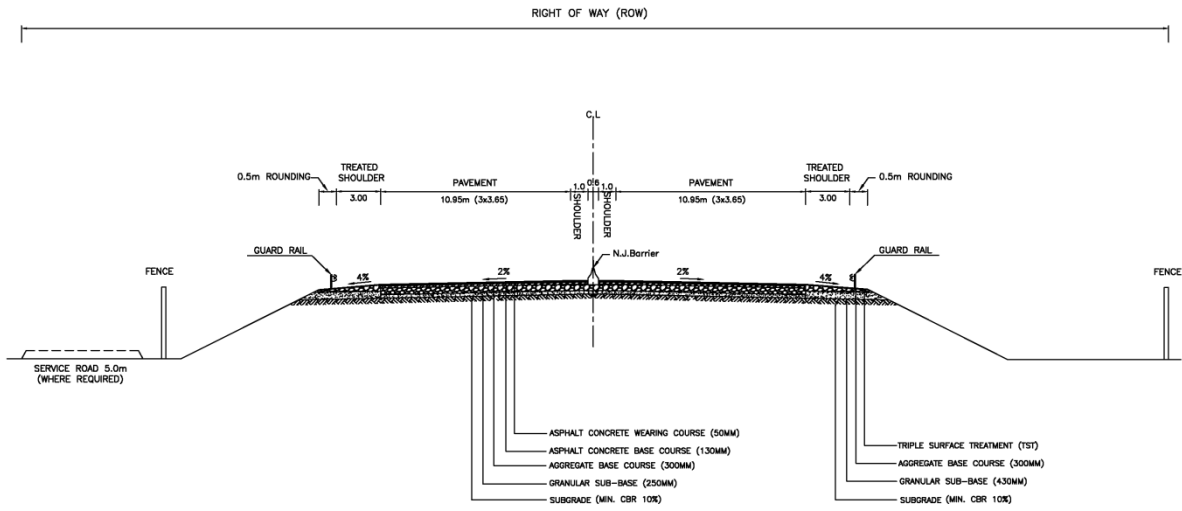
### **3.8 Components of the Project**

The Project includes construction of 6-lane divided motorway, and will comprise the following technical features:

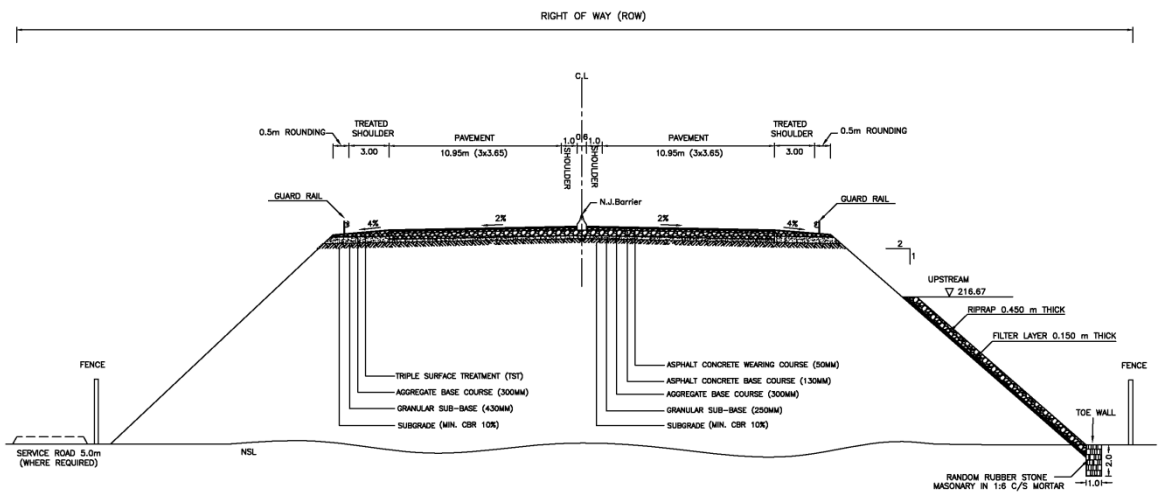


**Road Geometric Standards:** AASHTO geometric guidelines have been used as Geometric Standard for the design of the Project. Typical cross section of the road is presented in **Figure 3.4**.

**Figure 3.4 (a): Typical cross-section (except river khader)**



**Figure 3.4 (b): Typical cross-section (except river khader)**



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- Length of Road : 18.30 Km (Dual carriageway)
- Lanes : 06 (Road & River Bridge)
- Lane Width : 3.65m
- Paved Shoulders (Outer) : 3.0m
- Paved Shoulders (Inner) : 1.0m
- Right of Way : 100m

#### Design Speed:

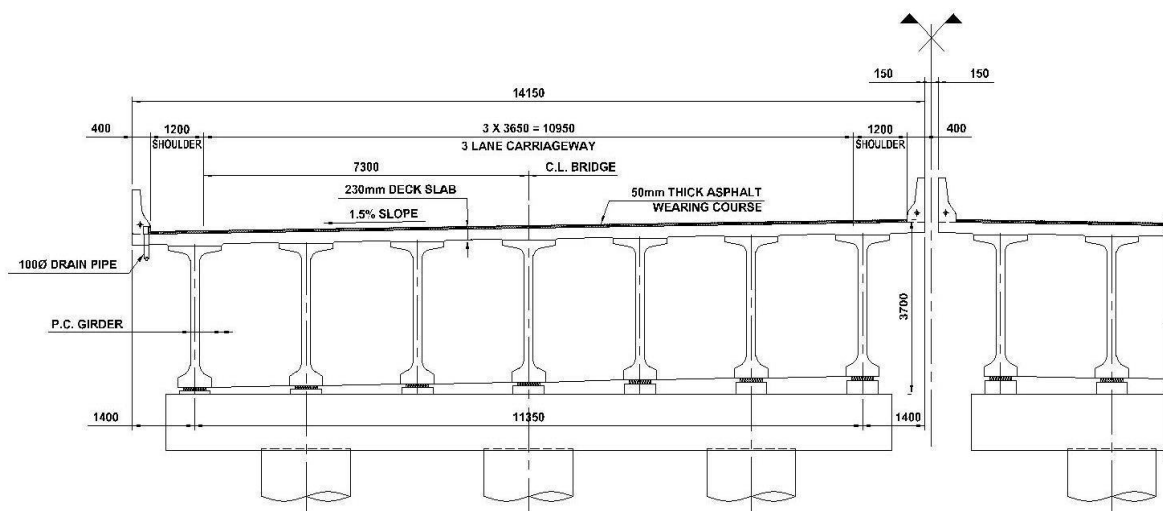
- Design speed : 120 Km/hr

#### Design Life:

- Embankment : 50 Years
- Bridges : 100 Years
- Road Pavement : 10 Years

**Design Criteria for Bridges:** Design Criteria for bridges shall follow the Standardization of Bridge Superstructures (SBS) issued by National Highway Authority and AASHTO specifications. Typical cross section for bridge is shown in the **Figure 3.5**.

**Figure 3.5: Typical cross-section of the bridge**



**Proposed Structures:**

## i) Interchanges (4 Nos.)

- 3 Nos. New Construction
- 1 No. Modification

## ii) Bridges

- One bridge over River Ravi
- 4 bridges on drains/nullahs
- 2 bridges over railway crossings
- 5 bridges over crossing roads

## iii) Underpasses (2 Nos.)

## iv) Cattle Creeps (21 Nos.)

## v) Culverts (11 Nos.)

**3.9 Traffic Survey Analysis**

Traffic studies are intended to provide necessary input data for determination of the magnitude and the pattern of the traffic load for the project road through the design period that involves collection, verification and analysis of the traffic data. From these results, the projected traffic for the design life is calculated and converted into equivalent standard axles loads (ESAL) for the structural design of pavement. The same counts and traffic study data is used to carry out capacity analysis of the intersection and check for adequacy of the existing facilities and/or propose adequate traffic solutions.

**3.9.1 Traffic Volume Estimation****3.9.1.1 Adjacent Road Corridors**

The traffic volume for Lahore Eastern Bypass is to be estimated from the probable diversion of the current traffic of competitive corridors which are mainly:

- G.T. Road (Shahdrah to KSK section)
- Lahore Ring Road (Northern Section)
- Lahore-Sialkot Motorway





The traffic on these main traffic carriers will be distributed on Lahore Eastern Bypass. For this reason the traffic volume on this proposed road can be derived from these roads with logically justified traffic engineering sense.

The interchanges of this bypass with the connecting roads are:

- KSK Interchange (North-Western End)
- Lakhoder Interchange (South-Eastern End)
- LSM-LEBP Interchange

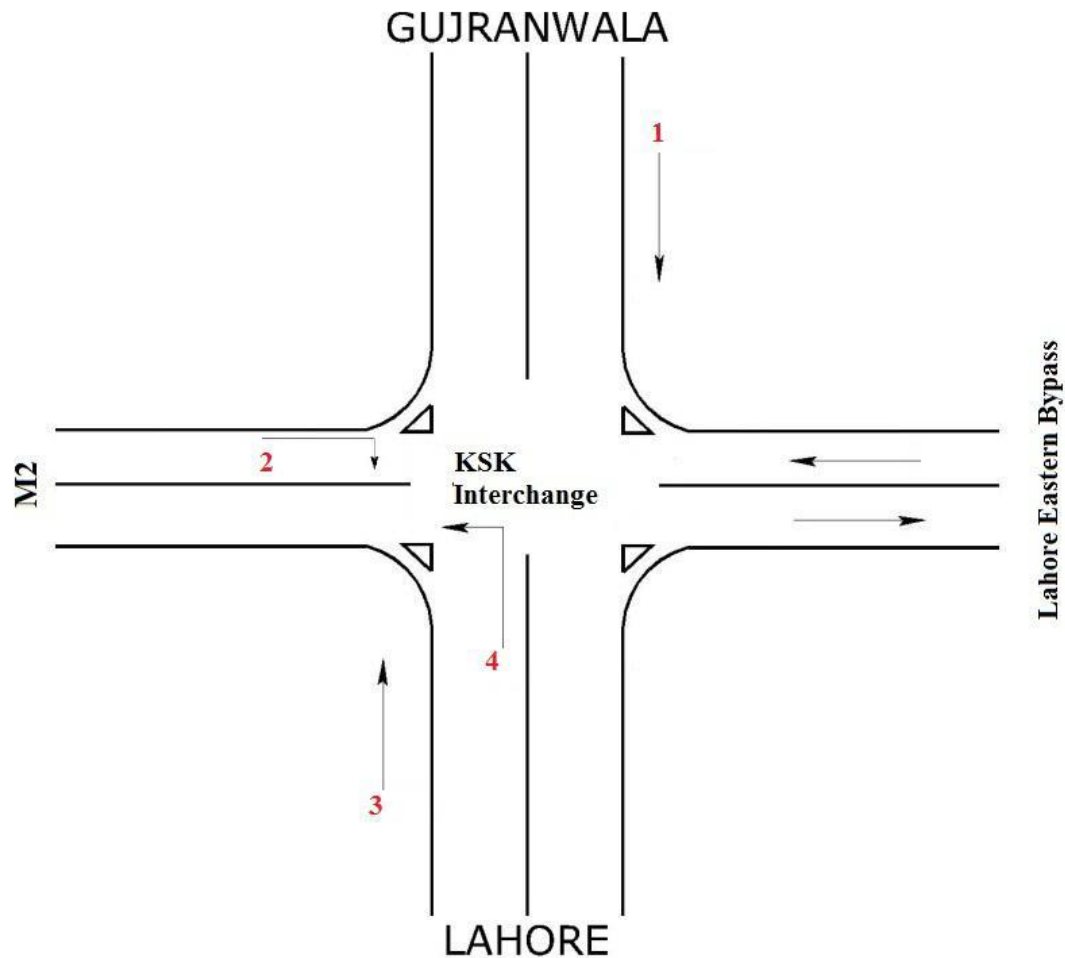
The **Table 3.1** shows the traffic sharing movements and their relative % age traffic share with the through traffic of Proposed Lahore Eastern Bypass on KSK Interchange with respect to their movement serials provided in the **Figure 3.6**.

**Table 3.1: Traffic sharing movements and their relative %age**

Sr. No.	Movement	Volume 2016	%age Share
1	Gujranwala to Lahore	15,663	30%
2	M2 to Lahore	1,182	30%
3	Lahore to Gujranwala	14,172	35%
4	Lahore to M2	830	40%

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**Figure 3.6: KSK Interchange Condition Diagram with Traffic Movements likely to share traffic volume with Proposed Bypass**



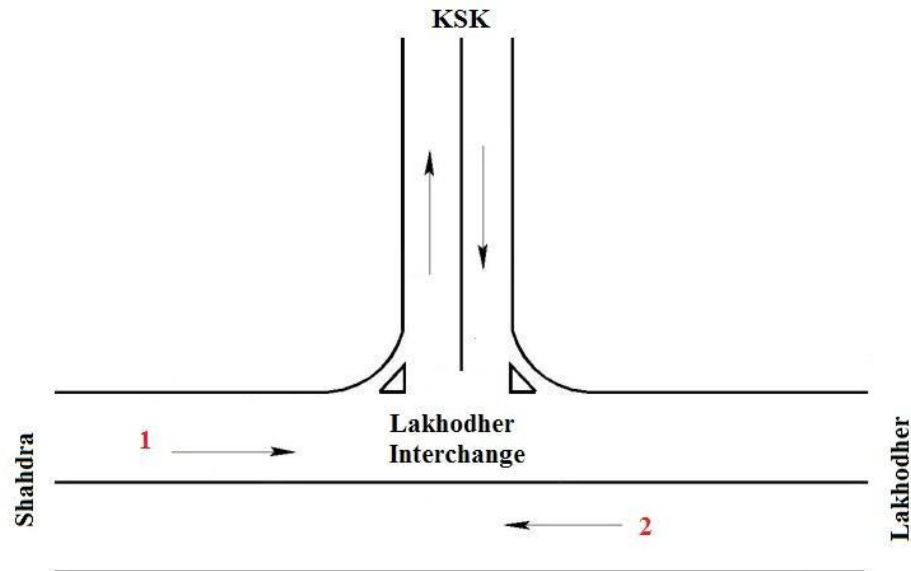
The **Table 3.2** shows the traffic sharing movements and their relative %age traffic share with the through traffic of Proposed Lahore Eastern Bypass on Lakhoder interchange with respect to their movement serials provided in the **Figure 3.7**.

**Table 3.2: Traffic sharing movements and their relative %age**

Sr. No.	Movement	Volume 2016	%age Share
1	Shahdrah to Lakhoder	23,789	20%
2	Lakhoder to Shahdrah	23,789	20%

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**Figure 3.7: Lakhodher Interchange Condition Diagram with Traffic Movements likely to share traffic volume with Proposed Bypass**



By using these above described assumptions the Annual Average Daily Traffic (AADT) 2016 for the proposed bypass comes out to be 19,852.

The volume for the bypass is further classified into the vehicle type categories which are done by assuming the following proportion of the individual vehicle type. This assumed proportion is taken from the through Traffic of G.T. Road from Lahore to Gujranwala as shown in **Table 3.3**.

**Table 3.3:**

Motorcycle/ Rickshaw	Cars/Jeeps	Wagons/Pick- ups	Coasters/mini- Buses/Buses	Truck (2 Axel)	Truck (3 & More Axel)	Tractor Trolleys
20.5%	42.7%	21.0%	5.3%	6.7%	3.2%	0.6%

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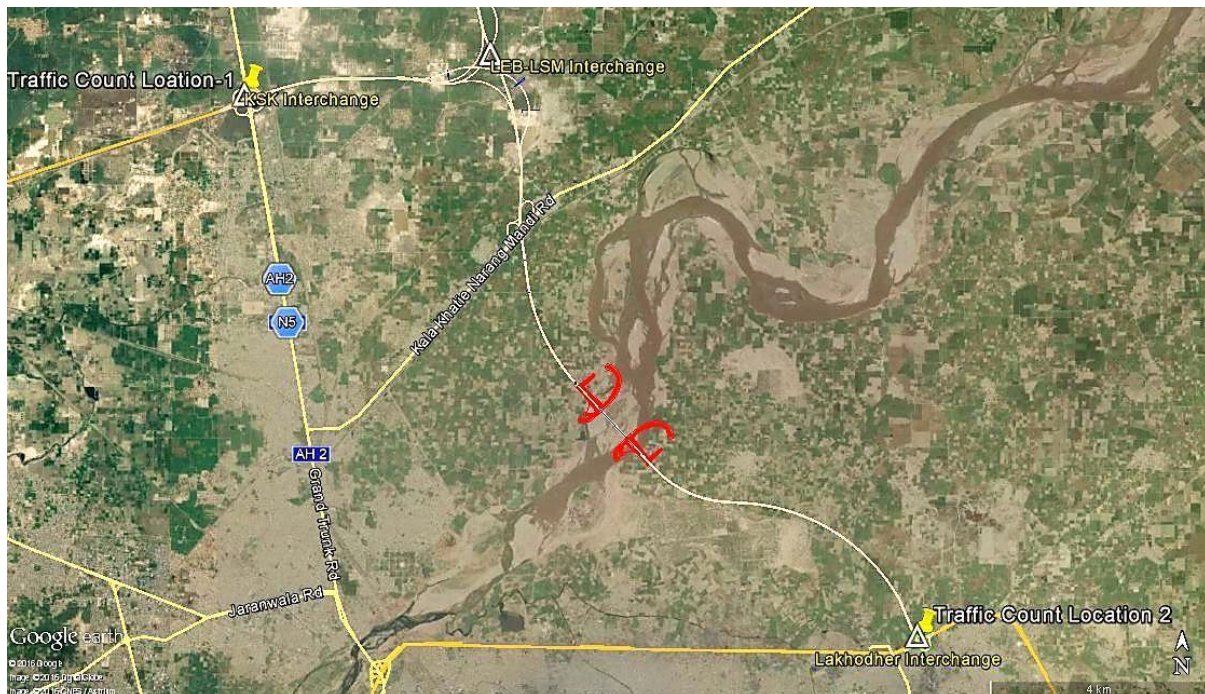
Thus, using these values the following results are generated for the classified vehicle types as shown in **Table 3.4**.

**Table 3.4:**

Date	Directions	Motorcycle/ Rickshaw	Cars/Jeeps	Wagons/Pick- ups	Coasters /Mini- Buses /Buses	Truck (2 Axel)	Truck (3 & More Axel)	Tractor Trolleys	Total
March, 2016	KSK-LRR	2010	4182	2061	519	660	315	55	9802
	LRR-KSK	2061	4288	2114	532	676	323	56	10050
<b>Annual Average Daily Traffic (AADT) 2016</b>		<b>4071</b>	<b>8469</b>	<b>4175</b>	<b>1051</b>	<b>1336</b>	<b>638</b>	<b>112</b>	<b>19852</b>

Traffic count locations for Lahore Eastern Bypass are shown in **Figure 3.8**.

**Figure 3.8: Final Traffic Count Locations for Lahore Eastern Bypass**



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### 3.10 Manpower Requirements

The manpower requirement during construction of the project will be approximately one hundred (1200) including managerial staff, skilled and unskilled labour which will be arranged by Construction Contractor.

### 3.11 Water Consumption

The water consumption during the construction phase of the project is estimated to be 96,000 gallons/day<sup>1</sup> for 1200 workers.

### 3.12 Waste Water Generation

The waste water generation is estimated to be 76,800 gallons/day<sup>2</sup> during the construction phase of the project.

### 3.13 Solid Waste Generation

The solid waste generation during the construction phase of the project is estimated to be 780.10 kg/day<sup>3</sup>.

### 3.14 Energy Sources

Electric power in the District of Lahore is provided by the Lahore Electric Supply Company (LESCO) that runs a complex grid with numerous local sub-stations. Other energy sources in the Project area are kerosene and LPG, obtained from Petrol stations and LPG dealers in the District. However, during the construction phase diesel fired generators will be used.

### 3.15 Construction Materials

The materials used in construction of the road for the proposed project would include coarse aggregates (crush), fine aggregates (sand), steel, water, asphalt, reinforcement, cement etc. According to the geotechnical investigation report of the proposed project, crushed base and sub-base materials will consist of a blend of processed aggregates such as crushed stone fragments and rock dust. To meet the grading

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<sup>1</sup>WASA Average Daily Per Capita Water Consumption (80 gallons/day)

<sup>2</sup>Design Criteria of Public Health Engineering for Water Supply, Sewerage and Storm Water Drain (Domestic sewage generation = 80% of water consumed/day)

<sup>3</sup>Analysis and Assessment report on integrated solid waste management in Lahore, Pakistan, 2010. Study conducted by ISTAC Company



requirement, blending may also be required. The design CBR for these materials shall be governed by the Project specifications. The limited material investigation using existing archive shows that the following are the nearest sources of the aggregate for base, sub-base, asphalt pavement and drainage material at shoulders.

- Sargodha Rock Quarries
- Tarki Rock Quarry
- Dina Gravel Deposits

A quarry at Chiniot is not recommended source due to poor rock type and having precedence of poor response in the road construction in the vicinity. For asphalt pavement material only Sargodha Rock Quarry is recommended. For coarse and fine aggregates for concrete Margalla Quarry and Lawrencepur sand deposits respectively are recommended. Dina Gravel deposits and Tarki Rock Quarry are recommended for open graded shoulder and Riprap material respectively.

### **3.16 Location of Construction Camps**

Camp sites will be selected keeping in view the availability of adequate area for establishing camp sites, including parking areas for machinery, stores and workshops, access to communication and local markets, and an appropriate distance from sensitive areas in the vicinity. Final locations will be selected by the contractor in consent with supervision consultant after approval from NHA.

### **3.17 Expected Equipment's for Construction**

The list of the machinery and the equipment expected to be used for the proposed project is provided in **Table 3.5**.



**Table 3.5: Machinery and Equipment Requirement for the Proposed Project**

Sr. No.	Machine Code	Name of Machine
1	3003	BULL-DOZER 90 H.P.
2	3005	FRONT END LOADER. 2.5 CUM.
3	3032	DUMPER. 18 T.
4	3033	DUMPER. 10 T.
5	3047	EXCAVATOR. (TRACK TYPE) 100 H. P
6	3061	COMPRESSOR 300 CFM
7	3062	ROCK DRILLER
8	3008	GRADER - 140. H. P
9	3016	COMBINATION ROLLER 10-12 T.
10	3024	WATER TANK BOWSER TYPE 12000 LTR.
11	3086	PUMP 4"DELIVERY (DIESEL)
12	3007	GRADER. 165 H.P.
13	3015	COMBINATION ROLLER. 18. T.
14	3004	FORNT END LOADER (3 CUM)
15	3011	TANDEM VIBRATORY ROLLER. 10-12T.
16	3018	P.T.R (9-WHEELER) 21. T
17	3025	WATER TANK TOW TYPE 4000 LTR.
18	3055	ASPHALT PLANT. 80T.
19	3058	PAVER 4 M WIDE
20	3061	COMPRESSOR. 300 CFM.

### 3.18 Land use of the Project Area

The land use of the project area is mostly agricultural with small villages/towns along the proposed route alignment.

### 3.19 Vegetation

As mentioned above, most of the route alignment is surrounded by agricultural fields. There is a reserve forest (Shahdrah Reserve Forest) in close proximity of the proposed alignment mostly comprising Eucalyptus trees. The commonly found trees along the route alignment were Neem, Alstonia, Jamin, Peepal, Eucalyptus, Simbal, Sheesham, Poplar and Keekar.

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## SECTION-4 ENVIRONMENTAL & SOCIAL BASELINE

### 4.0 General

Assessment of environmental and social impacts of the Project required development of a detailed environmental and social baseline of the study area. Unless otherwise stated or implied by the context, 'Study Area' for this study is defined as Lahore Eastern Bypass that will connect the Lahore Ring Road to the GT Road and Motorway M-2 through Kala Shah Kaku Interchange and 5 km of area around it. Baseline information for environmental and social components has been developed using secondary literature as well as surveys (primary data) conducted in the Study Area. References to the secondary information are provided in the text.

### 4.1 Environmental Setting

#### 4.1.1 Topography

The area is plain and highly fertile, with lush grounds on the site and in surrounding areas. Topography revealed that site is almost levelled. As compared to surrounding area the site is low lying area. Heavy rains or flood may affect the area and water could be accumulated in the area for longer period of time. A view of topographical features in and around the project area is given in **Figure 4.1**.

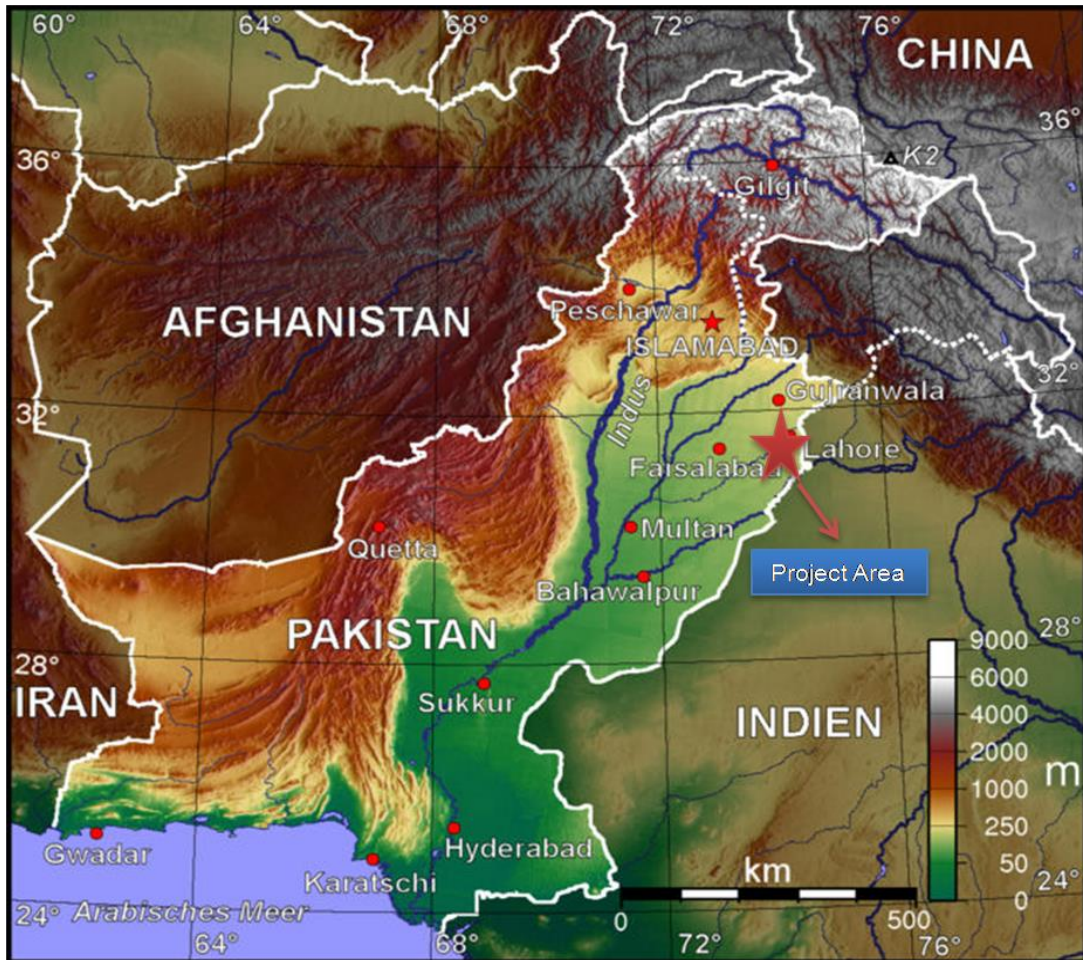
**Figure 4.1: View of topographical features in the project area**



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Overall, the district Lahore is divided into two parts. The low lying alluvial soil is along the Ravi River, and the upland in the east. Upland is a plain slope from north-east to south-west. The lowlands are generally inundated during the monsoon season by Ravi River, flowing in the west of district along its boundary with district Sheikhupura. **Figure 4.2** represents the topography of the area.



**Figure 4.2: Topography of the Study Area**

#### 4.1.2 Geology and Soil

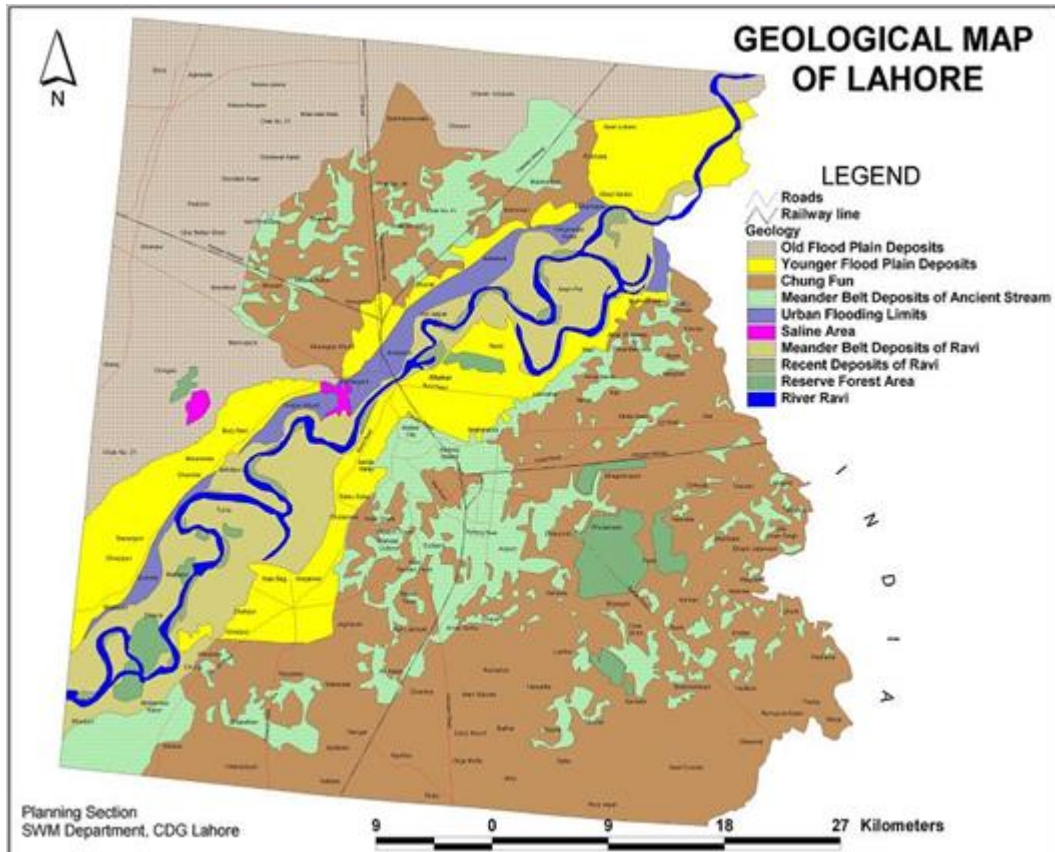
Lahore plains are most probably underlain by the Potwar stratigraphy, but it would be deeply eroded. Lahore is located just north of the NW-SE running Sargodha high, where the sedimentary rocks may also be truncating against the high. Moreover, very thick alluvial and older fluvial deposits (Recent to Miocene) before older eroded rocks are also encountered.

These alluvial deposits comprise earthy brown to brown silt, clay and sand. The beds are largely hard, laminated and sandy with interbeds of clay and layers or lenses of

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sand. Geological map of the Study Area is given in **Figure 4.3**. Project site is located in meander belt deposits.

**Figure 4.3: Geological Map of the Study Area**



The Project Area does not have any valuable minerals. Although, scientific/in depth, investigations haven't been carried out, yet the surveys conducted have failed to discover any minerals worth the name till to- date.

The only minerals worth to value are kallar and kankar in the district Lahore. Kallar is the grey powdery substance collected and taken out from the old village sites and other deserted abodes in the district. It is used for the manufacture of crude saltpeter and also as manure for the top dressing of young cotton and tobacco plants (no longer in the line of extensive cultivation). With the Passage of time the demand for Kallar diminished and its use as a trading commodity is on the decline. Kankar is used for metaling roads and its smaller particulars are burnt for lime. It is a kind of limestone

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gravel and is found, after being dug out at a depth varying from one to eight feet, in many parts of the district particularly the uplands

### ***Soil***

In general, soil in the Lahore District is cohesion less and is of alluvial type deposited by Ravi River. Various soil layers below the ground level includes: silt, silty clay, silty sand, poorly graded sand with silt, lean clay etc. The soil is different in character and generally inclined to be dry. However, it is rich in potential plant nutrients. Rainfall is low and groundwater is saline and brackish at the shallow depth and irrigation is largely dependent on the canals. Tube wells have also been sunk at the greater depths in the Project Area where fresh water is available. The chemical quality of groundwater in the district varies with depth. However, the sweet potable water is available in a belt five to twenty miles wide paralleling the Ravi River.

### **Geo-technical Investigation Study**

The geotechnical investigation of the project area were undertaken to meet the following objectives:

- To delineate the subsoil conditions of the site area.
- To evaluate the geotechnical design parameters for various structures

A total of 6 testpits of 1 m deep were performed and five borrow area samples were collected for the proposed road construction.. The field investigations were performed as per the latest ASTM standards (ASTM D1556-07).

Samples collected from the testpits were subjected to the following tests, as per latest ASTM, AASHTO, BS or equivalent Standards, as listed in **Table 4.1**.

**Table 4.1: List of Lab tests and the ASTM Standards**

No.	Laboratory Test	ASTM / BS Standard
1.	Grain Size Analysis (GSD)	ASTM D421-85(07), ASTM D422-63(07)
2.	Atterberg Limits (ATL)	ASTM D4318-00
3.	Modified Proctor Compaction Test (MPT)	ASTM D1557-12, AASHTO T180
4.	California Bearing Ratio Test (CBR)	ASTM D1883-05, AASHTO T193-92



Disturbed soil samples were obtained from the testpits. Disturbed samples were used to classify the soil type and depth of occurrence of different layers, and were preserved, for laboratory testing. All the samples obtained from the testpits were properly preserved in polythene bags and labelled as disturbed samples. The entire sampling, preservation and transportation of the samples were carried out as per latest ASTM standards.

Laboratory compaction tests of soil using modified effort were performed on nine (9) samples collected from test pits, the results of which indicate maximum dry density ranging from 1.66g/cm<sup>3</sup> to 2.03g/cm<sup>3</sup>.

According to the tests performed, The sub-soil lithology comprises of top vegetative cover, underlain by Lean Clay/Silty Clay/Silty Sand up to maximum investigated depth of 1m below NSL. The ground conditions consist of the following general conditions summarized below in **Table 4.2**.

**Table 4.2: Summary of ground conditions of the project area**

Testpit No.	Top Depth (m)	Bottom Depth (m)	Description Title	Description
1	0	0.8	CLAYEY SILT	Light Brown. Firm. Clayey Silt. Low Plasticity. Low Dry Strength. Trace Concretion. Slightly Moist
1	0.8	1.6	SILTY SAND	Light Gray. Loose. Silty Sand. Dry to Saturated
1	1.6	3	CLAYEY SILT	Brown. Stiff. Clayey Silt. Non Plastic. Trace Concretion. Moist.
2	0	3	SILTY SAND	Light Gray. Loose. Silty Sand. Dry to Saturated. Trace Plastic Bags. Cloth Pieces
3	0	3	SILTY SAND	Light Gray. Loose. Silty Sand. Dry to Saturated. Trace Plastic Bags. Cloth Pieces
4	0	0.69	SILT	Light Brown. Firm. Silt. Non Plastic. Low Dry Strength. Trace Concretion and Grass Roots
4	0.69	1.64	LEAN CLAY	Brown. Stiff. Lean Clay. Medium Plasticity. Medium Dry Strength. Moist
4	1.64	3	SILTY SAND	Gray. Loose. Silty Sand. Trace Mica. Trace Silt. Moist
5	0	0.89	SILT	Light Brown. Firm. Silt. Non Plastic. Low Dry Strength. Trace Concretion and Grass Roots
5	0.89	3	SILTY SAND	Gray. Loose. Silty Sand. Trace Mica. Trace Silt. Moist
6	0	1.79	LEAN CLAY	Brown. Stiff. Lean Clay. Low to Medium Plasticity. Medium Dry Strength. Moist

Groundwater was not encountered up to investigated depth of 1 m during investigation at site.

#### 4.1.3 Climate and Meteorology

Generally the climate of the area is dry and severe during summer season and moderately cold in winter. The Lahore, Punjab has a subtropical steppe/ low-latitude semi-arid climate that is hot all year (Köppen-Geiger classification: BSh). Meteorology data was collected from different previous studies and from the website: <https://weatherspark.com/averages/32865/Lahore-Punjab-Pakistan>. The Average Temperatures in Lahore are as under:

- The average annual temperature in Lahore, Punjab, Pakistan is fairly hot at 24.3 degrees Celsius (75.7 degrees Fahrenheit);
- There is a range of average monthly temperatures of 21.1 °C (38°F) which is a below moderate range. The average diurnal temperature variation/ range is 15.5 °C (27.9 °F).
- The warmest month (June) is very, very hot with an average temperature of 33.9 degrees Celsius (93.02 degrees Fahrenheit); and
- The coolest month (January) is mild having an average temperature of 12.8 degrees Celsius (55.04 degrees Fahrenheit).

#### ***Rainfall/Precipitation:***

Lahore mainly receives its rainfall during the monsoon season from June till September, and in winter season from December till February. The highest-ever annual rainfall in Lahore was recorded in 1955 when 1,317.5 millimeters (51.87 in) of rainfall was recorded. Lahore received below normal rains in 2009, and normal rains in 2007 and 2010. The following is the Annual rainfall in Lahore since 2007 based on data from the Pakistan Meteorological Department:

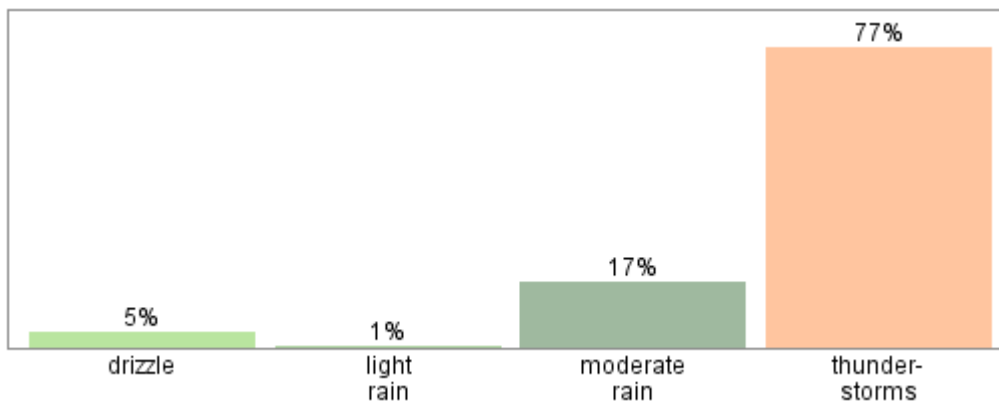
- In 2007, a total of 716 millimeters (28.2 in) rain was recorded;
- In 2008, a total of 917 millimeters (36.1 in) rain was recorded;
- In 2009, a total of 468.4 millimeters (18.44 in) rain was recorded;
- In 2010, a total of 738 millimeters (29.1 in) rain was recorded;



- In 2011, a total of 1,576.8 millimeters (62.08 in) rain was recorded as of September 21, 2011.

Over the entire year, the most common forms of precipitation are thunderstorms and moderate rain. Thunderstorms are the most severe precipitation observed during 77% of those days with precipitation. They are most likely around August 6, when it is observed during 40% of all days. Moderate rain is the most severe precipitation observed during 17% of those days with precipitation. It is most likely around August 5, when it is observed during 7% of all days. This is shown in **Figure 4.4**.

**Figure 4.4: Types of precipitation throughout the year**



***Sunshine Hours:***

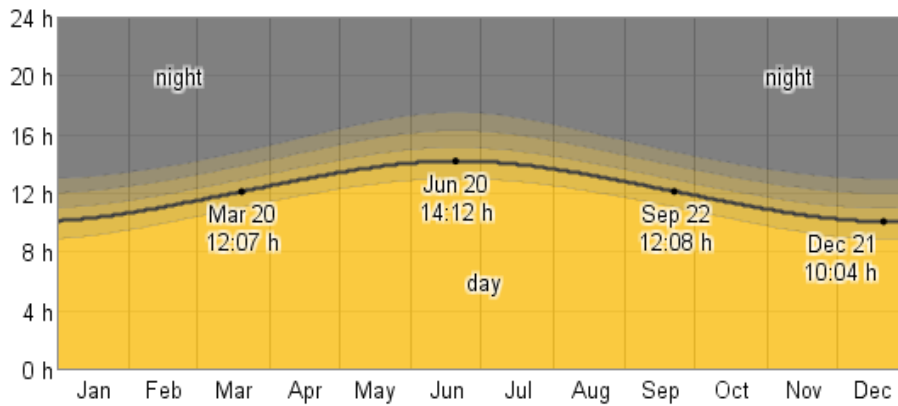
Mean hours of sunlight in Lahore, Punjab range from 6:50 for every day in January to 9:54 per day in May. The average of 8:28 of sunlight per day. Moreover, it is sunny about 71% of daylight hours. The remaining 29% of daylight hours are likely cloudy or with shade, haze or low sun intensity.

The length of the day varies significantly over the course of the year. The shortest day is December 21 with 10:05 hours of daylight; the longest day is June 20 with 14:12 hours of daylight.

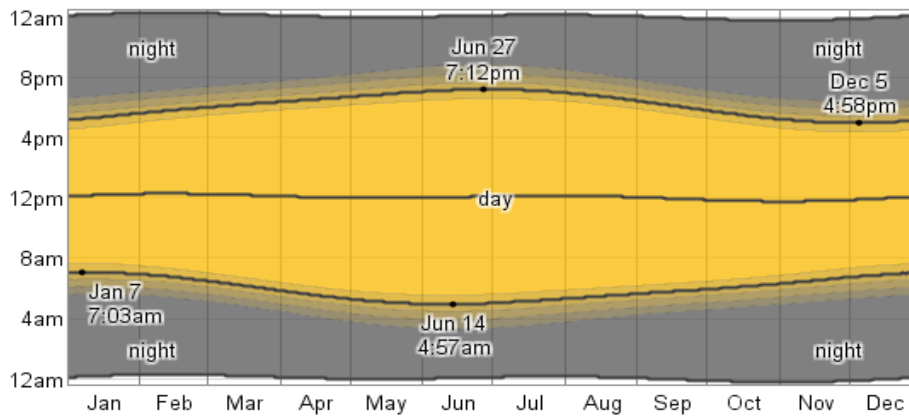
**Figure 4.5** shows daily hours of daylight and twilight and **Figure 4.6** shows daily sunrise and sunset with twilight of Lahore.

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**Figure 4.5: Daily hours of daylight and twilight**



**Figure 4.6: Daily sunrise and sunset with twilight**

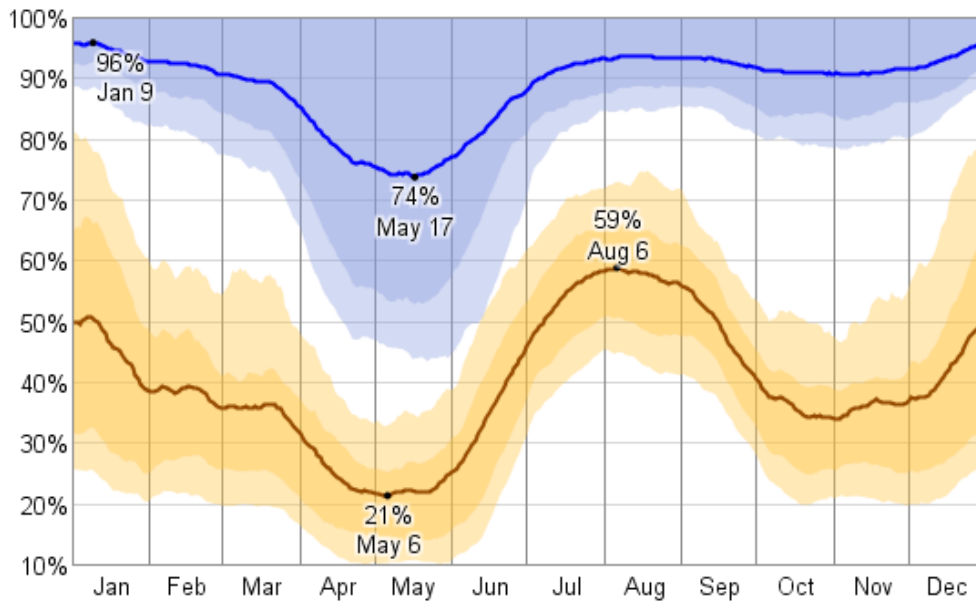


**Relative Humidity:**

The relative humidity typically ranges from 21% (dry) to 96% (very humid) over the course of the year, rarely dropping below 10% (very dry) and reaching as high as 100% (very humid).

The air is driest around May 6, at which time the relative humidity drops below 25% (dry) three days out of four; it is most humid around January 9, exceeding 93% (very humid) three days out of four. This is shown in **Figure 4.7**.

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**Figure 4.7: Annual Relative Humidity in Lahore**

The average daily high (blue) and low (brown) relative humidity with percentile bands (inner bands from 25th to 75th percentile, outer bands from 10th to 90th percentile).

#### **Wind Characteristics:**

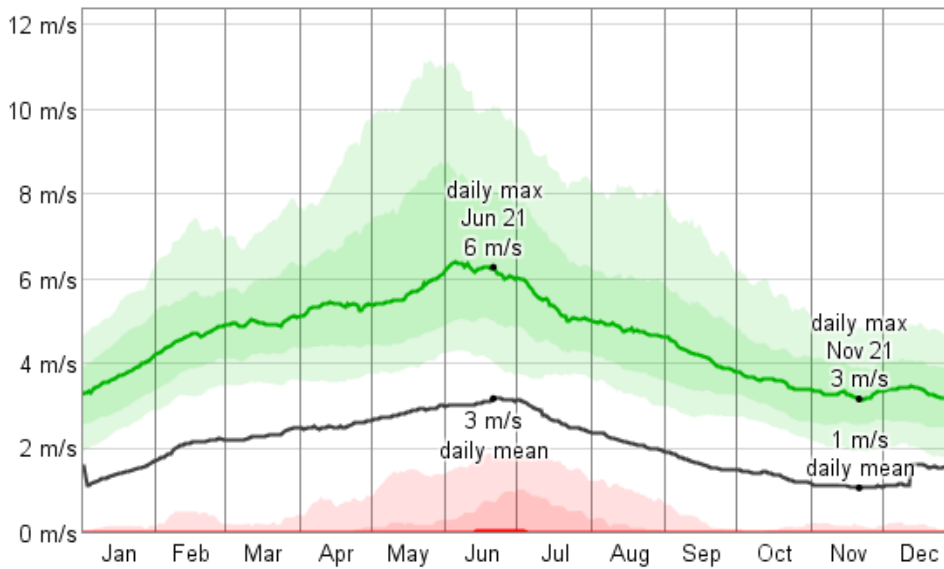
Study of the Meteorological Department Lahore reveals that 60% days of the year are calm and 33% days have mean speed of 1-3 knots. Only 6% days exhibit speed of 4-6 knots and higher. Wind directions are from north-west and south-east during summer and winter respectively. Summer winds bring monsoon rains. Wind storms of moderate intensity occur during summer (April - July). Their occurrence is maximum in June when low pressures are caused due to high temperature.

The highest average wind speed of 3 m/s (light breeze) occurs around June 21, at which time the average daily maximum wind speed is 6 m/s (moderate breeze). The lowest average wind speed of 1 m/s (light air) occurs around November 21, at which time the average daily maximum wind speed is 3 m/s (light breeze). This is shown in **Figure 4.8**.

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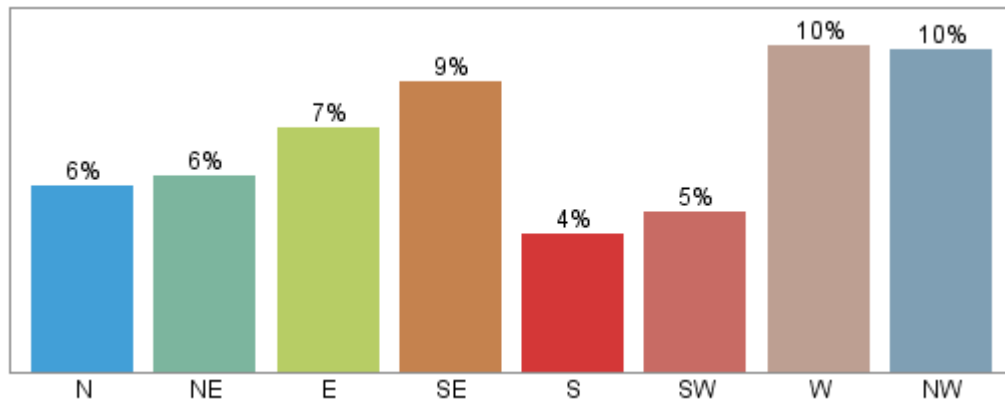
**Figure 4.8: Annual Wind Speed in Lahore**



The average daily minimum (red), maximum (green), and average (black) wind speed with percentile bands (inner band from 25th to 75th percentile, outer band from 10th to 90th percentile).

The wind direction is highly variable and is not predominantly from any single direction. The wind is least often out of the south (4% of the time) and south west (5% of the time). This is shown in **Figure 4.9**.

**Figure 4.9: Fraction of Time Spent with Various Wind Directions**



The fraction of time spent with the wind blowing from the various directions on a daily basis. Stacked values do not always sum to 100% because the wind direction is undefined when the wind speed is zero.

#### 4.1.4 Hydrogeology and Ground Water

##### *Hydrogeology:*

The aquifer under Lahore area is composed of unconsolidated alluvial sediments, consisting of sand, silt and clay in different proportions. The chief

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constituent minerals are quartz, muscovite, biotite and chlorite, in association with a small percentage of heavy minerals. The sediments have been deposited by the present and ancestral tributaries of the Indus River during Pleistocene-Recent age. The sedimentary complex has a thickness of more than 400 meters. The shifting course of the tributaries in the area has impregnated the heterogeneous character to the thick sedimentary alluvium. Therefore, the geological strata have little vertical or lateral continuity. In spite of their heterogeneity, the alluvial sediments constitute a large aquifer, which on regional basis behaves as an unconfined homogeneous aquifer (Greenman et al., 1967). The individual lenses of silt and clay do not impede the flow of groundwater, considering long-term pumping. Lahore aquifer is highly transmissive, with hydraulic conductivity variation between 25 m/day to 70 m/day. In spite of heterogeneous nature of alluvial complex, groundwater occurs under water table conditions.

#### *Regional Flow Pattern and Condition of Groundwater*

The regional groundwater flow in the area is from northeast, the Jammu and Kashmir foothills which are at higher elevation, towards the southwest along the general slope of the area.

The previous studies and behavior of existing shallow and deep tube wells in the area have shown that in spite of local variation, aquifer overall behaves as a single homogeneous water body and 73 % of the total consists of sand. This condition is during the monsoon season, when the water table is the high and the annual fluctuation is reported not more than 10 feet.

Before the introduction of controlled irrigation system in Punjab, the water table was deep towards the centre of Doabs and was shallow along the rivers. After the introduction of controlled irrigation system in the region, water table started rising as a result of leakage/seepage from irrigation canals and infiltration from irrigation applications on crop fields. As a result, the area became water logged until about 1960 when a quasi equilibrium state was reached, controlled in part, by evapotranspiration and drainage.



***Groundwater:***

Ground water quality is fresh (defined as acceptable in terms of its salinity). Raw water abstracted from the deep tube wells is believed to be essentially bacteria free. The water quality in the upper 50 meters zone of subsoil is generally brackish. For city's drinking purposes water is abstracted from groundwater aquifer by means of tube wells located throughout the city. The quality of water is generally adequate for direct consumption. About 83% of city population is consuming groundwater for drinking purposes.

Groundwater is available at a depth ranging between 15 to 23m below the natural surface level. Deep groundwater from a depth of about 210m in the vicinity of the Project Area is being extracted for meeting the domestic and commercial water demands in nearby areas. Adequate quantity of good quality groundwater is available below a depth of 50m.

Water consumption varies significantly and its variation as of industrial units. Usual water consumption pattern for industrial units and data collected from the prospective industrialist will form basis for total water demand. According to Master Plan-2030 for the city of Lahore, the mean average decline in ground water is about 2.03 feet per year.

***Ground Water Quality:***

The monitoring for ground water was done on 08-09-16 at two locations from the hand pumps. These locations were Kala Khatai Road near Usmania Mosque and from Chak No. 40. All the chemical and biological parameters were found within the permissible limits of NEQS. The water sampling at the specific locations can be seen in **Figure 4.10**. The details of these results are given in **Annexure-III**.



**Figure 4.10: View of ground water sampling in the project area**

#### 4.1.5 Air Quality

Motor vehicle emissions are composed of the by-products that comes out of the exhaust systems or other emissions such as gasoline evaporation. These emissions contribute to air pollution and are a major ingredient in the creation of smog in some large cities. A study by MIT indicates that 53,000 early deaths occur per year in the United States alone because of vehicle emissions.

Ambient air is being polluted due to emission of fuel gases like Carbon Monoxide (CO), Nitrogen Oxide (NO<sub>x</sub>) and Sulphur Oxide (SO<sub>x</sub>) due to the vehicle exhaust.

Air Quality was monitored from 07-9-16 to 08-09-16. The data was collected at three points along the proposed project route. The results are tabulated in **Table 4.3**.

**Table 4.3 Ambient Air Quality Results**

#	Location(s)	CO (mg/m <sup>3</sup> )	NO <sub>2</sub> (µg/m <sup>3</sup> )	SO <sub>2</sub> (µg/m <sup>3</sup> )	PM <sub>10</sub> (µg/m <sup>3</sup> )
	<b>NEQS-2010</b>	<b>5</b>	<b>80</b>	<b>120</b>	<b>150</b>
1.	<b>Near Lakhoder Interchange</b>	1.56	26.8	56.1	72
2.	<b>Near Kala Khatai Road</b>	1.10	30.4	43.6	41.1
3.	<b>Near Kala Shah Kakoo Interchange</b>	1.99	40.2	64.3	87.8

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The results indicate that all the parameters at the selected points are within the allowable limits of NEQS. Ambient air quality monitoring in the project area can be seen in **Figure 4.11**. The details of the Ambient Air Monitoring are given in **Annexure-III**.

**Figure 4.11: Ambient air quality monitoring in the project area**



#### 4.1.6 Waste Water Quality

There are few surface water bodies along the proposed alignment that include some distributaries, water courses and nullahs. A waste water sample was collected on 08-09-16 from Naala Bhed (Chak 40) for laboratory analysis. The results indicate that all the parameters are well within the limits specified by NEQS. The details of the results are given in **Annexure-III**.

#### 4.1.7 Noise Level

Noise pollution is an unpleasant human or machine-created sound that disrupts the activity or balance of human or animal life. A common form of noise pollution is from transportation, principally motor vehicles.

The noise level monitoring was conducted for 24 hours continuously on hourly basis at three locations from 07-09-16 to 08-09-16. Noise level monitoring in the project area can be seen in **Figure 4.12**. The results are presented in **Table 4.4**.

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**Figure 4.12: Noise level monitoring in the project area****Table 4.4: Noise level Monitoring Results**

#	Sampling Locations	Leq Equivalent -(Leq) Hourly Maximum - dB(A)		NEQS	
		Day Time (0600-2200 hrs)	Night Time (2200-0600 hrs.)	Day Time (0600-2200 hrs)	Night Time (2200-0600 hrs)
1.	Near Kala Shah Kakoo Interchange	66.37	56.00		
2.	Near Kala Khatai Road	61.65	52.12	55	45
3.	Near Lakhoder Interchange	49.93	47.12		

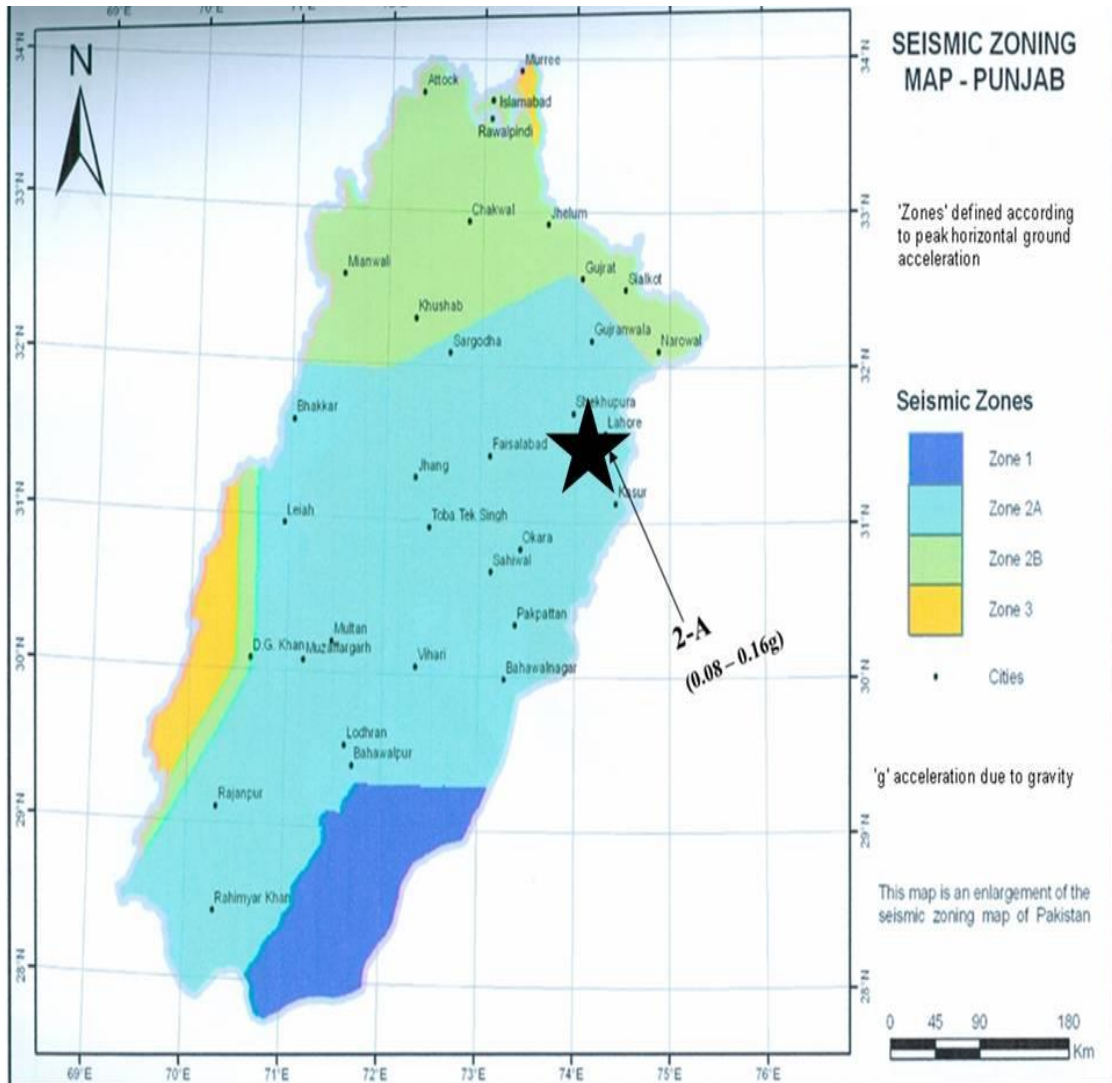
The table shows that the noise levels were higher than the NEQS at two monitoring locations maybe due to honking of horns or traffic. The details of noise level monitoring is given in **Annexure-III**.

#### 4.1.8 Seismology

According to building code of Pakistan prepared by NESPAK, the project area is located in Seismic Zone 2A of Pakistan (Lower limit of moderate damage). Zone 2A represents peak ground acceleration (PGA) from 0.08 to 0.16g. **Figure 4.13** shows the seismic zoning map of Punjab with the Project Area falling under Seismic Zone-2A.

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**Figure 4.13: Seismic Zoning Map of Punjab**



## 4.2 Ecological Resources

As climate of Lahore is semi-arid and subtropical, the vegetation of the area falls under scrub, dry, tropical thorn forest type as per phyto-geographical classification of the area.

The alignment in which our project area stands now, was once covered with native vegetation consisting, of trees like Karir (*Capparis deciduas*), Wan (*Salvadora oleoides*) and Jand (*Prosopis spicigera*). With the onslaught of civilization, this vegetation was cleared for agricultural purposes.

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Due to rapid increase in the population of the city and to cater for its housing and commercial requirements, these agricultural lands were converted into business centres, multi storey plazas and housing colonies.

#### 4.2.1 Flora

Lahore the city of gardens is heart of Pakistan. The city has seen the heydays of the Mughals, Sikhs and the British; all left their footprints on the history and cultural mosaic of the city. Resultantly Lahore is a treasure-trove of monuments, historical relics and remains which these nations have left in this historical metropolis of Punjab.

Though an ancient city; over the years Lahore has considerably expanded. However, along these modern additions, the ancient monuments, old gardens, trees, graveyards and traditional bungalows having attached gardens, large expanses of lawn and old roadside trees some of them can still be seen, are gradually disappearing. These green areas and old endemic trees of Lahore are home to many resident bird species as well as many summer, winter and transit migrants. So, Lahore is also very important due to its ecological conditions.

Several types of floral species are present in Lahore, however, some of the principal trees, shrubs (plants) and herbs (ground covering plants) are given below in **Table 4.5**, which illustrates their nomenclature including local names, English names and Botanical names.

**Table 4.5: Inventory of Trees Present in Lahore District**

No.	Common Names	Botanical Names
1	Arjun	<i>Terminalia arjuna</i>
2	Dhak	<i>Butea frondosa</i>
3	Mahwa	<i>Bassia latifolia</i>
4	Bahara	<i>Terminalia bellerica</i>
5	Amaltas	<i>Cassia fistula</i>
6	Gul-e-nishter	<i>Erythrina subrosa</i>





<b>No.</b>	<b>Common Names</b>	<b>Botanical Names</b>
7	Barringtonia	<i>Barringtonia acutengula</i>
8	Nim	<i>Melia indica</i>
9	Gab	<i>Diospyros embryopteris</i>
10	Berna	<i>Crateva religiosa</i>
11	Khark	<i>Celtus australis</i>
12	Putajan	<i>Putranjiva roxburghi</i>
13	Fiddle wood/Kashmir Lagotis	<i>Eithrxyllum ruberratum</i>
14	Gul-e-mast	<i>Dalinia indica</i>
15	Gul-e-mohr	<i>Poinciana regia</i>
16	Alstonia	<i>Alstonia scholaris</i>
17	Ashoke	<i>Saraca indica</i>
18	Sheesham	<i>Dalbergia sisso</i>
19	Alata	<i>Stercolia colorata</i>
20	Kenair	<i>Nerium grandiflora</i>
21	Weeping Willow	<i>Salix babylonica</i>
22	Keekar	<i>Parkinsonia aculeata</i>
23	Nilem	<i>Jacaranda mimosfolia</i>
24	Kachnar	<i>Bauhinia purpurea</i>
25	Molsary	<i>Mimosop elengi</i>
26	Bel	<i>Aegle marmelos</i>
27	Siris	<i>Albizia lebbek</i>
28	Tun	<i>Cedrela toona</i>
29	Jamin	<i>Eugenia jambolana</i>
30	Moor pankh	<i>Thuja orientalis</i>
31	Silkoak	<i>Grevillea robusta</i>
32	Sufeda	<i>Eucalyptus citriodora</i>
33	Peepal	<i>Ficus relegiosa</i>
34	Simbal	<i>Hyacinthus orientalis</i>
35	Berri	<i>Diospyros melanoxyton</i>
36	Suk chain	<i>Pongamia glabra</i>
37	Poplar	<i>Populus alba</i>



No.	Common Names	Botanical Names
38	Aam	<i>Mangifera indica</i>
39	Shehtoot	<i>Morus alba</i>
40	Peepal	<i>Ficus relegiosa</i>

Source: PHA, Lahore

Table 4.6 shows the list of endangered and prohibited floral species.

**Table 4.6: List of Endangered and Prohibited Species in Lahore District**

Endangered Species	Prohibited Species
Dalbergia sissoo	Eucalyptus species
Salvedora persica	Broussonetia papyrifera
Ficus bengalensis	Salmalia malabarica
Ficus religiosa	Populus nigra/Alba
Ficus enfectoria	Nerium odorum
Ficus glomerata	Thevetia nerifolia
Albizzia procera	
Albizzia lebbek	
Anogeissus acuminat	
Artocarpus integrifolia	
Artocarpus lakoocha	
Azadirachta indica	
Bischofia javanica	
Berser Serrata	
Dillenia indica	
Meringa oleifera	
Prosopis spiligera	
Ziziphus mauritiana	
Cassia alata	
Jaguinia aristata	
Tecoma undalata	

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Endangered Species	Prohibited Species
Prosopis juliflora	
Tamyrax articulate	
Magnolia grandiflora	
<b>Source:</b> Forest Department, Lahore	

There were no species reported by Forest and Wildlife Departments to be threatened, which are included in the IUCN Red Data Book.

The project area has a variety of trees, consisting of the following major species as shown in **Table 4.7**.

**Table 4.7: List of identified trees in the Project area**

Sr #	Local Name	English Name	Scientific Name
1	Amaltas	Pudding pipe tree	<i>Cassia fistula</i>
2	Golarra	Coccinia	<i>Coccinia cardifolia</i>
3	Alstonia	Devil tree	<i>Alstonia scholaris</i>
4	Neem	Ash-leaved bed tree	<i>Azadirachta indica</i>
5	Gul-e-nishtar	Coral tree	<i>Erythrina variegata</i>
6	Jamin	Black bery	<i>Eugenia jambolana</i>
7	Peepal	Ficus	<i>Ficus religiosa</i>
8	Simbal	Hyacinth	<i>Hyacinthus orientalis</i>
9	Sheesham	Sosoo tree	<i>Dalbergia sisoo</i>
10	Berri	Indian-cigar	<i>Diospyros melanoxylon</i>
11	Chanar	Platanus	<i>Platanus orientalis</i>
12	Suk chain	Smooth level pongama	<i>Pongamia glabra</i>
13	Poplar	Poplar	<i>Populus alba</i>
14	Aam	Mango	<i>Mangifera indica</i>
15	Bakain	Persian lilac	<i>Melia azedarach</i>
16	Molsary	Mimusaps	<i>Memusops elangi</i>
17	Shehtoot	Mulbury	<i>Morus alba</i>
18	Arjun	Terminalia	<i>Terminalia arjuna</i>



Sr #	Local Name	English Name	Scientific Name
19	Anar	Pomegranate	<i>Punica granatum</i>
20	Safeda	Indian willow	<i>Salix tetarsperma</i>
21	Keekar	Parkinsonia	<i>Parkinsonia aculeate</i>
22	Kawar gandal	Aloe	<i>Aloe vera</i>
23	Araucaria	Araucaria	<i>Araucaria cumminighamli</i>
24	Bans	Bamboo	<i>Bambusa stricta</i>
25	Khajor	Date palm	<i>Phoenix sylvestris</i>
26	Banana	Bannana	<i>Musa sapientum</i>
27	Kenair	Oleandar	<i>Nerium grandiflora</i>
28	Gulab	Rose	<i>Rosa Indica</i>
29	Ashook	Saraca	<i>Saraca indica</i>
30	Bougainvillia	Bougainvillia	<i>Bougainvillea spectabilis</i>
31	Dronta	Duranta	<i>Duranta repens</i>

There is a reserve forest (Shahdrah Reserve Forest) in close proximity of the proposed alignment mostly comprising Eucalyptus trees. This can be viewed in **Figure 4.14**.

**Figure 4.14: A view of Shahdrah Reserve Forest**



#### 4.2.2 Fauna

##### Mammals

Common mammals found in the area are dogs, cats, house rats and bats. Small Indian Mongoose and Indian Palm Squirrel have also been reported. These are mostly seen in areas where houses have already been constructed or are under construction.

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### **Reptiles**

Snakes such as cobra, kraits etc. were once common in the tract, but now cases of snake bites are very rare, as these reptiles have been either killed by expanding urbanization or they have moved away. Lizards such as Spiny tailed lizard (*Uromastix hardwickii*) and fringed toed lizard (*Acanthodactylus cantoris*) are also reported by the residents of the area.

### **Amphibians**

Amphibians frequently seen in and around the project area, especially during rainy season, include common Frog (*Rana tigrina*) and Indus valley toad.

### **Birds**

House sparrow (*Passer domesticus*), House crow (*Corvus splendens*) and Mynah (*Acredotheres tristis*) are the most common sight in the area. In addition, following birds have also been observed in the area.

1. Nightingale (*Pycnontus cafer*)
2. Parrot (*Psittacula krameri*)
3. Pigeon (*Columba livia*)
4. Hoopoe (*Upupa epops*)

There are no endangered species of flora and fauna in the Study Area.

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

No wildlife sanctuary or Game Reserve is located in the vicinity of the study area.

### **Critical Habitats**

No wild life sanctuary or game reserve (Critical Habitats), exists near the project area or the study area and therefore it can be stated that, this project does not affect any critical habitat as, no critical habitat is located close to the project area.



### 4.3 Social Environment

This section deals with the social conditions of the Project Area. During the desk/ office study, available reports/ documents were comprehensively studied. During the field survey interviews with the residents, shopkeepers, pedestrians, drivers, hospital owners were held and observations were taken after giving due consideration to the desk/ office study results.

#### 4.3.1 Political and Administrative Setup

The project area falls in Lahore City of the Lahore District. District Co-ordination Officer is the highest ranked administrator of the district. For the collection of revenue and administration, the districts are subdivided into Tehsils. Local governments also administer the area through Union Councils and Tehsils. The total area of the district Lahore is 1,772 square kilometers.

#### 4.3.2 Demographic Characteristics of the Project Area

The total population of Lahore District was 6,318,745 as enumerated in March 1998 with an intercensal percentage increase of 78.3 since March 1981 when it was 3,544,942 souls. The average annual growth rate of population in the district during intercensal period 1981-1998 was 3.5 percent. The total area of the district is 1772 square kilometers, which gives population density of 3,566 persons per square kilometer as against 2000 persons observed in 1981 indicating a fast growth rate of the district. **Table 4.8** gives population, its intercensal increase and average annual growth rate since 1951 of Lahore district.

**Table 4.8: Population and Intercensal Increase and Growth Rates**

Description	1951	1961	1972	1981	1998
Population (in 000's)	1,135	1,626	2,588	3,545	6,319
Intercensal Increase (%)	43.3	59.2	37.0	78.3	-
Average Annual Growth Rate (%)	3.7	4.1	3.8	3.5	-

*Source: DCR of Lahore District, 1998*

### A) Rural and Urban Distributions

The urban population was 5,209,088 or 82.4 percent of the total population of the Lahore district, which grew at an average rate of 3.3 percent during 1981-98. The growth decreased from 3.7 percent, which was observed during 1972-81. There are one Metropolitan Corporation, two Town Committees and one Cantonment in the District.

There were 261 Mauzas (a smallest revenue unit) in 1998. Of these 61 had population over 5 thousand, another 61 had 2 to 5 thousand, 64 had one to two thousand, and 74 had under one thousand persons while one was un-inhabited.

### B) Religion

The population of the district is predominantly Muslims i.e. 93.9 percent. The next higher percentage is of Christians with 5.8 points followed by Ahmadis 0.2 percent. While other minorities like Hindu etc. are very small in number as shown in the **Table 4.9** given below:

**Table 4.9: Percentage of Population by Religion and Rural/ Urban Areas**

Religion	Lahore District		
	All Areas	Rural	Urban
Muslims	93.9	90.9	94.5
Christians	5.8	8.9	5.2
Hindu	0	*	0
Ahmadis	0.2	0.1	0.3
Others	*	*	*

\* Refers to a very small number      Source: DCR Lahore District, 1998

### C) Ethnic Structure

The main castes and groups of the Lahore district are Arain, Jat, Rajput, Pathan, Mughal, Sheikh, Kombh and Gujjar. Besides, there are also village artisans, which include Lohars (blacksmiths), Tarkhan (carpenter), Kumhars (potters), Mochis (cobblers), Machhis (water-carries), barbers and weavers etc.



**D) Mother Tongue**

The mother tongue refers to the language used for communication between parents and their children in any household. Punjabi is the predominant language being spoken by majority (86.2 percent) of the population of the district followed by Urdu, Pushto and Siraki being spoken by 10.2, 1.9, and 0.4 percent. Sindhi is spoken by 0.1 percent.

**E) Sex Ratio**

Number of males for every 100 females was 111 percent recorded in 1998 Census in the district, which had decreased from 115 in 1981. The ratio was 112 percent in rural areas and it was 111 in urban areas.

**F) Marital Status**

The population above 15 years was classified into never married, married, widowed and divorced. 36.2 percent of the total population was never married, 58.6 percent married, 4.9 percent widowed and 0.3 percent divorced. The percentage share of never married male was higher than that of females, being 41.3 percent and 30.3 percent respectively. The percentage of never married females was higher in urban than in rural areas.

**Table 4.10** gives details about percentage of population 15 years and above by marital status, sex and rural and urban residence.

**Table 4.10: Population Percentage Distribution by Marital Status, Sex and Rural/ Urban Areas**

Marital Status		Lahore District		
		All Areas	Rural	Urban
Never	Both Sexes	36.2	31.5	37.1
	Married			
	Male	41.3	36.8	42.2
	Female	30.3	25.4	31.2
Married	Both Sexes	58.6	63.2	57.7
	Male	55.5	59.3	54.8



Marital Status	Lahore District			
	All Areas	Rural	Urban	
Widowed	Female	62.1	67.6	61.1
	Both Sexes	4.9	5.1	4.9
	Male	2.9	3.7	2.8
	Female	7.2	6.7	7.3
Divorced	Both Sexes	0.3	0.2	0.3
	Male	0.2	0.2	0.2
	Female	0.4	0.3	0.4

*Source: DCR of Lahore district, 1998*

### G) Migration

The total number of life time in-migrants in Lahore district was 1,034,848 or 16.4 percent of the population of the district. Of total life time in-migrants 890,427 persons settled in the towns. Of total district migrants 71.7 percent came from other districts of the Punjab, 10.1 percent were from Sind, NWFP and Baluchistan, 1.3 percent from Azad Kashmir and Northern Areas while remaining 16.9 percent were Pakistanis who repatriated from other countries. There were only 11 migrants whose birth place was not reported. **Table 4.11** throws light on life time in-migrants with their decomposition by place of origin, and place of settlement in rural and urban areas of the district.

**Table 4.11: Life Time Migrants in the District by Rural/ Urban Areas, 1998**

Description	Migrants by Residence		
	All Areas	Rural	Urban
Total in-migrants	100	100	100
Migrants from the same province	71.3	79.4	70.5
Migrants from other provinces	10.1	6.1	10.7
Migrants from AK/ NA	1.3	0.8	1.4
Migrants from other countries	16.9	13.7	17.4
Migrants from places not	**	0	*

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Description	Migrants by Residence		
	All Areas	Rural	Urban
reported			

Source: DCR of Lahore District, 1998

\* Including FATA and Islamabad Capital Territory

\*\* refers to very small number

#### 4.4 Economic Conditions

##### A) Economically Active Population of the Lahore District

The economically active population is defined here as the persons working, most of the time during the year preceding the census date i.e. 5<sup>th</sup> March 1998, looking for work, laid off and un-paid family helpers assisting their family. The economically active population as enumerated in the last census was 21.8 percent of the total population or 29.5 percent of the 10 years and over i.e. the population exposed to the risk of entering the economically active life at any time. The formal percentage is known as Crude Activity Rate (CAR), while the latter is known as Refined Activity Rate (RAR). Of the total male population 39.9 were economically active, while 60.1 percent were inactive, 25.4 percent children under 10 years, 18.0 percent students, 1.9 percent domestic workers, while 14.8 percent were landlords, property owners, retired persons, disabled etc. Further details can be seen in **Table 4.12**.

**Table 4.12: Percentage (%) of Population by Economic Categories, Sex and Rural Urban Areas, 1998**

Economic Category	All Areas			Rural			Urban		
	Both Sexes	Male	Female	Both Sexes	Male	Female	Both Sexes	Male	Female
Economically Active	21.8	39.9	1.6	20.7	37.9	1.3	22.0	40.4	1.6
Not Economically Active	78.2	60.1	98.4	79.3	62.1	98.7	78.0	59.6	98.4
Children under 10	26.1	25.4	26.8	31.1	30.3	32.0	25.0	24.3	25.7

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Economic Category	All Areas			Rural			Urban		
	Both Sexes	Male	Female	Both Sexes	Male	Female	Both Sexes	Male	Female
10									
Students	9.8	18.0	0.6	7.0	13.2	0.1	10.3	19.0	0.7
Domestic Workers	34.5	1.9	70.9	32.6	2.5	66.4	34.9	1.8	71.8
Others	7.9	14.8	0.1	8.5	16.1	00	7.7	14.5	0.1
<b>Unemployment Rate</b>	<b>20.7</b>	<b>21.4</b>	<b>2.2</b>	<b>21.5</b>	<b>22.1</b>	<b>1.2</b>	<b>20.5</b>	<b>21.2</b>	<b>2.4</b>

*Source: DCR of Lahore District, 1998*

### B) Unemployment

Unemployment rate is measured as ratio of looking for work and laid off in total economically active population comprising employed, looking for work, laid off and unpaid family workers, generally representing in percentage. The unemployment rate was 20.7 percent, which was mainly due to unemployment amongst males representing 21.4 percent, while female unemployment rate was just 2.2 percent. This is because of their small proportion in total economically active population. The detail is given in above in **Table 4.12**.

### C) Employed Population by Occupations

In 1998 of the total employed persons, 44.7 percent had elementary occupations, followed by service workers, and shop and market sale workers, 17.5 percent and professional 9.2 percent. In rural areas people having elementary occupations, were again in majority followed by skilled agricultural and fishery works and service workers and shop and market sale workers represented 52.5, 23.7, and 8.4 percent respectively. The highest percentage in urban area is of elementary occupations too, followed by service workers and shop and market sales workers and crafts and related trade workers and having 43.2, 19.3 and 9.1 percent respectively. Further details are given in **Table 4.13**.

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**Table 4.13: Percentage of Employed Population by Occupation and Rural/Urban Areas, 1998**

Occupation		All Areas	Rural	Urban
No.	Description			
1	Legislators, Senior Officials and Managers	0.7	0.1	0.8
2	Professional	9.2	2.5	10.5
3	Technicians and Associate Professionals	3.4	2.1	3.7
4	Clerks	4.1	1.2	4.6
5	Services Workers and Shop and Market Sales Workers	17.5	8.4	19.3
6	Skilled Agricultural and Fishery Workers	5.7	23.7	2.1
7	Craft and Related Trade Workers	8.5	5.3	9.1
8	Plant and Machine Operators and Assemblers	5.1	3.8	5.4
9	Elementary Occupations	44.7	52.5	43.2
10	Others	1.1	0.3	1.3

*Source: DCR of Lahore District, 1998*

#### **D) Industry, Trade and Trade Centers**

After Karachi, Lahore is the biggest industrial area in Pakistan. There has been a steady expansion of industries in and around Lahore since independence. There are many large industrial units in the district. These units manufacture cotton, woolen and silk cloths, carpets and rugs, textile products, lather and rubber foot wears, wearing apparel, pharmaceutical goods, soap, iron and steel products, heating, plumbing and lighting equipment, hardware, miscellaneous fabricated products, agriculture machinery, engines and turbines, textile machinery, printing machinery, metal working machinery, pumps and compressors, household machinery, water generators, motor generators, transformers, electric fans, communication equipments, cycles and rickshaws. There are also a good number of printing and publishing units and body building workshops. Besides, there are units of canning and preservation of food, edible oils, beverages, metal and wood furniture, rubber products, chemicals, glass products, repair of railway equipment, toys, stationary etc.



## 4.5 Transportation

Lahore is one of the most accessible cities of Pakistan. In addition to the historic Grand Trunk Road (G.T. Road), a Motorway (M-2) was completed in 1997 from Lahore to Islamabad. The government has built underpasses to ease congestion and prevent traffic jams, and according to official figures, Lahore has the highest number of underpasses in Pakistan.

### *Railways*

The Pakistan Railways headquarters is located in Lahore. Pakistan Railways provides an important mode of transportation for commuters and connects distant parts of the country with Lahore for business, sight-seeing, pilgrimage, and education. The Lahore Central Railway Station, built during the British colonial era, is located in the heart of the city.

## 4.6 Educational Facilities

Educational facilities in Lahore are mainly being provided by the Government of Punjab, the city government and the private sector and voluntary organizations. To a limited extent the high school education is also being managed by the Federal Government through the operation of few institutes located in the cantonment area.

Of the total educated persons 12.6 % are below primary, 23.2 % had passed primary, 22.5 % middle, 18.2 % Matriculation, 9.3 % Intermediate, 7.2 % Graduates, 2.6 % Post graduates while 0.6 % were certificate holders.

Total number of Government schools in Lahore District is 409 out of which, 223 are boy schools and 186 are girls schools while total number of students studying in these schools are 121,417 out of which, 46,625 are boys while 74,792 are girls. Similarly, total numbers of Municipal Corporation based schools in Lahore are 103 out of which, 44 are boy schools and 59 are girl schools. In these 44 boy schools total number of students is 4,575 and the total number of girl students is 9,606.

Similarly, there are number of colleges and universities are dealing with all fields of Science and arts. The Educational Facilities located at in Ferozpur Road include Beacon House School, Superior College, Central College, Kim's College, Hailey



College, GC university Qurish University , Punjab college, Quaid-e-Azam College, Govt. Centre Model School etc. The numeric details of these institutes are given in **Table 4.14**.

**Table 4.14: Population-Institution Relationship**

<b>Sr. No.</b>	<b>Type of Institutions</b>	<b>Number</b>	<b>Number of population served</b>
1	Higher Secondary Schools and Intermediate Colleges	36	182990
2	Degree Colleges	38	173359
3	Universities	52	48025

*Source: DCR of Lahore District, 1998*

#### **4.7 Health Facilities**

Ample medical and health facilities are available in the Lahore Metropolitan Corporation area and its suburbs. Shaukat Khanam Hospital is the latest addition in the medical care facilities in Lahore for the most dangerous disease in the country. i.e. Cancer. There are also other hospitals of voluntary organizations which provide health cover to the general public. King Zaid Bin Sultan Hospital is also a very advanced addition in the medical care for Lahore. Among the prominent hospitals are General Hospital, Lady Willington Hospital, Mayo Hospital, Fatima Jinnah Hospital, The Children Hospital, Services Hospital, and Ganga Ram Hospital etc. Besides, a number of private medical practitioners, Hakims and homeopathic doctors are also practicing in the city. There is Masood Hospital, a famous private health facility located at Kalma Chowk.

#### **4.8 Archeological and Cultural Property/ Places of Interest**

The most common places of interest in Lahore city are discussed as following;

##### **a) Royal Fort Lahore**

Royal Fort Lahore/Shahi Qila is located at an eminence in the north-west corner of the Walled City. The Citadel is spread over an area of 50 acres. Many visitors from the foreign and local tours of different educational institutions come to see this historical

place every year. The front gate of the Fort is called the Alamgiri Gate of the Royal Fort.

**b) Minar-e-Pakistan**

About 59.5 meters tall monument, called Minar-e-Pakistan is situated near the Royal Fort in the spacious Iqbal Park (previously known as Minto Park), where the historical resolution for the creation of Pakistan was adopted on the 23<sup>rd</sup> March, 1940. Around the minar, there are spacious parks with beautiful Cyprus trees and flowers all over.



The total area of the minar including the park is 22 acres.

**c) Badshahi Mosque**

The imperial or the Badshahi Mosque is across the courtyard from Alamgiri Gate of the Royal Fort. It has beautiful gateway and a courtyard that is said to be the largest mosque courtyard in the world for outdoor prayers.



**e) Lahore Museum**

Opposite the old Punjab University Hall, a Mughal style building on the Shahrah-e-Quaid-e-Azam, houses the Lahore Museum. The Museum contains some fine specimens of Mughal and Sikh door-ways and wood work and has a big collection of paintings dating back to Indo-Pakistan, Mughal, Sikh and British times. It also has a collection of musical instruments, ancient jewelry, textile, pottery and armory. There are also relics from some Tibetan and Nepalese exhibits.



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**g) Shrine of Data Ganj Bakhsh**

Close to the confluence of Lower mall and the Circular Road is the shrine of Data Sahib. Data Sahib was a great Sufi saint, which is well known work Kashf-ul-Mahjub has been translated from the original Persian version into Urdu and other several European languages and is considered a classic.

**i) Shrine of Madhu Lal Hussain**

This is the famous tomb in Lahore, where Mela Chiraghan is held on the last weekend of March and draws enormous crowds of devotees and others. The shrine is famous because of its antiquity and is revered by Muslims and Hindus alike.

**j) Recreational/Entertainment Places****Shalimar Garden**

About 5 kilometers east of Lahore is the famous, Shalimar Garden laid out by the Mughal Emperor Shah-Jehan in 1642 A.D. The Garden is spread out in typical Mughal Style and surrounded by high walls with watched-towers at the four corners. It covers an area of about 42 acres. Many people from the entire city come to visit the park with their families at the weekend to spend their idle times.

**k) Jallo Park**

The Jallo Park is 28 kilometers from Lahore and located on the Lahore Branch Canal. Covering an area of 450 acres, it has expanses of lawns, a forest research centre, a children's park, zoo, small museum and gift shop inside.



**1) Lahore Zoo**

Lahore Zoo covers an area of 24 acres and has a prime location in the capital city of the province of Punjab. It is located on Mall road near the WAPDA House. The premises are covered by ancient trees that provide natural environment to the animals. It houses birds of different species, reptiles, small creatures and big animals. These include lions, rhinoceros, chimpanzees, girafas, bears, elephants, wolves and deer etc.



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## SECTION - 5

### PUBLIC CONSULTATION

#### 5.0 General

Consultation with stakeholders is an important tool through which people with interest in the project (stakeholders) influence and share control over development initiatives and decisions and resources that affect them. It is a tool for managing two way communications between the project sponsors and concerned stakeholders. The goal is to improve decision - making and build understanding by actively involving individuals, groups and organizations which have a stake in the project. Their involvement increases project's long term viability and enhances benefits to local people and stakeholders.

In order to evaluate the socio economic and environmental impacts, filed surveys and involvement of stakeholders is extremely essential. Consultation with the community and their active participation plays a vital role in successful implementation of the project. To identify the different type of stakeholders and ascertain their perception about the construction of Lahore Eastern Bypass Project and its impacts, consultation was carried out. Stakeholders were consulted with the help of semi structured guide and their observations were duly noted. Informal group discussions were also held for obtaining feedback from the stakeholders.

Attempt was made to develop an understanding of the perceptions of stakeholders, assessments of social impacts and concerns of the people / communities in the nearby vicinity of the proposed alignment of Lahore Eastern Bypass by providing an opportunity to the public to give their valuable suggestions in a positive manner in order to reduce the chances of conflict through early identification of controversial issues and finding acceptable solutions in consultation with them.

#### 5.1 Identification of Main Stakeholders

Consultants carried out public consultation in various villages located along the ROW of Lahore Eastern Bypass Project. Following strategy was adopted for public consultation;

- Identification of stakeholders for consultation and their stakes in the project. Different stakeholders identified were the villagers, local residents, government officials, shop owners, farmers, public representatives, NGO's and general public etc;
- Meeting the stakeholders through consultant's environmental and social team and documenting the opinion of stakeholders expressed during the meetings.



The stakeholders consulted belonged to different categories of people as shown in the **Table 5.1** below;

**Table 5.1: Different Categories of Stakeholders and their Stakes**

Sr. No	Stakeholders	Stakes (Apprehensions)
1	Residents	Air pollution, exit/ entry problems, and disturbance of utilities, security / safety issues, noise, dust and waste material.
2	Shop owners	Noise, air pollution, access problem for customers, reduction in number of customers, exit/entry problems, disturbance of utilities, security/ safety and decline in business.
3	Motorized transport users	Appropriate detour, management of traffic, dust & noise, increasing the time of travelling
4	Office workers	Dust, noise & vibrations, access to office, disruption in routine work, parking of vehicles, disruption of utilities
5	Drivers	Appropriate detour, management of traffic, dust & noise, vibrations, disruption to passengers, increase travelling time during construction
6	Pedestrians	Appropriate detour, traffic management, exit/ entry problems etc.

Generally, people had the project information gathered through news papers and topographic survey team conducting survey at site. People were aware of the significance of the project in development of the area and were generally supportive and wanted to be part of the consultative process at all stages of the project. Following information was disseminated and discussed during the consultation process;

- Overall objectives, activities and various components of the project;
- Possible impacts of the project;
- Possible mitigation measures; and
- Beneficial factors and their involvement opportunities of the local people in the set of activities of the project.

The consultation in the project area was held from October 27<sup>th</sup> – 29<sup>th</sup>, 2016 through a Consultation Tool attached as **Annexure-IV**. The schedule of meetings conducted is given below in **Table 5.2**.



**Table 5.2: Schedule of Meetings Held in the Project Area**

Sr. No.	Date	Venue	No. of Participants
1	27/10/2016	Darbar, near Village Lakhudher	18
2	27/10/2016	Chowk, Village Jabbu	08
3	27/10/2016	Malik Pan Shop, Village Karol	08
4	28/10/2016	Govt. Boys High School, Nathokot	11
5	28/10/2016	Village Barrth	17
6	28/10/2016	DIG Farm House, Kot Mulchand	06
7	29/10/2016	General Store, Chak 42	07
8	29/10/2016	Farm House Rai Faiz (MPA) Chak 40	11

**Figure 5.1** given below shows the view of consultation meetings held with the stakeholders;



**Figure 5.1: View of Public Consultation meetings held with the Stakeholders**

## 5.2 Commonly Raised Concerns of the Stakeholders during Consultation

The most commonly raised concerns by the participants of the meetings are listed below:

- Acquisition of land and household structures should be avoided at the maximum;
- Proper compensation should be paid to the affectees for the loss of their properties;
- Criteria of payments to the affectees should be transparent and fair;
- Market rates of land should be adopted for compensation purpose;
- Cross drainage structures should be provided so that the natural flow pattern of the area is not disturbed and the upstream villages may be avoided from flooding;
- Interchange should be provided to connect the alongside villages with the Bypass;
- Underpasses should be provided to facilitate movement of tractors trolleys and other rural transport;
- Bifurcation of agricultural land may occur, access routes should be provided to approach the other side settlements etc;
- Communication link of the road side villages shall be developed, which will increase economic prosperity of the villages;
- Economic value of land of villages will increase after the completion of Bypass road;
- Culverts should be provided across the Bypass alignment;
- Construction of the Bypass project must be completed in time without any delays;
- Approach roads to the interchange must also be constructed;
- Environmental pollution will increase during construction;
- Economic conditions of the people will increase with the construction of this project;
- Employment is major issue, efforts should be made to induct local labour during construction stage;
- Maximum trees should be planted after completion of the project;
- Sui gas is the dire need of this area, arrangements can be made for its availability for the villages along the bypass;
- Service road should be provided along the bypass road;
- Avoid dumping construction material openly;
- Adopt measures to minimise dust, smoke, and noise pollution, and to control spillages from construction machinery;
- Solid waste produced during the construction should be disposed of properly; and
- Scheduled sprinkling of water during the construction phase.



### 5.3 Proposed Measures for Addressing the Stakeholders' Concerns

The contractors and design consultants will include the following provisions in the project design and to protect surrounding communities from the expected impacts of construction:

- A tree plantation programme to compensate for the anticipated loss of vegetation during the construction activities, and to help abate pollution caused by emissions, dust, and noise during the operation;
- Drainage system will be provided to control surface runoff;
- Project site will be fenced to minimize the level of noise and dust on the surrounding areas during the construction phase;
- In order to avoid restricting the mobility of the local people, construction vehicles will remain confined within their designated areas of movement;
- National Highway Authority (NHA) is bound to comply with the prevailing national/provincial regulations concerning pollution and waste disposal;
- NHA will make sure the payment for the acquisition of properties;
- Compensation of properties will be finalized according to the prevailing market rates in the project area;
- Criteria of payments should be transparent and fair;
- Water sprinkling should be regular to control the dust emissions;
- Solid waste generated during construction and at camp sites will be disposed of safely at the waste disposal sites approved by the City District Government Lahore; and
- All necessary measures will be taken to ensure the safety of traffic during construction, including barricades (including signs, pavement markings, flags, and lights). All such barricades will be set up to facilitate the local traffic.

### 5.4 Grievances Redress Mechanism (GRM)

Grievances Redress Mechanism is an integral part of the Lahore Eastern Bypass Project planning and implementation mechanism. It aims at addressing public grievances arising from the work and work related activities. Following are the specific objectives of establishing Grievances Redress Mechanism;

- Ensure better safeguard mechanism for implementation of project;
- Resolve environmental and social grievances in the project area;
- Build up relationship of trust between the project proponent and the stakeholders; and
- Ensure transparency in dealing amongst stakeholders including affected people through a proper communication mechanism.



## 5.5 Grievance Redress Committee

NHA will establish a Grievances Redress Committee (GRC) to facilitate resolution of complaints raised during implementation of the project. The GRC will address affected people concerns and complaints promptly using an understandable and transparent process. The terms of functioning of GRC will be as follows;

- Provide support to the affected persons and stakeholders in solving the problems;
- Resolve grievances preferably on the first day of hearing or within a period of one week, in case of complicated issues may require additional time;
- Coordinate with the Affected Persons (APs), getting proper and timely information on the solution worked out for grievances;
- Study the normal occurring grievances and advise Project Director of the Project on remedial measures / actions to avoid further occurrences;

GRC meetings will be held in NHA, PD Office or other locations agreed by the committee. If needed GRC members will conduct field visits to verify and review the issues at dispute.

## 5.6 Composition of Grievance Redress Committee (GRC)

The GRC will directly work under the supervision of Director Environment (ELAS). The following members are recommended to form a GRC to resolve the grievances;

- Deputy Director Environment (EALS)
- Representative of local community
- Environmental Engineer of Supervision Consultant
- Environmental Engineer of Construction Contractor

Deputy Director Environment (EALS) will act as Project Environmental Grievances officer (PEGO) / Coordinator of the Grievances Redress Committee (GRC). He will review the cases on merit and address the problems in accordance with prevailing rules / procedures applicable to such grievances as per Environmental Management Plan (EMP). The PEGO will refer the case to GRC for final decision, whether to update and make necessary amendment to EMP. The GRC will give its decision within 30 days of the registry of the complaint. The complainant can appeal to Director EALS who should act on the complaint / grievance within two weeks of its filing. If the Affected Person (AP) is not satisfied with the decision of Director Environment, he



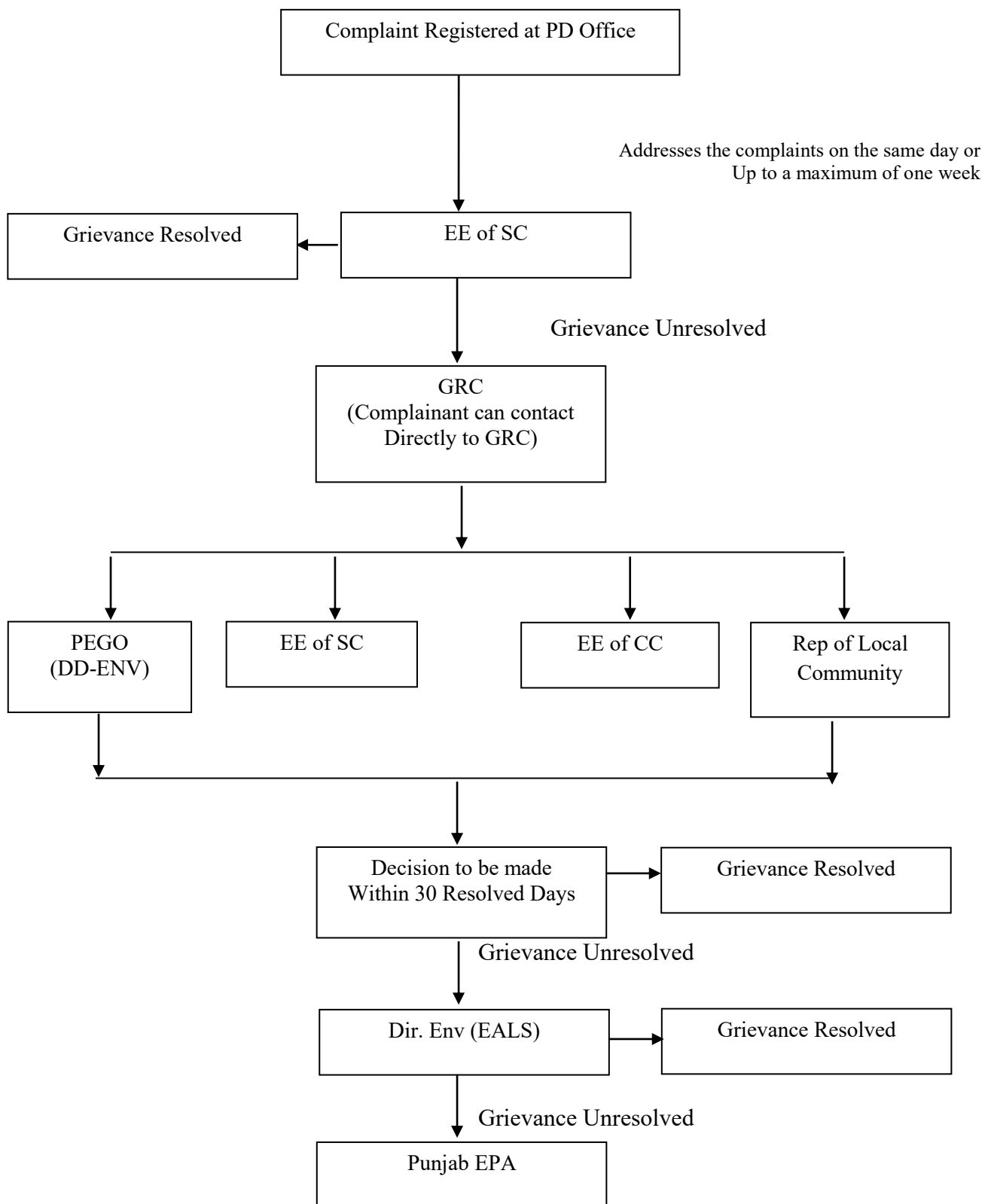
can request the higher authorities / relevant govt. departments for its resolution. In this regards, he may submit the complaint to Punjab EPA.

The flow chart of the proposed redress mechanism is shown in **Figure 5.2** on the next page:

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**Figure 5.2: Flow Diagram of Proposed Redress Mechanism**



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## 5.7 Procedure for Filing the Complaint

The Affected person (AP) / stakeholder may submit an application in the PD Office for the redressal of his grievances. The PD will refer the matter to Director Environment (EALS). Director Environment (EALS) will address the grievances preferably the same day or he may take a maximum of one week to resolve the grievance. In case the grievance is not addressed within a week time, the Affected Person (AP) may take the matter to GRC.

There are several ways to approach GRC for the redressal of grievances;

- Contact the PEGO of GRC over phone apprising him of his /her grievances; and
- Send an email or courier to the PEGO for taking up the matter in GRC.

GRC will investigate and review the grievance and convey the final decision to the AP. In case the grievance is not related to the project, the GRC will not process it and accordingly inform the grievant. All decision of the GRC will be conveyed to the grievant in writing. GRC can take up any matter of project related grievances for consideration of resolution.



## SECTION 6

### PREDICTED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

#### 6.0 General

This section provides the study of the probable impacts during pre-construction/design, construction and operational stages of the proposed project on the physical, biological and socio-economic environment of the project area. It also describes the actions that will alleviate/diminish the project's environmental impacts.

#### 6.1 Description of Project Corridor of Impact (COI)

Before proceeding to the environmental analysis of the proposed project, it is imperative to delineate the COI. There are two (02) types of Project corridors which have been used for the environmental baseline information, impacts assessment and mitigation purposes and is described briefly as under:

##### a) Corridor of Impact 1 (COI-1)

ROW is the corridor where direct impacts due to the construction of the proposed project are envisaged. ROW of the proposed project is 100 m which will be considered as COI-1.

##### b) Corridor of Impact 2 (COI-2)

The limit for COI for the proposed project was taken as 500 m on either side of the existing road for collection of baseline information, impacts assessment and mitigation measures of physical, ecological as well as social resources.

#### 6.2 Environmental Impact Matrices

The environmental impacts matrices have been developed to evaluate magnitude of the impacts of different project activities on different environmental settings for both construction and operational phases. These matrices are given in **Tables 6.1** and **6.2**. The following scale has been used for the evaluation of impacts:

LA = Low Adverse (low/short-term damage to the environment)

MA = Medium Adverse (moderate damage to the environment)



**Table 6.1**  
**Environmental Impacts Matrix for the Construction Phase**  
**Lahore Eastern Bypass**

Sr. No.	Project Activities	Physical Environment					Biological Environment			Socioeconomic Environment								
		Topography	Soil Erosion/Contamination	Landscape	Air Quality	Hydrology and Drainage	Groundwater Quality	Habitat Change	Vegetation	Animal Movement	Health & Safety for Public and Worker	Disruption of Public Utilities	Employment	Population Disturbance	Cultural/Religious Values	Noise & Vibration	Local Economy/Benefits to Community	Traffic Management
1	Construction camps, workshops etc.	O	LA	O	LA	O	LA	O	O	LA	LA	O	LB	LA	O	LA	LB	O
2	Excavation operations	LA	LA	LA	MA	LA	O	LA	LA	LA	LA	LA	MB	LA	O	MA	LB	LA
3	Transportation of construction materials	O	LA	O	LA	LA	O	O	O	LA	LA	O	LB	LA	O	MA	LB	LA
4	Use of construction materials etc.	O	LA	O	LA	O	LA	O	O	O	LA	O	O	O	O	LA	LB	LA
5	Earthwork/concretework operations	LA	LA	LA	LA	O	LA	LA	O	LA	LA	LA	MB	LA	LA	MA	MB	LA
6	Operation of concrete batching plants	O	LA	LA	HA	O	O	O	O	O	LA	O	MB	O	O	MA	MB	O
7	Disposal of Waste Water	O	MA	LA	MA	LA	LA	O	O	O	LA	O	MB	LA	O	MA	LB	O
8	Solid Waste Management ( Disposal of Excavated Material)	O	LA	LA	LA	LA	LA	O	O	O	LA	O	LB	O	O	O	O	O
9	Storage of oils/diesel	O	LA	O	LA	O	LA	O	O	O	LA	LA	LB	LA	O	O	O	O

**Legend**



O - Insignificant / no impact  
 NA - Not Applicable

LA - Low Adverse  
 LB - Low Beneficial

MA - Medium Adverse  
 MB - Medium Beneficial

HA - High Adverse  
 HB - High Beneficial

**Table 6.2**  
**Environmental Impacts Matrix for the Operational Phase**  
**Lahore Eastern Bypass**

Sr. No.	Project Activities	Physical Environment				Biological Environment		Socioeconomic Environment			
		Soil Erosion/Quality	Surface Runoff	Air Quality	Groundwater Quality	Flora	Fauna	Public Transport	Employment	Community Development	HSE & Road Safety Issues
1	Movement of Traffic	O	LA	LA	O	O	LA	MB	MB	MB	LA
2	Road Maintenance Works	O	O	LA	O	O	O	O	LB	O	LA
4	Maintenance Contractor Camps	LA	O	LA	LA	LA	LA	O	O	O	LA

**Legend**

O - Insignificant / no impact  
 NA - Not Applicable

LA - Low Adverse  
 LB - Low Beneficial

MA - Medium Adverse  
 MB - Medium Beneficial

HA - High Adverse  
 HB - High Beneficial

*Sayed*

HA = High Adverse (severe damage to the environment)

LB = Low Beneficial (less beneficial to the environment)

MB = Medium Beneficial (moderate beneficial to the environment)

HB = High Beneficial (highly beneficial to the environment)

N/A = Not Applicable

O = Insignificant / No Impact

### 6.3 Environmental Sensitivity

Structures or places which are in close proximity of the proposed alignment and which can get influenced due to the construction or operation of the proposed project are considered to be environmentally sensitive. These sensitive receptors are mentioned here:

#### Forest:

- Shahdrah Reserve Forest (3+200 distance = 23m)

#### Surface Water Bodies:

- Shahdrah Distributory (11+098)
- Water Course (11+631)
- Nallah Bhed (13+676)
- Lila Nallah (15+694 ML) and (1+563 SL-1)
- Darghai Minor (3+926 SL-1)

#### Name of Settlements, Villages within 500 m of ROW:

- Lakhodher
- Jabbo
- Karol
- Barrth
- Balkhay,
- Chak 39
- Chak 40
- Chak 42



Graveyards:

- Graveyard Dera Changran (435968 E, 3506362 N)
- Graveyard Chak 42 (434711 E, 3597850 N)

**6.4 Pre-Construction/Design Stage**

Impacts predicted during Pre-construction/Design Stage and the suggested mitigation measures are described here.

**6.4.1 Topography**

The project area has plain topography and no cutting/excavation of land is involved except for piling for bridge over river Ravi. As compared to the surrounding area the site is low lying area. Heavy rains or flood may affect the area and water could be accumulated in the area for longer period of time. Therefore, in order to protect the proposed alignment, it must be constructed on an embankment and guide banks will also be constructed on the river's bank at bridge abutments near Bhamma village, which will influence the topography of the project area. These impacts are permanent and moderately negative in nature. These visual variations to the topography will be of permanent and moderate adverse in nature. Therefore, the project design should consider aesthetic apprehensions.

**6.4.2 Land Acquisition**

One of the major project related impact will be the land acquisition. Kot Molchand and Balkhay villages which are situated near the alignment may require some relocation. The village of Lakhodhair at the terminal point of bypass near Mehmood Booti Junction is populated and will require land acquisition and a little relocation. The list of land acquisition areas is given in **Annexure-V**. This impact will be permanent and high adverse in nature.

Mitigations:

- Careful alignment selection by the designer to minimize the impact;
- Also adequate budget should be allocated in the Project's budget for the compensation to the affectees as per Land Acquisition Act, 1894 and framing of a judicious and fair compensation package for provision of compensation



on prevailing market rates.

#### **6.4.3 Changes in Land Value**

The proposed project is expected to increase the land values, especially in nearby villages. Land owners will have an opportunity to sell their land on increased prices and start new businesses. This impact will be moderate beneficial in nature.

#### **6.4.4 Ecology**

The proposed project will be constructed on an agricultural/ river land. No area of Shahdrah Reserve Forest will be acquired for the construction of guide banks. However, about 250 number of trees will be cut due to the proposed project with loss of good quality agricultural land. This may have an adverse affect on the ecological habitat of the project area. This impact will be permanent and moderate adverse in nature.

##### Mitigations:

- Incorporate technical design measures to minimize removal of trees and loss of agricultural land, if possible such as change in alignment;
- Plan for compensatory planting for at least eight (8) trees against each removed tree of similar floral function in the same reserved forest area.

#### **6.4.5 Social Disturbance**

Due to the proposed project bifurcation of settlements, agricultural land/fields may occur for the residents. This will result in causing inconvenience and disturbance in daily activities. This impact is permanent and moderate adverse in nature.

##### Mitigations:

- Provision of underpasses and cattle creeps on tracks/ crossing roads at suitable locations.

#### **6.4.6 Public Utilities**

Due to the proposed project, public utilities affected (if any) may create disruption of public services and economics. This impact is however temporary and moderate adverse in nature.





Mitigations:

- Incorporate technical design features to minimize affect on public utilities; and
- All public utilities likely to be affected by the proposed project, need to be relocated well before the commencement of construction work.

**6.4.7 Surface/ Ground Water Resources**

A canal flows parallel to Kala Khatai Road, canal section between Barrath and Balkhay villages will be subjected to ground water contamination. Since this canal is a source of irrigation for the nearby fields, it will affect the quality of crops. Owing to mass excavation and construction works on river Ravi, water contamination levels will be high. A nullah also flows through Chak 42. These impacts are temporary and moderate adverse in nature.

Mitigations:

- Provision of septic tanks in the design to treat the wastewater from construction camps; and
- Provision of adequate drainage network to reduce infiltration.

**6.4.8 Traffic Management**

During the construction phase of the project, improper traffic management may cause inconvenience to the people passing through the project area. This impact is temporary and minor adverse in nature.

Mitigation:

- Proper traffic management plan should be formulated and announced before the construction to avoid traffic jams/public inconvenience.

**6.4.9 Waste**

Waste (municipal, construction and liquid) will be generated from construction camps and different construction activities. Moreover, construction waste will also be generated during construction phase. The waste if not collected and disposed of properly will affect the aesthetics of area. It will lead to generation of odour, attracting disease vectors and clogging of canal and drain. The impact is considered to be temporary and minor adverse in nature.



Mitigation:

- Waste management plan shall be devised including provision of waste bins, defining collection frequencies, allocating personnel and defining safe disposal options.

**6.5 Construction Stage**

Following is the brief description of impacts and their mitigation envisaged during the construction phase.

**6.5.1 Topography**

The main impact during the construction will be the clearing of ROW, cutting and filling of borrow pits including erosion of topsoil cover. This impact is temporary and Moderate adverse in nature.

Mitigations:

- Where the use of agricultural land is inevitable, the top 30 cm of the plough layer should be stripped of and stockpiled for redressing the land after the required borrow material has been removed;
- Ditches or borrow pits that cannot be fully rehabilitated should be landscaped to minimize erosion and to avoid creating hazards for people; and
- Landowners should be compensated according to the terms of lease agreements negotiated with them and the restoration actions agreed upon by the Contractor will be duly carried out.

**6.5.2 Soil**

The project area is a plain, fertile agricultural land. Soil erosion may occur at contractors' camp; on river banks; excavation of earth/cutting operations and clearing of vegetation. Although there are bridges constructed over river Ravi but the construction of new bridge over the river will reduce the channel width causing high water levels on up stream of the river, this will change the flood plain and potential threats to soil erosion will increase. The most immediate and obvious effect of road development on soil is the elimination of the productive capacity of the soil covered by roads.



Pollutants settling in road- side soil can impair the growth of vegetation and the success of soil organisms, thus increasing the likelihood of erosion. These effects are usually much localized, affecting only a narrow band on either side of the road. Soil contamination of soil may be caused by oil and chemical spills at asphalt plant sites, workshop areas and equipment washing yards. This impact is temporary and moderate adverse in nature.

Mitigations:

- Low embankments should be protected by planting vetiver grass that can flourish in relatively dry conditions;
- Soil contamination by asphalt should be minimized by placing all containers in caissons;
- All spoils should be disposed of as desired and the site will be restored back to its original conditions before handing over;
- Non-bituminous wastes from construction activities should be dumped in approved sites, in line with the legal prescriptions for dumpsites, and covered;
- Land adjacent to agricultural land may not be preferred for excavation;
- Non-productive, barren lands in broken terrain, nullahs and publicly recognized waste lands should be given preference for borrowing materials;
- Store and reuse topsoil. This requires that topsoil be separated from subsoil during the initial excavation. The more fertile topsoil can later be deposited on the slopes to form a superficial layer conducive to seedling establishment;
- Replanting cleared areas and slopes is the most effective action to be taken in reducing erosion and stability problems, It should be undertaken as early as possible in the construction process, before erosion becomes too advanced.

### 6.5.3 Land Acquisition

One of the major impact during construction of the proposed project will be the land acquisition. This will result in loss of infrastructure, livelihood, commercial activities and disturbance to people. The impact will be permanent and high adverse.

Mitigation:

- Provide judicious compensation to the affectees by providing sufficient budget in the project cost. The process of land acquisition and compensation should be



followed in a transparent manner to minimize the impacts.

According to Land Acquisition Act 1894, the following points are to be considered while determining compensation to the project affectees:

- The market value of land at the date of publication of notification under section 4 sub section (1);
- The damage sustained by the person interested, by reason of the taking of any standing crops, or trees which may be on the land at the time of the collector's taking possession thereof;
- The damage if any sustained by the person interested at the time of the collector's taking possession of the land by reason of acquisition injuriously affecting his other property, moveable, or immovable, in any other manner, or his earning;
- As a consequence of the acquisition of the land by the collector, the person affected is compelled to change his residence or place of business, the reasonable expenses incidental to such change.

#### **6.5.4 Construction Camps**

Due to the proposed camp sites, loss of vegetation and dissatisfaction of rehabilitation measures during and after completion of construction phase may occur. These impacts may include temporary habitat loss, waste generation, air and noise pollution, generation of sanitary effluents and social issues/conflicts. However, these impacts will be temporary and moderate adverse in nature.

##### Mitigations:

- The contractor(s) should provide plan for removal & rehabilitation of site upon completion;
- Reinstate any temporary facilities to pre-existing conditions in ecologically sensitive areas;
- Implement landscaping plan for all facilities in areas where high landscape value and visual vulnerability to the proposed activities warrants site-specific landscape restoration measures;



- Operate equipment in a manner sympathetic to the ambient noise environment. Do not leave equipment idling unnecessary;
- Provide adequate warnings of impending works to all potential receptors within a 1 km corridor surrounding the RoW via public notices and local news;
- The construction contractor is required to develop a Construction Camp Management Plan to address discipline, community liaison, ethnic tension and communicable diseases; and
- The construction contractor will be required to assess the environmental/social sensitivity of any additional or alternative sites prior to their approval for adoption.

### 6.5.5 Health and Safety of Workers and Community

Health risks and work safety problems may result at the workplace if the working conditions provide unsafe and/or unfavorable working environment and due to storage, handling and transport of hazardous construction material. This is a temporary and moderate adverse in nature.

Quality of ground water and surface water resources available in the nearby local communities may get contaminated due to the construction activities, oil spillage and leakage. The laborers work with different transmittable diseases may spread out those diseases in the local residents. The impact is temporary and moderate adverse in nature.

#### Mitigations:

- Layout plan for camp site, indicating safety measures taken by the contractor, e.g. firefighting equipment, safe storage of hazardous material, first aid, security, fencing, and contingency measures in case of accidents;
- Obligatory insurance against accidents for labourers/workers;
- Provide basic medical training to specified work staff and basic medical service and supplies to workers;
- Work safety measures and good workmanship practices are to be followed by the contractor to ensure no health risks for labourers;
- Protection devices (ear muffs) should be provided to the workers doing job in the high noise areas;
- Provision of adequate sanitation, washing, cooking and dormitory facilities;



- Provision of protective clothing i.e. helmet, adequate footwear for bituminous pavement works, protective goggles, gloves etc. for labourers handling hazardous materials;
- Ensure strict use of wearing these protective clothing during work activities;
- Instruct foremen to strictly enforce the keeping out of non-working persons, particularly children, off work sites;
- Adequate signage, lightning devices, barriers, yellow tape and persons with flags during construction to manage traffic on access roads;
- There should be proper control on construction activities and oil spillage/ leakage from construction vehicles/ machinery.
- The labour works with different transmittable diseases should be restricted within the construction site;
- Timely public notification on planned construction works;
- Close consultation with local communities to identify optimal solutions to maintain community integrity & social links;
- Fencing around the camps should be strong enough so that it cannot be broken easily by local people for making passages; and
- Use of water should not disturb public water availability and source of water should be selected carefully.

### 6.5.6 Borrow Areas

Borrow areas/ open pits and its excavation activities may result in land disputes, soil erosion, loss of potential cropland, loss of vegetation, landscape degradation, and damage to road embankments. Borrow/ Open pits may also result in potential sources of mosquito breeding and may prove hazardous to human beings, livestock and wildlife. This will also degrade hygienic condition of the project area. This impact is permanent and moderate adverse in nature.

#### Mitigations:

- Conversion of borrow pits into fish farms (if possible) and care in selection of borrow areas;
- Necessary permits must be obtain for any borrow pits from the competent authorities;
- No excavations are allowed within distance of 500 m to RoW;



- In borrow pits the depth of the pit should be regulated so that the sides of the excavation will have a slope not steeper than 1:4;
- Soil erosion along the borrow pit shall be regularly checked to prevent / mitigate impacts on adjacent lands;
- In case borrow pits fill with water, measures have to be taken to prevent the creation of mosquito-breeding sites;
- A pit shall have a barrier controlling access and such barriers shall be clearly visible to prevent safety hazards to the public. The use of cable, chain or similar barrier is prohibited. The control barrier shall deny access when the pit is not in operation;
- Dust control measures shall be utilized on non-paved routes in accordance with the policy of the local road authority. Dust control measures shall also take place within the pit itself, if adjacent properties would be affected by dust leaving the site;
- Erosion control measures must be taken in all parts of the pit operation, including the access road, in order to avoid potential damage to adjacent land and to control sedimentation that has potential to leave the site; and
- During the course of borrow pit excavations, operations should be planned in such a way that the amount of work that will be necessary for the finishing off of the borrow pit is reduced as far as possible. Indiscriminate excavation without due regard for the desired final shape of the borrow pit should not be permitted and should be rectified immediately.

#### **6.5.7 Air Pollution**

Air quality will be affected by fugitive dust and emissions from construction machinery, quarry areas, asphalt plants, material storage yards and vehicular traffic. Emissions may be carried over longer distances depending upon the wind speed, direction, temperature of surrounding air and atmospheric stability.

Air contamination due to unpaved surfaces will be more significant near Haji Kot, Karoul villages, because these villages are situated near open fields therefore more dust particles/particulate matter will blow through air causing air contamination in these areas. However, communities along Amir Road and Bhamma village are more developed with paved roads so air quality degradation will be less significant in these



communities.

The overall impact on the quality of air during the construction phase will, however, be limited to the project's construction phase only.

Mitigations:

- All vehicles, machinery, equipment and generators used during construction activities should be kept in good working condition and be properly tuned and maintained in order to minimize the exhaust emissions;
- Open burning of solid waste from the Contractor's camps should be strictly banned;
- Preventive measures against dust should be adopted for on-site mixing and unloading operations. Regular sprinkling of the site by water should be carried out to suppress excessive dust emission(s);
- Emissions from power generators and construction machinery are important point sources at the construction sites. Proper maintenance and repair is needed to minimize the hazardous emissions;
- Quarry areas and asphalt plants should be located atleast 500m downwind from populated areas, wildlife habitats and contractor's camps to minimize the impact of dust emissions;
- Asphalt, hot mix and batching plants should be equipped with dust control equipment such as fabric filters or wet scrubbers to reduce level of dust emissions;
- NEQS applicable to gaseous emissions generated by construction vehicles, equipment and machinery should be enforced during construction works;
- Ensure precautions to reduce the level of dust emissions from hot mix plants, crushers and batching plants should be taken up; e.g. providing them as applicable, with protection canvasses and dust extraction units. Mixing equipment should be well sealed and equipped as per existing standards;
- Regular sprinkling to avoid dust especially during high winds; and
- Regular monitoring of air quality in accordance with NEQS.

#### 6.5.8 Noise Pollution

Noise is defined as a loud, undesired sound that interferes with normal human activities. If it affects the well-being of the surrounding community (environmental





noise), it is considered a nuisance. Exposure to very high noise levels (exceeding 85 dBA), particularly for prolonged period can cause hearing loss.

Main sources of noise during the construction phase will be heavy machinery such as bulldozers, excavators, stabilizers, concrete mixing plant, pneumatic drills, stone crushers asphalt plants and other equipments. Noise generated by construction machinery is likely to affect workers working on the site and to the nearby communities. These noise levels will influence a relatively small area of the project i.e. Haji Kot, Karoul, Bhamma villages and communities along Amir Road as compared to whole project area.

This impact is temporary and minor adverse in nature.

Mitigations:

- Selection of up-to-date and well maintained plant or equipment with reduced noise levels ensured by suitable in-built damping techniques or appropriate muffling devices;
- Confine excessively noisy work to normal working hours in the day, as far as possible;
- Provide the construction workers with suitable hearing protection like ear cap or earmuffs and train them in their use;
- Preferably, restrict construction vehicles movement during nighttime;
- Heavy machinery like percussion hammers and pneumatic drills should not be used during the night;
- Vehicles and equipment used should be fitted, as applicable, with silencers and properly maintained;
- Use of low noise machinery, or machinery with noise shielding and absorption;
- Contractors should comply with submitted work schedule, keeping noisy operations away from sensitive points; implement regular maintenance and repairs; and employ strict implementation of operation procedures; and
- Noise barriers in sensitive areas in the form of high boundary walls (concrete or wood), earth berms, etc. in front of schools, hospitals/ clinics and mosques.



### 6.5.9 Surface and Groundwater Pollution

Surface water might get contaminated due to the disposal of construction waste generated during the project activities and earth and stone work activities. This contamination will not only risk the aquatic life but may also result in risking the health of locals that use this water for meeting domestic requirement. In addition to that, construction waste, if left unattended will result in forming leachate that will percolate through the soil strata and will reach underground water table and hence, will end up contaminating it. Also the water for construction and consumption may come in conflict with local water demand. During the construction phase, the sanitary wastewater will be generated at the workers' camp(s). If this wastewater is allowed to stagnate in water ponds on the site, it can percolate into the soil, thereby, contaminating groundwater. This impact is temporary and moderate adverse in nature.

#### Mitigations:

- Protection of surface and groundwater reserves from any source of contamination such as the construction and oily waste that will degrade its potable quality;
- The solid waste should be disposed of in designated landfill sites to sustain the water quality for domestic requirements;
- Water required for construction should be obtained in such a way that the water availability and supply to nearby communities remain unaffected;
- Conduct regular water quality monitoring according to Drinking Water Quality Standards (DWQS) and determined sampling schedule;
- The contractor should ensure that construction debris do not find their way into the drainage or irrigation canals which may get clogged;
- Work on canal areas should be kept to a minimum or protective walls should be constructed;
- Prohibit washing of machinery and vehicles in surface water, provide sealed washing basins and collect wastewater in sedimentation/retention pond;
- Construction work close to the water bodies should be avoided, especially during monsoon period; and
- Wastes must be collected, stored and taken to approve disposal site.



### 6.5.10 Ecology (Flora & Fauna)

#### Flora:

Trees act as a binding force as their roots are spread in the soil, which helps to keep the soil intact. With the removal of trees, however less, this binding force will be vanished and the soil will be liable to increased erosion. During the entire construction period dust laden polluted air will form a dust film on leaves thus blocking the stomata consequently hindering photosynthesis processes causing detrimental effect on the plant health. Exhaust of noxious gases from movement of heavy machinery will further pollute air which will adversely affect health of plants. These impacts will be permanent and high moderate negative in nature.

#### Mitigations:

- The indigenous trees most suited to the tract should be re-planted;
- An awareness campaign targeted on the neighborhood farmers should be run to popularize the planting of trees;
- The contractor's staff and labour should be strictly directed not to damage any vegetation such as trees or bushes. They should use the paths and tracks for movement and should not be allowed to trespass through farmlands;
- Construction vehicles, equipments and machinery should remain confined within their designated areas of movement;
- Contractor should supply gas cylinders at the camps for cooking purposes and cutting of trees/bushes for fuel should not be allowed; and
- Camp sites and asphalt plants should be established on waste/barren land rather than on forested or agriculturally productive land. However if such type of land is not available, it should be ensured that minimum clearing of the vegetation is carried out and minimum damage is caused to the trees.

#### Fauna:

The usual fauna found in the project area have already been mentioned earlier in baseline. Due to the implementation of the proposed project, the free movement of fauna would be disturbed. Another impact on the fauna of the project area will be the probable dislocation of the birds/animals (rodents) from their nests and burrows. Birds who have nests on the trees located in the RoW or who frequently visit the project area in search of food may receive an adverse impact and shall have to move to adjoining areas.



Also, due to the leakages/spills from the construction equipment/machinery the local ponds/water storages and surface water from where the animals/birds drink water may get contaminated; thus, affecting/endangering the fauna of the project area. This impact may be considered temporary and moderate adverse in nature.

Mitigations:

- Plantation of large number of trees along the proposed project to regain the ecological habitat;
- New and good condition machinery with minimum noise should be used in construction;
- Noisy work should not be carried out in night time so that there should be no disturbance to local birds and animals;
- Contractor should ensure that the no hunting, trapping of animals should be carried out during construction;
- Borrow pits should be fenced so that no animal can fall into these;
- The camps should be properly fenced and gated to check the entry of wild animals in search of eatable goods. Similarly waste of the camps should be properly disposed off to prevent the chances of eating by wild animals, which may prove hazardous to them; and
- Special measures should be adopted to minimize impacts on birds such as avoiding noise generating activities during the critical period of breeding.

#### **6.5.11 Traffic Management**

Due to the proposed construction activities, traffic management may pose a challenge in the project area. Movement of vehicles carrying construction materials may result in traffic jams and time delays and cause inconvenience to the people travelling on the access roads. It will also increase the traffic load on the existing road network. This impact is temporary and moderate adverse in nature.

Mitigations:

- Proper traffic management plan should be implemented to avoid traffic jams/public inconvenience;
- Movement of vehicles carrying construction materials should be restricted during the daytime to reduce traffic load and inconvenience to the local

residents/ business owners;

- Coordinate planning of traffic diversions with the traffic police and the Transport Department in accordance with the construction program with advance warnings to the affected residents and road users;
- Availability of continuous services of the traffic police in the diversion and control of traffic; and
- The executing agency is required to maintain liaison between the Highway/ Traffic Police, local residents/ travelers and the contractor to facilitate traffic movement during construction stage.

### 6.5.12 Waste

Different types of waste are likely to be generated during the construction phase of the proposed project. The municipal waste will be in the form of food, cans, paper and wastewater from construction camps toilets and washing yards. Construction waste will include excavated soil, sand, gravel, wood, metal pieces and electrical wires. Whereas hazardous waste can be comprise paints and construction chemicals. Due to construction activities waste will also be generated at construction and contractors camp site which may include wastewater, oil spillage from machinery and solid waste etc. Handling and storage of oil, asphalt/bitumen may be a source of environmental pollution as a hazardous waste. This will result in unhygienic conditions, health risk to work force at the camp site. All these, if left unintended, can become a source of nuisance and environmental pollution in the project area. The impact is considered to be temporary and moderate adverse in nature.

#### Mitigations:

- Wastewater effluent from contractor's workshop and equipment washing yards should be passed through gravel/ sand beds to remove oil/ grease contaminants before discharge;
- Training of work force should be conducted in the storage and handling of materials and chemicals that can potentially cause soil contamination;
- Solid waste generated during construction and camp sites should be safely disposed in demarcated waste disposal sites and the contractor should provide a proper waste management plan;



- Reusable/recyclable waste should be sold to waste vendors and those which cannot be sold out may be used as a filling material for leveling the depressions, subject to technical feasibility;
- Debris generated by dismantling of existing pavement structures should be re-used subject to the suitability of the material;
- Ensure proper labelling of containers, including the identification and quantity of the contents, hazard contact information etc.;
- Conduct training of employees involved in the transportation of hazardous material regarding emergency procedures;
- The sewage system for camps should be properly designed (pit latrines or, as required, septic tanks) to receive all sanitary wastewaters;
- Construction workers and supervisory staff should be encouraged and educated to practice waste minimization, reuse and recycling to reduce quantity of waste.

#### **6.5.13 Social Issues due to Construction Activities**

Negative perceptions about the Project could lead to tension and discord. Negative perceptions could result from unequal access to opportunities created by the Project, population influx and associated pressures on services and infrastructure, deterioration in public health and increases in social ills associated with the population influx, and deterioration in roads or traffic congestion as a result of the Project traffic.

Approach/ hindrance problems for the local residents/ business owners and movement of the people to the mosque/ shrines will be disturbed during construction activities. This impact is temporary and minor adverse in nature.

#### Mitigations:

- Maintaining regular communication with local communities and other stakeholders to minimize tensions arising from Project activities;
- Maintaining a grievance procedure to facilitate stakeholders in expressing concerns; and
- Timely completion of the construction work and provision of alternate routes for the areas where the construction is being carried out.



#### 6.5.14 Impacts of Heavy Vehicles on Existing Road Network

The plying of heavy vehicles on the existing road network may result in air pollution (if unpaved roads), noise pollution due to tire-road friction especially near sensitive receptors (residential areas, school, health facility etc.), and damage to roads and traffic congestion. However, the impacts would be temporary and moderate negative in nature.

Mitigations:

- Any vehicle with an open load carrying area used for transport of potentially dust producing materials shall have properly fitted side and tailboards. Materials having potential to produce dust shall not be loaded to a level higher than the side and tail boards and shall be covered with clean tarpaulin in good condition. The tarpaulin shall be properly secured and extended over the edges of the sideboard and tailboard;
- The Contractor shall not use any vehicles either on or off road with grossly excessive noise pollution. Noise mufflers shall be installed and maintained in good condition on all motorized equipment under the control of the contractor;
- Timely maintenance of affected roads to avoid any inconvenience to the road commuters.

#### 6.5.15 Economic Activity

Due to the construction of the proposed project, economic activity will be generated in the project area as the laborers and semi-skilled staff will have an opportunity to work for the construction of the proposed project. This will help in developing their skills and capacities.

The Project will invest in equipment, construction materials, infrastructure and human resources. This investment and the return from the project will get distributed through wages, payments for procured goods and services, revenue to government and social investment for community development.

Proposed mitigation, enhancement and good-practice measures include:

- Preferentially recruit local candidates provided they have the required skills and qualifications for the announced positions;



- Coordinate efforts to recruit unskilled labor, if any are required under the Project, from the adjacent rural areas; and
- Require contractors to prefer local candidates in the recruitment process provided they have the required skills and qualifications.

#### **6.5.16 Maintenance of Construction Equipment**

Improper maintenance of construction equipment may lead to safety and environmental hazards like groundwater and soil contamination or injury to workers. This impact is temporary and moderate negative in nature.

##### Mitigations:

- Place substantial blocking under any chain-hoist-suspended or jack supported equipment under which people must work. (The operator of trenching equipment should never leave the controls while shovels are suspended without blocking);
- No work should occur in areas where passing automobiles or moving machinery result in a hazardous condition;
- All work areas should be provided with proper ventilation. Employees shall not work in areas where they are exposed to excessive carbon monoxide gas from exhausts of running engines;
- Gasoline should not be kept in open containers or pits;
- Use a reasonably nontoxic solvent with a high flash point for cleaning parts and never use gasoline;
- Keep wrenches or tools clean and in safe working condition;
- Secure unbolted heavy parts or engines if necessary to leave the work;
- Always keep a suitable fire extinguisher ready. Inspect fire extinguishers regularly, and keep them in good operating order;
- Ground electric appliances, keep them in good working condition, and ensure that sparking will not ignite gases or vapors. Do not permit live cords to touch workers;
- Put oily rags in closed metal containers for disposal after use; and
- The maintenance workshop must be equipped with washing yards for cleaning of heavy equipment and septic tanks/soakage pits for the treatment of waste water.





### 6.5.17 Conservation of Resources and Environmental Sustainability

The construction of the proposed project will pose burden on the existing natural resources. For example procurement of aggregates from longer hauling distances require more trucks. This means an increase in fuel consumption, resulting in higher aggregate costs, and a corresponding increase in the release of hydrocarbon emissions to the atmosphere, resulting in higher environmental costs. In the public eye, truck traffic in some locations is considered excessive, and there is evidence that the transportation of aggregate contributes to the deterioration of roads. Similarly use of fossil fuels in generators is another example of environmental footprint.

An environmentally sustainable project promotes the avoidance or minimization of project area impacts on natural resources, which can reduce project costs, and protects sensitive species and environments. This will be a permanent negative impact.

#### Mitigations:

- One strategy for conserving aggregate resources and reducing the demand for virgin aggregate is to recycle and reuse materials in road construction;
- Reuse of materials, such as concrete and asphalt, reduces the need for concrete and asphalt manufacturing, reduce greenhouse gas (GHG) emissions, and reduces waste disposal costs and emissions;
- Use of solar panels and LED lights in the construction camps instead of using diesel operated generators and normal bulbs.
- By promoting and demonstrating to the public and stakeholders the resolve of road project agencies and associated entities to utilize balanced, sustainability-based approaches and innovative transportation management, the project can be a positive public outreach tool to help show concern for and awareness of environmental, social, and economic factors;
- The installation of the storm water basin is not considered a sustainability criteria or action. If a permanent wetland can be constructed within or just downstream of the storm water basin, it could be used to treat and filter the storm water. If the wetland also provided high-quality habitat for wildlife, the creation of the wetland would be considered an environmentally sustainable action for this project;
- Divert waste from landfills, reduce materials taken from project site, plan



project deconstruction and recycling;

- Control hazardous and solid waste, develop waste minimization strategies;
- To reduce the level of energy consumption, warm-mix asphalt (WMA) can be used to replace hot-mix asphalt (HMA). Besides the fact that WMA is produced at a lower temperature, it also induces great benefits such as an improvement of working conditions (less exposure to heat and fumes) and asphalt compaction, reduction of paving cost and longer hauling.

## 6.6 Operation Stage

The predicted impacts related to the proposed project during the operational stage and their mitigations are discussed in this sub-section.

### 6.6.1 Ecology (Flora & Fauna)

#### Flora

No negative impacts are envisaged on the flora of the area during the operational phase. However, improper maintenance of the saplings planted against the trees cut for the proposed project may adversely affect the growth of those saplings which were planted to improve the environmental aesthetics of the project area. Raising of new trees in four rows on either side of the proposed project, will render a positive impact on the flora of the area and will also cause a beneficial impact on the landscape of the area, which will be of permanent in nature. Presence of adequate flora will absorb noxious hydrocarbon gases, through photosynthesis, emitted from an expected large number of cars, vehicles and public transport, thus purifying air of hazardous particles.

#### Mitigations:

- The saplings planted in the project area against the trees affected should be properly maintained throughout their initial growth period in terms of water requirement and necessary nutrients;
- An awareness campaign targeted on the neighborhood farmers should be run to popularize the planting of trees; and
- Organic farming should be encouraged to minimize the use of chemical fertilizers and pesticides.



## **Fauna**

The project activities will bring some adverse impacts on the fauna of the project area such as the uneasiness of movement and increased probability of accidents, if the animals/live stock approach the proposed project. This impact is permanent and moderate adverse in nature. Raising of dense plantation of shady trees on both sides of the proposed project will provide resting, nestling and roosting habitat to the avifauna which is a high beneficial impact.

### **Mitigation:**

- Provision of animal/ livestock crossings after appropriate distances to facilitate their movement.

## **6.6.2 Surface and Groundwater**

No major adverse impact on surface and groundwater is anticipated during the operational phase with the exception of some occasional oil spills due to any road accident, which may be restricted up to the road surface with the help of an emergency plan.

## **6.6.3 Air and Noise Quality**

During the operational phase, the air pollution and noise levels are anticipated to decrease due to free flow of traffic. However, vibrations from movement of heavy vehicles use of pressure horns can cause nuisance. This impact is permanent and minor adverse in nature.

### **Mitigations:**

- Air and Noise monitoring should be carried out at locations and schedule specified in the Environmental Monitoring Plan (EMP) to ensure the effectiveness of mitigation measures;
- Signs for sensitive zones (health centers/ educational institutions etc.) to disallow the use of pressure horns; and
- Enforcement and penalties against traffic rules violators.



#### 6.6.4 Road Maintenance Works

During the operational phase, different maintenance works will be carried out throughout the project life. Laborers or the staff involved in these maintenance works are exposed to health and safety issues. Poor implementation of HSE plans or noncompliance of personal protective equipments (PPEs) can lead to personal injuries and accidents. Moreover, application of poorly maintained equipments and material can lead to air pollution. The maintenance works can also cause traffic problems to the travelers. Lack of maintenance may also lead to ground water and soil pollution. This impact is temporary and minor adverse in nature.

##### Mitigations:

- Implementation of HSE Plans during the maintenance period;
- Strict implementation of PPEs;
- Use of high quality equipment and material by the contractor;
- Continuous improvements in the emergency plans; and
- Placement of sign boards for traffic diversions and proper implementation of traffic diversion plans.
- Selection of suitable sites for contractor camps and implementation of all the related important protocols for the management of camp activities in order to avoid environmental and HSE issues.
- Inspect culverts, roadside ditches, water bars and outlets after each major runoff event and restore flow capacity as needed.
- Maintain vegetated areas in adequate cover to meet the intended purpose(s); and
- Conservation practices that limit particulate matter emissions should be incorporated into long-term maintenance plans.



**SECTION - 7****ENVIRONMENTAL MANAGEMENT & MONITORING PLAN****7.1 General**

The main objective of the Environmental Management Plan (EMP) is to identify mechanisms to implement the environmental mitigation measures discussed in Section 6. It is the fundamental tool that ensures that all mitigation measures are consolidated, their implementation responsibilities identified and the resources required to implement the measures are provided. Further, the EMP includes monitoring measures as a feedback mechanism on implementation and effectiveness of the mitigation measures.

EMP is prepared for all the identified environmental impacts during design, pre-construction, construction and operation stages. The methodology followed for preparing the EMP consists of the following steps:

- Identify mitigation and enhancement measures for each identified impacts and risks;
- Identifying the organization or person that would be responsible for implementing the measures; and
- Developing a mechanism for monitoring the proposed mitigation measures.

**7.2 Institutional Responsibilities**

Following functionaries will be involved in the implementation of EMP:

- EALS (NHA);
- Environmental Engineer (EE)/Officer of Supervision Consultant (SC);
- Environmental Engineer/Officer of Contractor.

The duties/responsibilities of the functionaries are discussed below:

**Responsibilities of NHA**

NHA (EALS) will be responsible for the environmental management and supervisory affairs during the construction phase of the proposed Project. Director Environment (EALS) will designate the Deputy Director Environment who will look after the



environmental related issues during the construction phase. The responsibilities of DD Environment are as follows:

- Coordinating and planning of activities of EALS;
- Monitoring progress of the project as per planned schedule of activities;
- Exercising oversight over the implementation of environmental mitigation measures by the contractor;
- Guiding the Environmental Specialist by providing appropriate environmental advise and solutions;
- Documenting the experience in the implementation of the environmental process;
- Preparing training materials and implementing programs;
- Maintaining interfaces with the other lined departments/ stakeholders; and
- Reporting to the EPA Punjab on status of EMP implementation.

#### Responsibilities of Supervision Consultant

Environmental Engineer/specialist of SC will oversee the performance of contractor to make sure that the contractor is carrying out the work in accordance with EMP as mentioned in the contract documents. The Environmental Engineer/Specialist will also provide assistance to the Contractor's Staff to implement EMP. Package wise Site Specific Environmental Management Plan (SSEMP) will be prepared by the contractor under the supervision of EE of SC. The SSEMP would be approved by the EALS (NHA). EE of SC will provide guidance to the contractor's EE for implementing each of the activity as given in EMP. EE of SC will be responsible for record keeping providing instruction through the "Resident Engineer (RE)" for corrective actions and will ensure the compliance of various statutory and legislative requirements. EE will maintain the close coordination with the contractor and EALS for successful implementation with environmental safeguard measures. However, overall responsibilities of EE of SC are as follows:

- Directly reporting to the RE;
- Discussing various environmental issues and environmental mitigation, enhancement and monitoring actions with all concerned directly or indirectly;
- Review contractor's SSEMP as part of their work program;
- Inspect, supervise and monitor all the construction and allied activities related to the EMP for the project;



- Visiting construction sites including incomplete construction work sites, where there is no contractor's activities, active construction work sites, completed areas of work sites as well as ancillary sites such as borrow areas, quarries, asphalt and crusher sites, hot mix plant sites, construction camps and work shop areas etc. to ensure contractors compliance with EMP stipulations and conditions of statutory bodies;
- Assist the RE to ensure the environmental sound engineering practices;
- Assisting contractor and EALS in all matters related to public contacts including public consultation pertaining to environmental and community health & safety issues;
- Assisting EALS to carry out environmental monitoring;
- Organizing training to the EE of contractor and field staff; and
- Preparing and submitting monthly and quarterly environmental progress/compliance reports to the EALS.

#### Responsibilities of Contractor

Site Environmental Engineer of contractor will carry out the implementation of the mitigation measures at construction site. Contractor will be bound through contract documents to appoint the Site Environmental Engineer/Specialist with relevant educational background and experience. The responsibilities of EE of Contractor are as follows:

- EE of contractor will prepare SSEMP, monitoring plan, traffic control/diversion plan, and asphalt and batching plant area plans and will submit all the plans to the EE of SC.
- EE of contractor will be responsible for the implementation of EMP and to take effective measures against corrective actions plan;
- EE will prepare the compliance reports as per schedule and will submit it to the SC;
- Provision of proper Personal Protective Equipments (PPEs) to the workers and train them for their proper use; and
- EE will conduct the environmental and health & safety trainings to the workers /labor.



### 7.2.1 Non-Compliance of the EMMP

The implementation of the proposed SSEMP involves inputs from various functionaries as discussed earlier. The contractor will be primarily responsible for ensuring implementation of the mitigation measures proposed in the EMP, which will be part of the contract documents. The provision of the environmental mitigation cost will be made in the total cost of project, for which contractor will be paid on the basis of monthly compliance reports. However, if the contractor fails to comply with the implementation of EMP and submission of the monthly compliance reports, NHA (EALS) will be responsible for enforcing compliance of contractor with the terms of the contract, including adherence to the EMP. For minor infringements, an incident which causes temporary but reversible damage, the contractor will be given 48 hours to rectify the problem and to restore the environment. If restoration is done satisfactorily during this period, no further actions will be taken. If it is not done during this period, NHA (EALS) will arrange for another contractor to do the restoration, and deduct the cost from the offending contractor's next payment. For major infringements, causing a long-term or irreversible damage, there will be a financial penalty up to 1% of the contract value in addition to the cost for restoration activities.

### 7.3 Environmental Management Plan (EMP)

The EMP provides the framework for the implementation of the mitigating measures and environmental management and monitoring during the construction and operational phases of the proposed project. **Table 7.1** represents impacts, objectives, mitigations and the responsible organizations for the implementation of the mitigation measures during the construction and the operational phases.





**Table 7.1: Environmental Management Plan**

<i>No.</i>	<i>Impact</i>	<i>Objective</i>	<i>Mitigations</i>	<i>Responsibility(s)</i>
<b>A. PRE-CONSTRUCTION/ DESIGN STAGE</b>				
1.	Topography	To ensure minimum changes in topography of the project area.	<ul style="list-style-type: none"> <li>Project design should consider aesthetic concerns.</li> </ul>	DC
2.	Land Acquisition	To minimize land acquisition.	<ul style="list-style-type: none"> <li>Careful alignment selection by the designer to minimize the impact; and</li> <li>Also adequate budget will be provided in the Project cost for the compensation to the affected people as per Land Acquisition Act, 1894.</li> </ul>	DC
3.	Ecology	To avoid/ minimize tree cutting.	<ul style="list-style-type: none"> <li>Incorporate technical design measures to minimize removal of trees, if possible such as change in alignment;</li> <li>Plan for compensatory planting for four (4) trees against each fallen tree of similar floral function; and</li> <li>Disallow introduction of exotic species with known environmental setbacks.</li> </ul>	DC and EALS
4.	Social Disturbance	To minimize the entry/exit problems of the locals in the Project Area.	<ul style="list-style-type: none"> <li>Mitigation measures should include provision of pedestrian overhead bridges (after every 2 to 3 kilometers) in the design to minimize the impact.</li> </ul>	DC
5.	Public Utilities	To avoid disturbance to the public.	<ul style="list-style-type: none"> <li>Incorporate technical design features to minimize effect on public utilities; and</li> <li>All public utilities (e.g. sewage, drainage/water pipes, power transmission lines, underground telephone lines, etc.) likely to be affected by the proposed project, need to be relocated well before the commencement of construction work.</li> </ul>	DC
6.	Surface/ Ground Water Resources	To avoid/ minimize the contamination of surface and ground water bodies.	<ul style="list-style-type: none"> <li>Provision of septic tanks in the design to treat the wastewater;</li> </ul>	DC



- Provision of adequate drainage network to reduce infiltration.

7.	Traffic Management	To minimize traffic problems in the Project Area.	<ul style="list-style-type: none"> <li>• Proper traffic management plan should be formulated and announced before the construction to avoid traffic jams/public inconvenience.</li> </ul>	DC & Traffic Police
8.	Waste	To minimize odour, spreading of diseases and clogging of canal and drain.	<ul style="list-style-type: none"> <li>• Waste management plan shall be devised including provision of waste bins, defining collection frequencies, allocating personnel and defining safe disposal options.</li> </ul>	NHA & CC

## B. CONSTRUCTION STAGE

<i>No.</i>	<i>Impact</i>	<i>Objective</i>	<i>Mitigations</i>	<i>Responsibility(s)</i>
1.	Topography	To minimize adverse impact to topography of the Project Area.	<ul style="list-style-type: none"> <li>• Where the use of agricultural land is unavoidable, the top 30 cm of the plough layer should be stripped of and stockpiled for redressing the land after the required borrow material has been removed;</li> <li>• Ditches or borrow pits that cannot be fully rehabilitated should be landscaped to minimize erosion and to avoid creating hazards for people; and</li> <li>• Landowners should be compensated according to the terms of lease agreements negotiated with them and the restoration actions agreed upon by the Contractor will be duly carried out.</li> </ul>	CC& SC
2.	Soil	To minimize soil erosion and contamination.	<ul style="list-style-type: none"> <li>• Low embankments should be protected by planting vetiver grass that can flourish in relatively dry conditions;</li> <li>• Soil contamination by asphalt will be minimized by placing all containers in caissons;</li> <li>• All spoils should be disposed off as desired and the site will be restored back to its original conditions before handing over;</li> <li>• Non-bituminous wastes from construction activities should be dumped in approved sites, in line with the</li> </ul>	CC & SC

			<ul style="list-style-type: none"> <li>legal prescriptions for dumpsites, and covered;</li> <li>Productive land or land adjacent to agricultural land may not be preferred for excavation; and</li> <li>Non-productive, barren lands in broken terrain, nullahs and publicly recognized waste lands should be given preference for borrowing materials.</li> </ul>	
3.	Land Acquisition	To provide compensation to the affectees.	<ul style="list-style-type: none"> <li>Provide judicious compensation to the affectees by providing sufficient budget in the project cost. The process of land acquisition and compensation should be followed in a transparent manner to minimize the impacts.</li> </ul>	EALS & LAC
4.	Construction Camps	To minimize loss of assets and vegetation/ trees due to construction of construction camps.	<ul style="list-style-type: none"> <li>The contractor(s) should provide plan for removal &amp; rehabilitation of site upon completion;</li> <li>Reinstate any temporary facilities to pre-existing conditions in ecologically sensitive areas;</li> <li>Implement landscaping plan for all facilities in areas where high landscape value and visual vulnerability to the proposed activities warrants site-specific landscape restoration measures;</li> <li>Operate equipment in a manner sympathetic to the ambient noise environment. Do not leave equipment idling unnecessary;</li> <li>Provide adequate warnings of impending works to all potential receptors within a 1 km corridor surrounding the RoW via public notices and local news;</li> <li>The construction contractor is required to develop a Construction Camp Management Plan to address discipline, community liaison, ethnic tension and communicable diseases; and</li> <li>The construction contractor will be required to assess the environmental/social sensitivity of any additional or alternative sites prior to their approval for adoption.</li> </ul>	CC, SC & EALS
5.	Health and safety of workers and	To minimize health risks	<ul style="list-style-type: none"> <li>Obligatory insurance against accidents for laborers/workers;</li> </ul>	CC, SC & EALS



communities

- Provide basic medical training to specified work staff and basic medical service and supplies to workers;
- Layout plan for camp site, indicating safety measures taken by the contractor, e.g. firefighting equipment, safe storage of hazardous material, first aid, security, fencing, and contingency measures in case of accidents;
- Work safety measures and good workmanship practices are to be followed by the contractor to ensure no health risks for laborers;
- Protection devices (ear muffs) should be provided to the workers doing job in the high noise areas;
- Provision of adequate sanitation, washing, cooking and dormitory facilities;
- Proper maintenance of facilities for workers will be monitored;
- Provision of protective clothing i.e. helmet, adequate footwear for bituminous pavement works, protective goggles, gloves etc. for laborers handling hazardous materials;
- Ensure strict use of wearing these protective clothing during work activities;
- Instruct foremen to strictly enforce the keeping out of non-working persons, particularly children, off work sites; and
- Adequate signage, lightning devices, barriers, yellow tape and persons with flags during construction to manage traffic on Multan Road, haulage and access roads.
- There should be proper control on construction activities and oil spillage/ leakage from construction vehicles/ machinery.
- The labour works with different transmittable diseases should be restricted within the construction site;

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- Timely public notification on planned construction works;
- Close consultation with local communities to identify optimal solutions to maintain community integrity & social links;
- Fencing around the camps should be strong enough so that it cannot be broken easily by local people for making passages; and
- Use of water should not disturb public water availability and source of water should be selected carefully.

6.	Borrow Areas	To avoid land disputes and to minimize soil erosion	<ul style="list-style-type: none"> <li>• Conversion of borrow pits into fish farms and care in selection of borrow areas;</li> <li>• Necessary permits must be obtain for any borrow pits from the competent authorities;</li> <li>• No excavations are allowed within distance of 500 m to RoW;</li> <li>• In borrow pits the depth of the pit will be regulated so that the sides of the excavation will have a slope not steeper than 1:4;</li> <li>• Soil erosion along the borrow pit shall be regularly checked to prevent / mitigate impacts on adjacent lands; and</li> <li>• In case borrow pits fill with water, measures have to be taken to prevent the creation of mosquito-breeding sites.</li> </ul>	CC, SC & EALS
7.	Air Pollution	To minimize air pollution	<ul style="list-style-type: none"> <li>• All vehicles, machinery, equipment and generators used during construction activities should be kept in good working condition and be properly tuned and maintained in order to minimize the exhaust emissions;</li> <li>• Open burning of solid waste from the Contractor's camps should be strictly banned;</li> <li>• Preventive measures against dust should be adopted for on-site mixing and unloading operations. Regular</li> </ul>	CC, SC & EALS

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sprinkling of the site by water should be carried out to suppress excessive dust emission(s);

- Emissions from power generators and construction machinery are important point sources at the construction sites. Proper maintenance and repair is needed to minimize the hazardous emissions;
- Quarry areas and asphalt plants should be located at least 500m downwind from populated areas, wildlife habitats and contractor's camps to minimize the impact of dust emissions;
- Asphalt, hot mix and batching plants should be equipped with dust control equipment such as fabric filters or wet scrubbers to reduce level of dust emissions;
- NEQS applicable to gaseous emissions generated by construction vehicles, equipment and machinery should be enforced during construction works;
- Ensure precautions to reduce the level of dust emissions from hot mix plants, crushers and batching plants should be taken up; e.g. providing them as applicable, with protection canvasses and dust extraction units. Mixing equipment should be well sealed and equipped as per existing standards;
- Regular sprinkling to avoid dust; and
- Regular monitoring of air quality in accordance with NEQS.

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8.	Noise Pollution	To minimize noise pollution	<ul style="list-style-type: none"> <li>• Selection of up-to-date and well maintained plant or equipment with reduced noise levels ensured by suitable in-built damping techniques or appropriate muffling devices;</li> <li>• Confine excessively noisy work to normal working hours in the day, as far as possible;</li> <li>• Provide the construction workers with suitable hearing protection like ear cap or earmuffs and train them in</li> </ul>	CC, SC & EALS
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- their use;
- Preferably, restrict construction vehicles movement during nighttime;
- Vehicles and equipment used should be fitted, as applicable, with silencers and properly maintained;
- Use of low noise machinery, or machinery with noise shielding and absorption;
- Contractors should comply with submitted work schedule, keeping noisy operations away from sensitive points; implement regular maintenance and repairs; and employ strict implementation of operation procedures;
- Noise barriers in sensitive areas in the form of high boundary walls (concrete or wood), earth berms, etc. in front of schools, hospitals/ clinics and mosques; and

9.	Surface and Groundwater	To avoid contamination of surface and groundwater and to avoid use of canal water in construction work.	<ul style="list-style-type: none"> <li>• Protection of surface and groundwater reserves from any source of contamination such as the construction and oily waste that will degrade its potable quality;</li> <li>• The solid waste should be disposed of in designated landfill sites to sustain the water quality for domestic requirements;</li> <li>• Water required for construction should be obtained in such a way that the water availability and supply to nearby communities remain unaffected;</li> <li>• Conduct regular water quality monitoring according to Drinking Water Quality Standards (DWQS) and determined sampling schedule;</li> <li>• The contractor should ensure that construction debris do not find their way into the drainage or irrigation canals which may get clogged;</li> <li>• Work on canal areas should be kept to a minimum or protective walls should be constructed;</li> <li>• Prohibit washing of machinery and vehicles in surface water, provide sealed washing basins and collect wastewater in sedimentation/retention pond;</li> </ul>	CC, SC & EALS
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- Construction work close to the water bodies should be avoided, especially during monsoon period; and
- Wastes must be collected, stored and taken to approve disposal site.

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10.	Ecology	To minimize the impact on flora& fauna	<p><b><u>Flora:</u></b></p> <ul style="list-style-type: none"> <li>• The indigenous trees most suited to the tract should be re-planted;</li> <li>• Flowering and fruiting shrubs should be planted along the road to beautify the landscape. Planting would however be done keeping in view the principles of landscape designing;</li> <li>• An awareness campaign targeted on the neighborhood farmers should be run to popularize the planting of trees;</li> <li>• The contractor's staff and labour should be strictly directed not to damage any vegetation such as trees or bushes. They should use the paths and tracks for movement and should not be allowed to trespass through farmlands;</li> <li>• Construction vehicles, equipments and machinery should remain confined within their designated areas of movement;</li> <li>• Contractor should supply gas cylinders at the camps for cooking purposes and cutting of trees/bushes for fuel should not be allowed; and</li> <li>• Camp sites and asphalt plants should be established on waste/barren land rather than on forested or agriculturally productive land. However if such type of land is not available, it should be ensured that minimum clearing of the vegetation is carried out and minimum damage is caused to the trees.</li> <li>• <b><u>Fauna:</u></b></li> <li>• Plantation of large number of trees along the proposed project to regain the ecological habitat;</li> </ul>	CC, SC & EALS
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**Flora:**

- The indigenous trees most suited to the tract should be re-planted;
- Flowering and fruiting shrubs should be planted along the road to beautify the landscape. Planting would however be done keeping in view the principles of landscape designing;
- An awareness campaign targeted on the neighborhood farmers should be run to popularize the planting of trees;
- The contractor's staff and labour should be strictly directed not to damage any vegetation such as trees or bushes. They should use the paths and tracks for movement and should not be allowed to trespass through farmlands;
- Construction vehicles, equipments and machinery should remain confined within their designated areas of movement;
- Contractor should supply gas cylinders at the camps for cooking purposes and cutting of trees/bushes for fuel should not be allowed; and
- Camp sites and asphalt plants should be established on waste/barren land rather than on forested or agriculturally productive land. However if such type of land is not available, it should be ensured that minimum clearing of the vegetation is carried out and minimum damage is caused to the trees.
- **Fauna:**
- Plantation of large number of trees along the proposed project to regain the ecological habitat;

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- New and good condition machinery with minimum noise should be used in construction;
- Noisy work should not be carried out in night time so that there should be no disturbance to local birds and animals;
- Contractor should ensure that the no hunting, trapping of animals should be carried out during construction;
- Borrow pits should be fenced so that no animal can fell into these;
- The camps should be properly fenced and gated to check the entry of wild animals in search of eatable goods. Similarly waste of the camps should be properly disposed of to prevent the chances of eating by wild animals, which may prove hazardous to them; and
- Special measures should be adopted to minimize impacts on birds such as avoiding noise generating activities during the critical period of breeding.

11.	Traffic Management	To minimize traffic problems in the Project Area.	<ul style="list-style-type: none"> <li>• Proper traffic management plan should be implemented to avoid traffic jams/public inconvenience;</li> <li>• Movement of vehicles carrying construction materials should be restricted during the daytime to reduce traffic load and inconvenience to the local residents/ business owners;</li> <li>• Coordinate planning of traffic diversions with the traffic police and the Transport Department in accordance with the construction program with advance warnings to the affected residents and road users;</li> <li>• Availability of continuous services of the traffic police in the diversion and control of traffic; and</li> <li>• The executing agency is required to maintain liaison between the Highway/ Traffic Police, local residents/ travelers and the contractor to facilitate traffic movement during construction stage.</li> </ul>	CC, SC & Traffic Police
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12. Waste (Municipal, Construction and Hazardous Waste)

To minimize the impact on soil and water resources.

- Wastewater effluent from contractor’s workshop and equipment washing yards should be passed through gravel/ sand beds to remove oil/ grease contaminants before discharge;
- Training of work force should be conducted in the storage and handling of materials and chemicals that can potentially cause soil contamination;
- Solid waste generated during construction and camp sites should be safely disposed in demarcated waste disposal sites and the contractor should provide a proper waste management plan;
- Reusable/recyclable (iron bars, aluminum) waste should be sold to waste vendors and those which cannot be sold out may be used as a filling material for leveling the depressions, subject to technical feasibility;
- Debris generated by dismantling of existing pavement structures should be re-used subject to the suitability of the material;
- Ensure proper labelling of containers, including the identification and quantity of the contents, hazard contact information etc.;
- Conduct training of employees involved in the transportation of hazardous material regarding emergency procedures;
- The sewage system for camps should be properly designed (pit latrines or, as required, septic tanks) to receive all sanitary wastewaters;
- Lined wash areas should be constructed within the camp site or at site, for the receipt of wash waters from construction machinery; and
- Construction workers and supervisory staff should be encouraged and educated to practice waste minimization, reuse and recycling to reduce quantity of

CC, SC & EALS



waste.

13.	Social Issues	To minimize the disturbance (hindrance in free movement) to people in the Project Area	<ul style="list-style-type: none"> <li>• Timely completion of the construction work and provide alternate routes for the areas where the construction is being carried out.</li> <li>• Maintaining regular communication with local communities and other stakeholders to minimize tensions arising from Project activities; and</li> <li>• Maintaining a grievance procedure to facilitate stakeholders in expressing concerns;</li> </ul>	NHA, CC & EALS
14.	Economic Activity	To monitor the economic implications in the project area	<ul style="list-style-type: none"> <li>• Preferentially recruit local candidates provided they have the required skills and qualifications for the announced positions;</li> <li>• Coordinate efforts to recruit unskilled labor, if any are required under the Project, from the adjacent rural areas; and</li> <li>• Require contractors to prefer local candidates in the recruitment process provided they have the required skills and qualifications.</li> </ul>	NHA & CC
15.	Impacts of Heavy Vehicles	The plying of heavy vehicles on the existing road network may result in air pollution	<ul style="list-style-type: none"> <li>• Materials having potential to produce dust shall not be loaded to a level higher than the side and tail boards and shall be covered with clean tarpaulin in good condition.</li> <li>• Noise mufflers shall be installed and maintained in good condition on all motorized equipment under the control of the contractor.</li> <li>•</li> </ul>	
16.	Maintenance of Construction Equipment	Improper maintenance of construction equipment may lead to safety and environmental hazards like groundwater and soil contamination or injury to workers	<ul style="list-style-type: none"> <li>• Place substantial blocking under any chain-hoist-suspended or jack supported equipment under which people must work.</li> <li>• All work areas should be provided with proper ventilation.</li> <li>• Always keep a suitable fire extinguisher ready.</li> <li>• Put oily rags in closed metal containers for disposal</li> </ul>	

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			after use	
			<ul style="list-style-type: none"> <li>Secure unbolted heavy parts or engines if necessary to leave the work</li> </ul>	
17.	Conservation of Resources and Environmental Sustainability	The construction of the proposed project will pose burden on the existing natural resources.	<ul style="list-style-type: none"> <li>Reuse of materials, such as concrete and asphalt, reduces the need for concrete and asphalt manufacturing, reduce greenhouse gas (GHG) emissions, and reduces waste disposal costs and emissions.</li> <li>Use of solar panels and LED lights in the construction camps instead of using diesel operated generators and normal bulbs.</li> <li>Control hazardous and solid waste, develop waste minimization strategies.</li> <li></li> </ul>	

**C. OPERATIONAL STAGE**

<i>No.</i>	<i>Impact</i>	<i>Objective</i>	<i>Mitigations</i>	<i>Responsibility(s)</i>
1.	Ecology (Flora & Fauna)	Proper maintenance of saplings planted.	<ul style="list-style-type: none"> <li>The saplings planted in the project area against the trees affected should be properly maintained throughout their initial growth period in terms of water requirement and necessary nutrients;</li> <li>An awareness campaign targeted on the neighborhood farmers should be run to popularize the planting of trees; and</li> <li>Organic farming should be encouraged to minimize the use of chemical fertilizers and pesticides.</li> <li>Provision of animal/ livestock crossings after every some distances to facilitate their movement; and</li> <li>Installation of sign boards indicating the sensitive areas for the road users to avoid accidents.</li> </ul>	EALS & Forrest Deptt.
2.	Air & Noise Quality	To minimize noise pollution.	<ul style="list-style-type: none"> <li>Air and Noise monitoring should be carried out at locations and schedule specified in the Environmental Monitoring Plan (EMP) to ensure the effectiveness of</li> </ul>	EALS & EPA Punjab

*Sujid*

- mitigation measures;
- Signs for sensitive zones (health centers/ educational institutions etc.) to disallow the use of pressure horns; and
- Enforcement and penalties against traffic rules violators.

3.	Road Maintenance Works	To control HSE and environmental related issues.	<ul style="list-style-type: none"> <li>• Strict enforcement of speed limits, installation of speed guns and channelization of traffic with respect to categories (heavy vehicle traffic and light vehicle traffic) and enforcement of penalties for the violators.</li> <li>• Implementation of HSE Plans during the maintenance period;</li> <li>• Strict implementation of PPEs;</li> <li>• Use of high quality equipment and material by the contractor;</li> <li>• Continuous improvements in the emergency plans; and</li> <li>• Placement of sign boards for traffic diversions and proper implementation of traffic diversion plans.</li> </ul>	NHA & Traffic Police
----	------------------------	--	--	----------------------

**KEY**

- DC Design Consultant
- CC Construction Contractor
- SC Supervision Consultant
- EC Environmental Committee
- NHA National Highway Authority
- EPA Environmental Protection Agency
- LAC Land Acquisition Collector

*Sujid*

## 7.4 Environmental Monitoring and Performance Indicators

Environmental Monitoring is undertaken during both the construction and operational phases to ensure the effectiveness of the proposed mitigation measures. Specific environmental parameters are selected and quantitative analysis is carried out. The environmental parameters that may be qualitatively and quantitatively measured and compared are selected as ‘performance indicators’ and recommended for monitoring during project implementation and operation stages. These monitoring indicators will be continuously monitored to ensure compliance with the national or other applicable standards and comparison with the baseline conditions.

The results of analysis are compared with the standards and pre-project conditions to investigate whether the EMP and its implementation are effective for the mitigation of impacts or not. Parameters to be analyzed during construction and operation of the proposed project and responsibilities for monitoring and reporting have been discussed in **Table 7.2**.

### 7.4.1 Monitoring and Reporting

The EALS will be responsible for environmental monitoring and reporting throughout the construction and operational phase. A monitoring report will be prepared on monthly basis and one comprehensive report will be prepared at the end of the project construction phase and a comprehensive quarterly report will also be prepared and submitted to the EPA-Punjab for the first year of the project. Contents of the final report will include results of environmental monitoring in comparison to the standards for the various parameters, location and sampling time along with recommendations for the future projects. One report will be submitted during the construction phase to each of the following authorities and institutions: (i) NHA-EALS and (ii) EPA-Punjab whereas, one report will be submitted to EPA-Punjab during the operational phase.



**Table 7.2: Cost Estimate for Environmental Monitoring During the Construction and Operational Phase**

Components	Parameters	Quantity (No. of samples x No. of locations x Frequency)	Frequency	Responsibility	Duration	Cost (Rs.)
<b>Construction Stage (2 years)</b>						
<b>Air Quality</b>	CO, NO <sub>2</sub> , SO <sub>2</sub> , PM <sub>10</sub>	3x1x8 = 24	Quarterly @ Rs. 25,000/ sample	Contractor & SC	24 hours	600,000/-
<b>Ground Water Quality</b>	According to DWQS	2x1x4 = 8	Bi-annual @ Rs. 30,000/sample	Contractor & SC	-	240,000/-
<b>Wastewater Quality</b>	According to NEQS	1x1x4 = 4	Bi-annual @ Rs. 30,000/sample	Contractor & SC	-	120,000/-
<b>Noise Level</b>	According to NEQS	3x1x8 = 24	Quarterly @ Rs. 4,000/point	Contractor & SC	24 hours	96,000/-
<b>Total</b>						<b>1,056,000/-</b>
<b>Operation Stage (1 year)</b>						
<b>Air Quality</b>	CO, NO <sub>2</sub> , SO <sub>2</sub> , PM <sub>10</sub>	2x1x4 = 8	Bi-annual @ Rs. 25,000/ sample	NHA & EPA Punjab	24 hours	200,000/-
<b>Ground Water Quality</b>	According to DWQS	2x1x4 = 8	Bi-annual @ Rs. 30,000/sample	NHA & EPA Punjab	-	240,000/-
<b>Wastewater Quality</b>	According to NEQS	1x1x4 = 4	Bi-annual @ Rs. 30,000/sample	NHA & EPA Punjab	-	120,000/-
<b>Noise Level</b>	According to NEQS	2x1x4 = 8	Bi-annual @ Rs. 4,000/point	NHA & EPA Punjab	24 hours	32,000/-



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<b>Sub-Total</b>	<b>592,000/-</b>
<hr/>	
<b>Total</b>	<b>1,648,000/-</b>

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**KEY**

SC – Supervision Consultant

NHA – National Highway Authority

EPA– Environmental Protection Agency





## 7.5 Environmental Technical Assistance and Training Plan

In order to raise the level of professional and managerial staff, there is a need to upgrade their knowledge in the related areas. The EALS should play a key role in this respect and arrange the trainings.

An environmental and social training and Technical Assistance (TA) program is to be carried out before the implementation of the project. Contractor's environmental awareness and appropriate knowledge of environmental protection is critical to the successful implementation of the EMMP because without appropriate environmental awareness, knowledge and skills required for the implementation of the mitigation measures, it would be difficult for the Contractor(s) workforce to implement effective environmental protection measures.

NHA will appoint TA consultant to manage the environmental training program. The TA consultant will organize training courses for NHA and contractor staff to train them in specialized areas such as air and noise pollution monitoring; develop environment operation manuals in consultation with the EPA, Punjab. The details of this training program are presented in **Table 7.3**.

**Table 7.3: Personnel Training Program/ TA Services**

<b>Provided by</b>	<b>Contents</b>	<b>Trainees/Events</b>	<b>Duration</b>
TA consultants/ organizations specializing in environmental management and monitoring	Short seminar and a course on: Environmental laws and regulations, daily monitoring and supervision	One seminar for NHA and contractor project staff	3 days
TA consultants/ organizations specializing in social management and monitoring	Short seminar and course on: Social awareness	One seminar for project staff dealing in Social/lands matters	2 days
TA consultants/ organizations	Short lecture relating to Occupational Safety	One seminar for contractor's staff	2 days



Provided by	Contents	Trainees/Events	Duration
specializing in Occupational, health and safety issues	and Health		

A lump sum of **Rs. 300,000/-** should be kept for the above mentioned training plan.

#### 7.6 Health, Safety & Environment (HSE) and Tree Plantation

The break-up and details for HSE components and tree plantation cost is given in **Annexure VI**.

#### 7.7 Environmental Monitoring, Mitigation and Training Cost

The cost required to effectively implement the mitigation measures is important for the sustainability of the Project both in the construction and operational phases of the Project. These costs are summarized in **Table 7.4**.

**Table 7.4: Environmental Mitigation and Monitoring Cost**

Sr. No.	Activity	Basis	Cost (Rs.)
1.	Health & Safety of Workers	For 100 employees for the provision of dust masks, safety shoes, gloves, first aid box, ear plugs, safety helmets and safety jackets (Hi Vis) And Provision of dust bins, warning tap, safety cones, safety sign boards and water sprinkling	82,280,000
2.	Environmental Monitoring Cost	Air, water and noise	1,648,000
3.	Cost for hiring of staff (Environment Health & Safety Specialist)	Rs. 100,000 / month for 24 months	2,400,000
4.	Cost of environmental training	For the whole construction period	300,000

*Syed*

<b>Sr. No.</b>	<b>Activity</b>	<b>Basis</b>	<b>Cost (Rs.)</b>
5.	Tree Plantation and maintenance for five (05) years	-----	7,551,000
<b>Total</b>			<b>94,179,000</b>

The estimated Environmental Mitigation and Monitoring cost will be **Rs. 94,179,000** or **Rs. 94.17** Million.



## **SECTION 8**

### **CONCLUSION & RECOMMENDATIONS**

#### **8.0 General**

This section provides the study of the probable impacts during pre-construction/design, construction and operational stages of the proposed project on the physical, biological and socio-economic environment of the project area. It also describes the actions that will alleviate/reduce the project's environmental effects.

#### **8.1 Conclusion**

The essence of any EIA process is aimed at ensuring informed decision-making and environmental accountability, and to assist in achieving environmentally sound and sustainable development. This EIA was conducted to comply with the national environmental regulations and best industry practice. For this purpose social, ecological and physical surveys were conducted to establish the baseline conditions. Some of the potential impacts identified in the EIA include:

- Land acquisition ;
- Impact on air quality impacts due to fugitive dust and vehicular emissions;
- Noise and vibration issues due to construction activities;
- Environmental and social impacts due to construction activities;
- Traffic impact;
- Waste management issues relating to domestic, construction and liquid waste;
- Occupational health and safety issues;
- Socioeconomic impacts due to employment and cultural difference; and
- Ecological impacts due to removal of forest trees and agricultural land.

These issues have been discussed in the report and mitigation measures for these and other aspects have been proposed.

Assuming effective implementation of the mitigation measures and monitoring requirements as outlined in the Environmental Management Plan, the potential adverse environmental and social impacts of the proposed Project are likely to be within the



acceptable limits. After the execution of the proposed project, it can be anticipated that less time and fuel will be required for travelling and reaching this part of Lahore City and overall safety of passengers will also be increased.

## 8.2 Recommendations

The following recommendations must be adopted prior to any decision about implementation of the project:

- Environmental compliance during the construction stage of the project must be implemented for which EMP must be a part of the construction contract document;
- Tree plantation plan must be executed with necessary modifications during the operational stage of the project;
- Health and safety issues must be tackled according to the designed/proposed HSE action plans during both the construction and operation stage. Emergency plans must also be followed in case of any incident;
- Judicious compensation to the affectees prior to execution of the project; and
- Traffic diversion plan should be formulated in close coordination with the highway/traffic police and communicated to the nearby communities and travelers well before the construction stage. These traffic plans should be strictly implemented during the construction stage of the project.

The implementation of the mitigation measures detailed in Section-6 and listed in the Environmental Management Plan (EMP), including monitoring, will provide a basis for ensuring that the potential positive and negative impacts associated with the establishment of the proposed project are enhanced and mitigated to a level which is deemed adequate for the project to proceed.



## **ANNEXURE - I**

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**SCHEDULE II**  
(See Regulation 4)

**List of projects requiring an EIA**

**A. Energy**

1. Hydroelectric power generation over 50 MW
2. Thermal power generation over 200 MW
3. Transmission lines (11 KV and above) and grid stations
4. Nuclear power plans
5. Petroleum refineries

**B. Manufacturing and processing**

1. Cement plants
2. Chemicals projects
3. Fertilizer plants
4. Food processing industries including sugar mills, beverages, milk and dairy products, with total cost of Rs.100 million and above
5. Industrial estates (including export processing zones)
6. Man-made fibers and resin projects with total cost of Rs.100 M and above
7. Pesticides (manufacture or formulation)
8. Petrochemicals complex
9. Synthetic resins, plastics and man-made fibers, paper and paperboard, paper pulping, plastic products, textiles (except apparel), printing and publishing, paints and dyes, oils and fats and vegetable ghee projects, with total cost more than Rs.10 million
10. Tanning and leather finishing projects

**C. Mining and mineral processing**

1. Mining and processing of coal, gold, copper, sulphur and precious stones
2. Mining and processing of major non-ferrous metals, iron and steel rolling
3. Smelting plants with total cost of Rs.50 million and above

**D. Transport**

1. Airports
2. Federal or Provincial highways or major roads (except maintenance, rebuilding or reconstruction of existing roads) with total cost of Rs.50 million and above
3. Ports and harbor development for ships of 500 gross tons and above
4. Railway works

**E. Water management, dams, irrigation and flood protection**

1. Dams and reservoirs with storage volume of 50 million cubic meters and above or surface area of 8 square kilometers and above
2. Irrigation and drainage projects serving 15,000 hectares and above

**F. Water supply and treatment**

Water supply schemes and treatment plants with total cost of Rs.25 million and above

**G. Waste Disposal**

1. Waste disposal and/or storage of hazardous or toxic wastes (including landfill sites, incineration of hospital toxic waste)
2. Waste disposal facilities for domestic or industrial wastes, with annual capacity more than 10,000 cubic meters

**H. Urban development and tourism**

1. Land use studies and urban plans (large cities)
2. Large-scale tourism development projects with total cost more than Rs.50 million

**I. Environmentally Sensitive Areas**

All projects situated in environmentally sensitive areas

**J. Other projects**

1. Any other project for which filing of an EIA is required by the Federal Agency under sub-regulation (2) of Regulation 5.
2. Any other project likely to cause an adverse environmental effect



## **ANNEXURE - II**

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GOVERNMENT OF THE PUNJAB  
LAW AND PARLIAMENTARY AFFAIRS DEPARTMENT

NOTIFICATION  
(124 of 2016)

12<sup>th</sup> August 2016

The following Notification No. SO(G)/EPD/7-26/2013, dated 05.08.2016 regarding the Punjab Environmental Quality Standards for Drinking Water is published for general information:

*Syed*

**DR SYED ABUL HASSAN NAJMEE**  
Secretary  
Government of the Punjab  
Law and Parliamentary Affairs  
Department

**Government of the Punjab  
Environment Protection Department**

**NOTIFICATION: No. SO(G)/EPD/7-26/2013** - In exercise of the powers conferred under clause (c) of sub-section (1) of section 4 of the Punjab Environmental Protection Act, 1997 (XXXIV of 1997), the Environmental Protection Council has approved the following as the Punjab Environmental Quality Standards for Drinking Water:

**Punjab Environmental Quality Standards for Drinking Water**

Properties/Parameters	Standard Values	WHO Standards	Remarks
All water intended for drinking (E. Coli or Thermo-tolerant Coliform bacteria)	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Most Asian countries also follow WHO standards
Treated water entering the distribution system (E. Coli or thermo tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample	Must not be detectable in any 100 ml sample	Most Asian countries also follow WHO standards
Treated water in the distribution system (E. Coli or thermo tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml sample In case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12- month period.	Must not be detectable in any 100 ml sample In case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12- month period.	Most Asian countries also follow WHO standards
Colour	≤15 TCU	≤15 TCU	
Taste	Non objectionable/ Acceptable	Non objectionable/ Acceptable	
Odour	Non objectionable/ Acceptable	Non objectionable/ Acceptable	
Turbidity	<5 NTU	<5 NTU	

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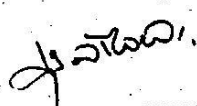
Properties/Parameters	Standard Values	WHO Standards	Remarks
Total hardness as CaCO <sub>3</sub>	< 500 mg/l	---	
TDS	<1000	<1000	
pH	6.5 - 8.5	6.5 - 8.5	
<b>Essential Inorganic</b>			
	mg/Litre	mg/Litre	
Aluminum (Al) mg/l	≤0.2	0.2	
Antimony (Sb)	≤0.005 (P)	0.02	
Arsenic (As)	≤0.05 (P)	0.01	Standard for Pakistan similar to most Asian developing countries
Barium (Ba)	0.7	0.7	
Boron (B)	0.3	0.3	
Cadmium (Cd)	0.01	0.003	Standard for Pakistan similar to most Asian developing countries
Chloride (Cl)	<250	250	
Chromium (Cr)	≤0.05	0.05	
Copper (Cu)	2	2	
Toxic Inorganic	mg/l	mg/l	
Cyanide (CN)	≤0.05	0.07	Standard for Pakistan similar to Asian developing countries
Fluoride (F)*	≤1.5	1.5	
Lead (Pb)	≤0.05	0.01	Standard for Pakistan similar to most Asian developing countries
Manganese (Mn)	≤ 0.5	0.5	
Mercury (Hg)	≤0.001	0.001	
Nickel (Ni)	≤0.02	0.02	
Nitrate (NO <sub>3</sub> )*	≤50	50	
Nitrite (NO <sub>2</sub> )*	≤3 (P)	3	
Selenium (Se)	0.01(P)	0.01	

*Syed*

Properties/Parameters	Standard Values	WHO Standards	Remarks
Residual chlorine	0.2-0.5 at consumer end 0.5-1.5 at source		
Zinc (Zn)	5.0	3	Standard for Pakistan similar to most Asian developing countries
<b>Organic</b>			
Pesticides mg/l			PSQCA No. 4639- 2004, Page No. 4 Table No. 3 Serial No. 20-58 may be consulted.**
Phenolic compounds (as Phenols) mg/l		0.002	
Poly-nuclear aromatic hydrocarbons (as PAHs) g/l		0.01 (By GC/MS method)	
<b>Inorganic</b>			
Alpha Emitters bq/L or pCi	0.1	0.1	
Beta emitters	1	1	

\* Indicates priority health related inorganic constituents, which need regular monitoring.

\*\* PSQCA: Pakistan Standards Quality Control Authority.

  
(IQBAL MOHAMMED CHAUHAN)  
Secretary, Government of the Punjab  
Environment Protection Department



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**GOVERNMENT OF THE PUNJAB  
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**NOTIFICATION  
(122 of 2016)**

12<sup>th</sup> August 2016.

The following Notification No. SO(G)/EPD/7-26/2013, dated 05.08.2016 regarding the Punjab Environmental Quality Standards for Ambient Air is published for general information:

*Syed*

**DR SYED ABUL HASSAN NAJMEE**

Secretary

Government of the Punjab  
Law and Parliamentary Affairs  
Department

**Government of the Punjab  
Environment Protection Department**

**NOTIFICATION: No. SO(G)/EPD/7-26/2013.** - In exercise of the powers conferred under clause (c) of sub-section (1) of section 4 of the Punjab Environmental Protection Act, 1997 (XXXIV of 1997), Environmental Protection Council has approved the following as the Punjab Environmental Quality Standards for Ambient Air:

**Punjab Environmental Quality Standards for Ambient Air**

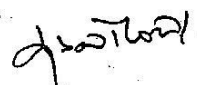
Pollutant	Time-weighted average	Concentration in Ambient Air	Method of measurement
Sulfur Dioxide (SO <sub>2</sub> )	Annual Average*	80 µg/m <sup>3</sup>	Ultraviolet Fluorescence method
	24 hours**	120 µg/m <sup>3</sup>	
Oxides of Nitrogen as (NO)	Annual Average*	40 µg/m <sup>3</sup>	Gas Phase Chemiluminescence
	24 hours**	40 µg/m <sup>3</sup>	
Oxides of Nitrogen as (NO <sub>2</sub> )	Annual Average*	40 µg/m <sup>3</sup>	Gas Phase Chemiluminescence
	24 hours**	80 µg/m <sup>3</sup>	
Ozone (O <sub>3</sub> )	1 hour	130µg/m <sup>3</sup>	Non dispersive UV absorption method
Suspended Particulate Matter (SPM)	Annual Average*	360µg/m <sup>3</sup>	High Volume Sampling, (Average flow rate not less than 1.1 m <sup>3</sup> /min).
	24 hours**	500µg/m <sup>3</sup>	
Respirable Particulate Matter PM <sub>10</sub>	Annual Average*	120µg/m <sup>3</sup>	Preferably β-Ray absorption method
	24 hours**	150µg/m <sup>3</sup>	
Respirable Particulate Matter PM <sub>2.5</sub>	Annual Average*	15µg/m <sup>3</sup>	Preferably β-Ray absorption method
	24 hours**	35µg/m <sup>3</sup>	

*Syed*

Pollutant	Time-weighted average	Concentration in Ambient Air	Method of measurement
	1 hour	15 $\mu\text{g}/\text{m}^3$	
Lead (Pb)	Annual Average*	1 $\mu\text{g}/\text{m}^3$	ASS Method after sampling using EPM 2000 or equivalent Filter paper
	24 hours**	1.5 $\mu\text{g}/\text{m}^3$	
Carbon Monoxide (CO)	8 hours**	5 $\text{mg}/\text{m}^3$	Non Dispersive Infra Red (NDIR) method
	1 hour	10 $\text{mg}/\text{m}^3$	

\* Annual arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval.

\*\* 24 hourly /8 hourly values should be met 98% of the in a year. 2% of the time, it may exceed but not on two consecutive days.

  
 (IQBAL MOHAMMED CHAUHAN)  
 Secretary, Government of the Punjab  
 Environment Protection Department





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**NOTIFICATION  
(120 of 2016)**

12<sup>th</sup> August 2016

The following Notification No. SO(G)/EPD/7-26/2013, dated 05.08.2016 regarding the Punjab Environmental Quality Standards for Municipal and Liquid Industrial Effluents is published for general information:

**DR SYED ABUL HASSAN NAJME**

Secretary  
Government of the Punjab  
Law and Parliamentary Affairs  
Department

*Syed*

**Government of the Punjab  
Environment Protection Department**

**NOTIFICATION: No. SO(G)/EPD/7-26/2013.** - In exercise of the powers conferred under clause (c) of sub-section (1) of section 4 of the Punjab Environmental Protection Act, 1997 (XXXIV of 1997), the Environmental Protection Council has approved the following as the Punjab Environmental Quality Standards for Municipal and Liquid Industrial Effluents.

**Punjab Environmental Quality Standards for Municipal and Liquid Industrial Effluents (mg/l, unless otherwise defined)**

No	Parameter	Into Inland Waters	Into Sewage Treatment
1	2	3	4
1	Temperature or Temperature Increase *	≤ 3°C	≤ 3°C
2	pH value (H <sup>+</sup> )	6-9	6-9
3	Biochemical Oxygen Demand (BOD <sub>5</sub> ) at 20 °C <sup>(1)</sup>	80	250
4	Chemical Oxygen Demand (COD) <sup>(1)</sup>	150	400
5	Total suspended solids (TSS)	200	400
6	Total dissolved solids (TDS)	3500	3500
7	Grease and Oil	10	10
8	Phenolic compounds (as phenol)	0.1	0.3
9	Chloride (as Cl <sup>-</sup> )	1000	1000
10	Fluoride (as F <sup>-</sup> )	10	10
11	Cyanide (as CN <sup>-</sup> ) total	1.0	1.0
12	An-ionic detergents (as MBAs) <sup>(2)</sup>	20	20
13	Sulfate (SO <sub>4</sub> <sup>2-</sup> )	600	1000

*Syed*

No	Parameter	Into Inland Waters	Into Sewage Treatment
1	2	3	4
14	Sulfide (S <sup>2-</sup> )	1.0	1.0
15	Ammonia (NH <sub>3</sub> )	40	40
16	Pesticides <sup>(3)</sup>	0.15	0.15
17	Cadmium (Cd) <sup>(4)</sup>	0.1	0.1
18	Chromium (trivalent and hexavalent) <sup>(4)(1)</sup>	1.0	1.0
19	Copper (Cu) <sup>(4)</sup>	1.0	1.0
20	Lead (Pb) <sup>(4)</sup>	0.5	0.5
21	Mercury (Hg) <sup>(4)</sup>	0.01	0.01
22	Selenium (Se) <sup>(4)</sup>	0.5	0.5
23	Nickel(Ni) <sup>(4)</sup>	1.0	1.0
24	Silver(Ag) <sup>(4)</sup>	1.0	1.0
25	Total Toxic metals	2.0	2.0
26	Zinc (Zn)	5.0	5.0
27	Arsenic (As) <sup>(4)</sup>	1.0	1.0
28	Barium (Ba) <sup>(4)</sup>	1.5	1.5
29	Iron (Fe)	8.0	8.0
30	Manganese (Mn)	1.5	1.5
31	Boron (B) <sup>(4)</sup>	6.0	6.0
32	Chlorine (Cl <sub>2</sub> )	1.0	1.0

**Explanations:**

1. Assuming minimum dilution 1:10 on discharge, lower ratio would attract progressively stringent standards to be determined by the Provincial Environmental Protection Agency. By 1:10 dilution means, for example that for each one cubic meter of treated effluent, the recipient water body should have 10 cubic meter of water for dilution of this effluent.
2. Methylene Blue Active Substances; assuming surfactant as biodegradable.

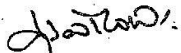
*Syed*

3. Pesticides include herbicides, fungicides and insecticides.
4. Subject to total toxic metals, discharge should not exceed level given at S.N. 25.
5. Applicable only when and where sewage treatment is operational and  $BOD_5=80$  mg/l is achieved by the sewage treatment system.

\* The effluent should not result in temperature increase of more than  $30^{\circ}\text{C}$  at the edge of the zone where initial mixing and dilution take place in the receiving body. In case zone is not defined, use 100 meters from the point of discharge.

\*\* The value for industry is 200 mg/l.

- Note:
1. Dilution of liquid effluents to meet to the PEQS limiting value is not permissible through fresh water mixing with the effluent before discharging into the environment.
  2. The concentration of pollutants in water being used will be subtracted from the effluent for calculating the PEQS limits.

  
(IQBAL MOHAMMED CHAUHAN)  
Secretary, Government of the Punjab  
Environment Protection Department



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**GOVERNMENT OF THE PUNJAB  
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**NOTIFICATION  
(121 of 2016)**

12<sup>th</sup> August 2016

The following Notification No. SO(G)/EPD/7-26/2013, dated 05.08.2016 regarding the Punjab Environmental Quality Standards for Noise is published for general information:

**DR SYED ABUL HASSAN NAJMEE**

Secretary

Government of the Punjab  
Law and Parliamentary Affairs  
Department

*Syed*

**Government of the Punjab  
Environment Protection Department**

**NOTIFICATION: No. SO(G)/EPD/7-26/2013.** In exercise of the powers conferred under clause (c) of sub-section (1) of section 4 of the Punjab Environmental Protection Act, 1997 (XXXIV of 1997), the Environmental Protection Council has approved the following as the Punjab Environmental Quality Standards for Noise:

**Punjab Environment Quality Standards for Noise**

No.	Category of Area/Zone	Effective from 1 <sup>st</sup> July, 2010		Effective from 1 <sup>st</sup> July, 2013	
		Limits in dB(A) Leq*			
		Day Time	Night Time	Day Time	Night Time
1	Residential Area (A)	65	50	55	45
2	Commercial Area (B)	70	60	65	55
3	Industrial Area (C)	80	75	75	65
4	Silence Zone (D)	55	45	50	45

Note:

1. Day time hours; 6:00am to 10:00pm.
2. Night Time hours; 10:00 pm to 6:00 am.
3. Silence Zone: Zones which are declared as such by the competent authority. An area comprising not less than 100 meters around hospital, educational institutions and courts
4. Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority

\* dB(A) Leq: Time weighted average of the level of sound in decibel on scale A which is relatable to human hearing.

*(Signature)*  
(IQBAL MOHAMMED CHAUHAN)  
Secretary, Government of the Punjab  
Environment Protection Department

*(Signature)*

## **ANNEXURE - III**

*Sujid*

***ENVIRONMENTAL MONITORING AND LABORATORY TESTING***

*For*

Drinking Water, Waste Water Samples, Ambient Gaseous Monitoring and Noise Level Monitoring  
For "Lahore Eastern Zone".

Asif Ali & Associates Private Limited,  
Phase -1, DHA, Lahore

By:



Suite # 4, 2<sup>nd</sup> Floor, Link Arcade, Link Model Town Road, Lahore - Pakistan  
Phone: +92 42 35925693, 35887517  
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**September, 2016**

*Sujid*





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*Sayed*

## Executive Summary:

The entire on-site environmental monitoring was carried out in the presence of staff from Asif Ali & Associates Private Limited.

This report contains the results of the environmental monitoring carried out on the project site of “Lahore Eastern Zone” dated 07, 08, 09 & 10 September, 2016. The report comprises the following sections:

<b>SECTION-A</b>	Ambient Gaseous Monitoring for Carbon Monoxide (CO), Sulphur dioxide (SO <sub>2</sub> ) and Nitrogen Dioxide (NO <sub>2</sub> ), from Three Locations of project area.
<b>SECTION-B</b>	Ambient Particulate Matter (PM <sub>10</sub> ) Monitoring, from Three Locations of project area.
<b>SECTION-C</b>	Noise Level Monitoring from Three Locations of project area.
<b>SECTION-D</b>	Drinking Water, Waste water Analysis.(3 Samples)



**Introduction:**

APEX Environmental Laboratory was assigned the job for monitoring of Drinking Water, Waste water Samples, Ambient Gaseous Monitoring and Noise Level as baseline environmental data for the project “Lahore Eastern Zone”.

Summarily, all precautions regarding sampling bottles cleaning, sampling of Ground water and Surface water along with Chain of Custody were followed according to the methods as referred in the Standard Methods for The Examination of Water and Waste Water, by APHA, Washington, DC, USA.



**SECTION-A**

**Ambient Gaseous Monitoring for Carbon Monoxide (CO), Sulphur Dioxide (SO<sub>2</sub>) and Nitrogen Dioxide (NO<sub>2</sub>), from Three Locations of project area.**

*Sujid*

This Section A exhibits the on-site monitored baseline data for Carbon Monoxide (CO), Sulphur dioxide (SO<sub>2</sub>) and Nitrogen Dioxide (NO<sub>2</sub>).the data was monitored at Three points from project area.

Monitoring of the ambient gases was done by using Dragger Miniwarn/ Impingers Method. Monitoring was carried out for 24 hours continuously hourly basis.

Sujid

## ENVIRONMENTAL MONITORING REPORT

**Reference:** 917/AEL/AAAPL  
**Client:** Asif Ali & Associates Private Limited.  
**Date of issue of report:** 21-09-16  
**Date of sampling:** 07-09-16 to 08-09-16  
**Nature/source of sample(s):** Ambient Gaseous Monitoring Near Lakhodair Interchange.  
**Testing specifications:** Dragger MiniWarn/ Impingers Method

### RESULTS:

Reference Point	Date of monitoring	Time of monitoring	SO <sub>2</sub> 24 hourly monitored (µg/m <sup>3</sup> )	NO <sub>2</sub> 24 hourly monitored (µg/m <sup>3</sup> )	CO 24 hourly monitored (mg/m <sup>3</sup> )	
<b>Near Lakhodair Interchange</b>	07-09-16	09:00 am	61.0	31.0	0.97	
	07-09-16	10:00 am	65.0	29.2	1.21	
	07-09-16	11:00 pm	63.0	33.5	1.39	
	07-09-16	12:00 pm	54.0	23.2	1.55	
	07-09-16	01:00 pm	53.0	29.0	1.67	
	07-09-16	02:00 pm	66.0	25.0	2.12	
	07-09-16	03:00 pm	68.0	34.0	1.96	
	07-09-16	04:00 pm	67.0	39.0	1.98	
	07-09-16	05:00 pm	62.0	25.0	1.62	
	07-09-16	06:00 pm	58.0	24.0	1.89	
	07-09-16	07:00 pm	69.0	23.0	1.88	
	07-09-16	08:00 pm	71.0	31.0	1.55	
	07-09-16	09:00 pm	55.0	22.0	1.77	
	07-09-16	10:00 pm	51.0	27.0	1.81	
	07-09-16	11:00 pm	53.0	21.3	1.89	
	08-09-16	12:00 am	59.0	28.0	1.70	
	08-09-16	01:00 am	51.0	32.0	1.93	
	08-09-16	02:00 am	47.0	31.0	1.67	
	08-09-16	03:00 am	44.0	19.0	1.38	
	08-09-16	04:00 am	41.0	23.0	1.19	
	08-09-16	05:00 am	42.0	21.9	1.61	
	08-09-16	06:00 am	49.0	26.5	0.99	
	08-09-16	07:00 am	53.0	20.0	0.89	
	08-09-16	08:00 am	45.0	25.0	0.85	
	<b>Average :</b>			<b>56.1 µg/m<sup>3</sup></b>	<b>26.8 µg/m<sup>3</sup></b>	<b>1.56 mg/m<sup>3</sup></b>
	<b>NEQSAA-2010 value:</b>			<b>120 µg/m<sup>3</sup></b>	<b>80 µg/m<sup>3</sup></b>	<b>5 mg/m<sup>3</sup></b>

*Sujid*

## ENVIRONMENTAL MONITORING REPORT

**Reference:** 917/AEL/AAAPL  
**Client:** Asif Ali & Associates Private Limited.  
**Date of issue of report:** 21-09-16  
**Date of sampling:** 08-09-16 to 09-09-16  
**Nature/source of sample(s):** Ambient Gaseous Monitoring Near Kala Khatai Road.  
**Testing specifications:** Dragger MiniWarn/ Impingers Method

### RESULTS:

Reference Point	Date of monitoring	Time of monitoring	SO <sub>2</sub> 24 hourly monitored (µg/m <sup>3</sup> )	NO <sub>2</sub> 24 hourly monitored (µg/m <sup>3</sup> )	CO 24 hourly monitored (mg/m <sup>3</sup> )	
<b>Near Kala Khatai Road</b>	08-09-16	10:00 am	44.0	29.9	0.91	
	08-09-16	11:00 am	49.2	25.7	0.93	
	08-09-16	12:00 pm	53.1	23.5	1.05	
	08-09-16	01:00 pm	58.5	26.3	1.06	
	08-09-16	02:00 pm	55.0	28.2	1.09	
	08-09-16	03:00 pm	44.0	26.7	1.03	
	08-09-16	04:00 pm	49.0	35.9	1.05	
	08-09-16	05:00 pm	43.2	29.2	1.17	
	08-09-16	06:00 pm	37.3	31.4	0.99	
	08-09-16	07:00 pm	42.5	28.5	1.20	
	08-09-16	08:00 pm	39.9	29.3	1.02	
	08-09-16	09:00 pm	51.0	30.4	1.10	
	08-09-16	10:00 pm	53.0	31.2	1.32	
	08-09-16	11:00 pm	41.3	37.7	1.15	
	09-09-16	12:00 am	47.5	35.5	1.27	
	09-09-16	01:00 am	43.5	33.8	1.55	
	09-09-16	02:00 am	42.2	32.3	1.09	
	09-09-16	03:00 am	42.7	31.9	1.07	
	09-09-16	04:00 am	39.2	39.6	0.90	
	09-09-16	05:00 am	35.7	37.7	0.92	
	09-09-16	06:00 am	39.8	38.9	0.98	
	09-09-16	07:00 am	27.5	25.9	1.05	
	09-09-16	08:00 am	35.7	21.3	1.61	
	09-09-16	09:00 am	33.0	19.9	1.02	
	<b>Average :</b>			<b>43.6 µg/m<sup>3</sup></b>	<b>30.4 µg/m<sup>3</sup></b>	<b>1.10 mg/m<sup>3</sup></b>
	<b>NEQSAA-2010 value:</b>			<b>120 µg/m<sup>3</sup></b>	<b>80 µg/m<sup>3</sup></b>	<b>5 mg/m<sup>3</sup></b>

*Asif*

## ENVIRONMENTAL MONITORING REPORT

**Reference:** 917/AEL/AAAPL  
**Client:** Asif Ali & Associates Private Limited.  
**Date of issue of report:** 21-09-16  
**Date of sampling:** 09-09-16 to 10-09-16  
**Nature/source of sample(s):** Ambient Gaseous Monitoring Near Kala Shah Kakoo Interchange  
**Testing specifications:** Dragger MiniWarn/ Impingers Method

### RESULTS:

Reference Point	Date of monitoring	Time of monitoring	SO <sub>2</sub> 24 hourly monitored (µg/m <sup>3</sup> )	NO <sub>2</sub> 24 hourly monitored (µg/m <sup>3</sup> )	CO 24 hourly monitored (mg/m <sup>3</sup> )	
<b>Near Kala Shah Kakoo Interchange</b>	09-09-16	09:00 am	78.2	43.9	1.19	
	09-09-16	10:00 am	57.1	46.3	1.27	
	09-09-16	11:00 am	65.4	48.2	1.75	
	09-09-16	12:00 pm	61.5	43.5	1.81	
	09-09-16	01:00 pm	62.0	49.8	1.97	
	09-09-16	02:00 pm	64.3	47.0	2.13	
	09-09-16	03:00 pm	61.2	49.3	2.15	
	09-09-16	04:00 pm	67.9	47.5	2.25	
	09-09-16	05:00 pm	70.8	49.5	2.29	
	09-09-16	06:00 pm	65.3	43.5	2.35	
	09-09-16	07:00 pm	55.3	41.8	2.54	
	09-09-16	08:00 pm	65.9	45.0	2.39	
	09-09-16	09:00 pm	58.5	42.2	2.44	
	09-09-16	10:00 pm	64.0	41.5	2.47	
	09-09-16	11:00 pm	69.0	37.8	2.59	
	10-09-16	12:00 am	66.5	39.0	2.58	
	10-09-16	01:00 am	62.2	32.1	1.95	
	10-09-16	02:00 am	65.7	29.5	1.98	
	10-09-16	03:00 am	69.0	32.3	1.69	
	10-09-16	04:00 am	65.3	27.0	1.58	
	10-09-16	05:00 am	61.2	25.7	1.65	
	10-09-16	06:00 am	63.1	38.0	1.67	
	10-09-16	07:00 am	67.0	34.3	1.57	
	10-09-16	08:00 am	59.0	31.9	1.52	
	<b>Average :</b>			<b>64.3 µg/m<sup>3</sup></b>	<b>40.2 µg/m<sup>3</sup></b>	<b>1.99 µg/m<sup>3</sup></b>
	<b>NEQSAA-2010 value:</b>			<b>120 µg/m<sup>3</sup></b>	<b>80 µg/m<sup>3</sup></b>	<b>5 mg/m<sup>3</sup></b>

*Asif Ali*



**SECTION-B**  
**Ambient Particulate Matter (PM<sub>10</sub>) Monitoring from Three Locations of project area**

*Sujid*



This Section B exhibits the on-site monitored baseline data for Ambient Particulate Matter (PM<sub>10</sub>) Monitoring. The data was monitored at Three points from project area.

Monitoring of the ambient Particulate Matter was done by using Iso Kinetic the Casella. Monitoring was carried out for 24 hours continuously hourly basis.

Sujid

## ENVIRONMENTAL MONITORING REPORT

**Reference:** 917/AEL/AAAPL  
**Client:** Asif Ali & Associates Private Limited.  
**Date of issue of report:** 21-09-16  
**Date of sampling:** 07-09-16 to 08-09-16  
**Nature/source of sample(s):** Ambient Particulate Matter Near Lakhodair Interchange.  
**Testing specifications:** The Casella

### RESULTS:

Reference point	Date of monitoring	Time of Monitoring	Particulate matter (PM <sub>10</sub> ) (24 hourly basis) µg/m <sup>3</sup>	
Near Lakhodair Interchange	07-09-16	09:00 am	67.0	
	07-09-16	10:00 am	75.2	
	07-09-16	11:00 pm	77.0	
	07-09-16	12:00 pm	72.4	
	07-09-16	01:00 pm	79.2	
	07-09-16	02:00 pm	73.5	
	07-09-16	03:00 pm	78.0	
	07-09-16	04:00 pm	79.0	
	07-09-16	05:00 pm	74.2	
	07-09-16	06:00 pm	62.7	
	07-09-16	07:00 pm	66.5	
	07-09-16	08:00 pm	71.5	
	07-09-16	09:00 pm	66.5	
	07-09-16	10:00 pm	69.1	
	07-09-16	11:00 pm	62.5	
	08-09-16	12:00 am	68.9	
	08-09-16	01:00 am	71.7	
	08-09-16	02:00 am	73.1	
	08-09-16	03:00 am	77.2	
	08-09-16	04:00 am	73.7	
	08-09-16	05:00 am	76.7	
	08-09-16	06:00 am	69.5	
	08-09-16	07:00 am	74.2	
	08-09-16	08:00 am	69.9	
	<b>Average :</b>			<b>72.0µg/m<sup>3</sup></b>
	<b>NEQSAA-2010 value:</b>			<b>150.0 µg/m<sup>3</sup></b>

*Syed*

## ENVIRONMENTAL MONITORING REPORT

**Reference:** 917/AEL/AAAPL  
**Client:** Asif Ali & Associates Private Limited.  
**Date of issue of report:** 21-09-16  
**Date of sampling:** 08-09-16 to 09-09-16  
**Nature/source of sample(s):** Ambient Particulate Matter Near Kala Khatai Road  
**Testing specifications:** The Casella

### RESULTS:

Reference point	Date of monitoring	Time of Monitoring	Particulate matter (PM <sub>10</sub> ) (24 hourly basis) $\mu\text{g}/\text{m}^3$	
<b>Near Kala Khatai Road</b>	08-09-16	10:00 am	42.0	
	08-09-16	11:00 am	40.2	
	08-09-16	12:00 pm	47.1	
	08-09-16	01:00 pm	45.0	
	08-09-16	02:00 pm	49.5	
	08-09-16	03:00 pm	46.1	
	08-09-16	04:00 pm	43.7	
	08-09-16	05:00 pm	41.5	
	08-09-16	06:00 pm	37.3	
	08-09-16	07:00 pm	39.5	
	08-09-16	08:00 pm	43.5	
	08-09-16	09:00 pm	41.0	
	08-09-16	10:00 pm	38.5	
	08-09-16	11:00 pm	39.1	
	09-09-16	12:00 am	31.0	
	09-09-16	01:00 am	38.5	
	09-09-16	02:00 am	35.9	
	09-09-16	03:00 am	42.1	
	09-09-16	04:00 am	39.0	
	09-09-16	05:00 am	42.1	
	09-09-16	06:00 am	36.2	
	09-09-16	07:00 am	39.0	
	09-09-16	08:00 am	44.1	
	09-09-16	09:00 am	45.9	
	<b>Average :</b>			<b>41.1 <math>\mu\text{g}/\text{m}^3</math></b>
	<b>NEQSAA-2010 value:</b>			<b>150.0 <math>\mu\text{g}/\text{m}^3</math></b>

*Asif Ali*

## ENVIRONMENTAL MONITORING REPORT

**Reference:** 917/AEL/AAAPL  
**Client:** Asif Ali & Associates Private Limited.  
**Date of issue of report:** 21-09-16  
**Date of sampling:** 09-09-16 to 10-09-16  
**Nature/source of sample(s):** Ambient Particulate Matter Near Kala Shah Kakoo Interchange  
**Testing specifications:** The Casella

### RESULTS:

Reference point	Date of monitoring	Time of Monitoring	Particulate matter (PM <sub>10</sub> ) (24 hourly basis) µg/m <sup>3</sup>
<b>Near Kala Shah Kakoo Interchange</b>	09-09-16	09:00 am	91.5
	09-09-16	10:00 am	90.2
	09-09-16	11:00 am	97.1
	09-09-16	12:00 pm	92.9
	09-09-16	01:00 pm	89.0
	09-09-16	02:00 pm	83.5
	09-09-16	03:00 pm	88.7
	09-09-16	04:00 pm	87.5
	09-09-16	05:00 pm	90.3
	09-09-16	06:00 pm	87.5
	09-09-16	07:00 pm	89.5
	09-09-16	08:00 pm	81.0
	09-09-16	09:00 pm	88.5
	09-09-16	10:00 pm	89.1
	09-09-16	11:00 pm	81.0
	10-09-16	12:00 am	88.5
	10-09-16	01:00 am	85.9
	10-09-16	02:00 am	82.1
	10-09-16	03:00 am	89.0
	10-09-16	04:00 am	82.7
	10-09-16	05:00 am	86.4
	10-09-16	06:00 am	89.2
	10-09-16	07:00 am	87.3
	10-09-16	08:00 am	89.0
<b>Average :</b>			<b>87.8µg/m<sup>3</sup></b>
<b>NEQSAA-2010 value:</b>			<b>150.0 µg/m<sup>3</sup></b>

*Asif Ali*

**SECTION-C**  
**Noise Level Monitoring from Three Locations of project area.**

*Sujid*



This Section C exhibits the on-site monitored baseline data regarding Noise Level Monitoring. The data was monitored at Three points from project area.

Monitoring of Noise Level was done by using Noise Level Meter, Model OS-11. Monitoring was carried out for 24 hours continuously hourly basis.

Sujid

### Noise Levels Monitoring Data

**Reference:** 917/AEL/AAAPL  
**Client:** Asif Ali & Associates Private Limited.  
**Date of issue of report:** 21-09-16  
**Date of sampling:** 07-09-16 to 08-09-16  
**Nature/source of sample(s):** Near Lakhodair Interchange

Reference Point	Date	Time (Hour)	Minimum dB (A)	Maximum dB (A)	Average Value Of One (h)	Average of 24 Hours
<b>Near Lakhodair Interchange</b>	07-09-16	09:00 am	50	55	52.5	51.0
	07-09-16	10:00 am	51	57	54	
	07-09-16	11:00 pm	49	53	51	
	07-09-16	12:00 pm	54	57	55.5	
	07-09-16	01:00 pm	58	62	60	
	07-09-16	02:00 pm	50	57	53.5	
	07-09-16	03:00 pm	48	54	51	
	07-09-16	04:00 pm	54	57	55.5	
	07-09-16	05:00 pm	56	60	58	
	07-09-16	06:00 pm	52	56	54	
	07-09-16	07:00 pm	48	53	50.5	
	07-09-16	08:00 pm	51	55	53	
	07-09-16	09:00 pm	47	50	48.5	
	07-09-16	10:00 pm	41	47	44	
	07-09-16	11:00 pm	43	48	45.5	
	08-09-16	12:00 am	40	43	41.5	
	08-09-16	01:00 am	42	46	44	
	08-09-16	02:00 am	41	47	44	
	08-09-16	03:00 am	43	46	44.5	
	08-09-16	04:00 am	50	54	52	
	08-09-16	05:00 am	53	56	54.5	
	08-09-16	06:00 am	47	55	51	
	08-09-16	07:00 am	51	57	54	
	08-09-16	08:00 am	50	54	52	
<b>NEQS limiting Value For Residential Area</b>			<b>55 dB(A) for Day &amp; 45 dB(A) for Night</b>			<b>dB(A)</b>

*Syed*



### Noise Levels Monitoring Data

**Reference:** 917/AEL/AAAPL  
**Client:** Asif Ali & Associates Private Limited.  
**Date of issue of report:** 21-09-16  
**Date of sampling:** 08-09-16 to 09-09-16  
**Nature/source of sample(s):** Near Kala Khatai Road

Reference Point	Date	Time (Hour)	Minimum dB (A)	Maximum dB (A)	Average Value Of One (h)	Average of 24 Hours
<b>Near Kala Khatai Road</b>	08-09-16	10:00 am	65	70	67.5	62.9
	08-09-16	11:00 am	67	75	71	
	08-09-16	12:00 pm	61	68	64.5	
	08-09-16	01:00 pm	64	71	67.5	
	08-09-16	02:00 pm	70	78	74	
	08-09-16	03:00 pm	62	67	64.5	
	08-09-16	04:00 pm	58	64	61	
	08-09-16	05:00 pm	64	71	67.5	
	08-09-16	06:00 pm	71	77	74	
	08-09-16	07:00 pm	67	72	69.5	
	08-09-16	08:00 pm	68	74	71	
	08-09-16	09:00 pm	55	62	58.5	
	08-09-16	10:00 pm	53	60	56.5	
	08-09-16	11:00 pm	56	61	58.5	
	09-09-16	12:00 am	61	64	62.5	
	09-09-16	01:00 am	50	56	53	
	09-09-16	02:00 am	51	54	52.5	
	09-09-16	03:00 am	50	57	53.5	
	09-09-16	04:00 am	52	56	54	
	09-09-16	05:00 am	58	63	60.5	
	09-09-16	06:00 am	50	57	53.5	
	09-09-16	07:00 am	61	65	63	
	09-09-16	08:00 am	61	68	64.5	
	09-09-16	09:00 am	64	71	67.5	
<b>NEQS limiting Value For Residential Area</b>			<b>55 dB(A) for Day &amp; 45 dB(A) for Night</b>			<b>dB(A)</b>

*Syed*

## Noise Levels Monitoring Data

**Reference:** 917/AEL/AAAPL  
**Client:** Asif Ali & Associates Private Limited.  
**Date of issue of report:** 21-09-16  
**Date of sampling:** 09-09-16 to 10-09-16  
**Nature/source of sample(s):** Near Kala Shah Kakoo Interchange

Reference Point	Date	Time (Hour)	Minimum dB (A)	Maximum dB (A)	Average Value Of One (h)	Average of 24 Hours
<b>Near Kala Shah Kakoo Interchange</b>	09-09-16	09:00 am	60	67	63.5	58.4
	09-09-16	10:00 am	55	64	59.5	
	09-09-16	11:00 am	60	71	65.5	
	09-09-16	12:00 pm	58	76	67	
	09-09-16	01:00 pm	68	75	71.5	
	09-09-16	02:00 pm	55	59	57	
	09-09-16	03:00 pm	65	72	68.5	
	09-09-16	04:00 pm	59	67	63	
	09-09-16	05:00 pm	50	59	54.5	
	09-09-16	06:00 pm	68	75	71.5	
	09-09-16	07:00 pm	61	68	64.5	
	09-09-16	08:00 pm	54	57	55.5	
	09-09-16	09:00 pm	47	55	51	
	09-09-16	10:00 pm	52	58	55	
	09-09-16	11:00 pm	53	56	54.5	
	10-09-16	12:00 am	48	57	52.5	
	10-09-16	01:00 am	47	52	49.5	
	10-09-16	02:00 am	51	54	52.5	
	10-09-16	03:00 am	46	51	48.5	
	10-09-16	04:00 am	46	55	50.5	
	10-09-16	05:00 am	48	57	52.5	
	10-09-16	06:00 am	52	61	56.5	
	10-09-16	07:00 am	54	64	59	
		10-09-16	08:00 am	57	63	
<b>NEQS limiting Value For Residential Area</b>			<b>55 dB(A) for Day &amp; 45 dB(A) for Night</b>			<b>dB(A)</b>

*Sujid*

**SECTION-D**  
**Drinking Water, Waste water Analysis. (3 Samples)**

*Sujid*

This Section D exhibits the on-site monitored baseline data for Drinking Water, waste water Analysis. Samples were collected at three points from project area.

Summarily, all precautions regarding sampling bottles cleaning, sampling of Ground water and Surface water along with Chain of Custody were followed according to the methods as referred in the Standard Methods for The Examination of Water and Waste Water, by APHA, Washington, DC, USA.

*Sujid*

## LABORATORY TEST REPORT

**Reference:** 917/AEL/AAAPL  
**Client:** Asif Ali & Associates Private Limited.  
**Date of issue of report:** 21-09-16  
**Date of sampling:** 08-09-16  
**Nature/source of sample(s):** Drinking Water from Kala Khatai Road near Usmania Mosque (Hand Pump)  
**Testing specifications:** APHA-USA

Sr. No.	Parameter	Unit	Result	National Standards for Drinking Water Quality, 2010
1.	pH	--	8.6	6.5-8.5
2.	Color	TCU	7	≤15
3.	Taste & Odour	---	Acceptable	Non objectionable/Acceptable
4.	Turbidity	NTU	1	<5
5.	Total Hardness as CaCO <sub>3</sub>	mg/l	34	<500
6.	E Coli	Number/100ml	N.D.	0/100ml
7.	F Coli	Number/100ml	N.D.	0/100ml
8.	Total Coli	Number/100ml	N.D.	0/100ml
9.	Total Dissolved Solids (TDS)	mg/l	312	<1000
10.	Aluminum	mg/l	0.08	≤0.2
11.	Antimony	mg/l	N.D.	≤0.005
12.	Arsenic	mg/l	N.D.	≤0.05
13.	Barium	mg/l	0.3	0.7
14.	Cadmium	mg/l	N.D.	0.01
15.	Chloride	mg/l	23	<250
16.	Chromium	mg/l	N.D.	≤0.05
17.	Copper	mg/l	0.03	2
18.	Cyanide	mg/l	N.D.	≤0.05
19.	Fluoride	mg/l	N.D.	≤1.5
20.	Lead	mg/l	0.006	≤0.05
21.	Manganese	mg/l	N.D.	≤0.5
22.	Mercury	mg/l	N.D.	≤0.001
23.	Nickel	mg/l	N.D.	≤0.02
24.	Nitrate	mg/l	3.7	≤50
25.	Nitrite	mg/l	0.02	≤3
26.	Selenium	mg/l	N.D.	0.01
27.	Residual Chloride	mg/l	0.04	1.5
28.	Zinc	mg/l	0.02	5

**N.D = Not Detected**  
**Source:** Hand Pump

**Manager (Laboratory)**

**Countersigned by:**  
 (Dr. Muhammad Hanif)

**Laboratory Analyst**

Ph.D. –Analytical chemistry; Post Doctorate – Analytical chemistry Advisor Laboratory  
 Director General (R), PCSIR Laboratories Complex, Lahore  
 Director General (ex) Ministry of Environment,  
 Government of Pakistan

*Sujid*

## LABORATORY TEST REPORT

**Reference:** 917/AEL/AAAPL  
**Client:** Asif Ali & Associates Private Limited.  
**Date of issue of report:** 21-09-16  
**Date of sampling:** 08-09-16  
**Nature/source of sample(s):** Drinking Water from Chak No. 40 (Hand Pump)  
**Testing specifications:** APHA-USA

Sr. No.	Parameter	Unit	Result	National Standards for Drinking Water Quality, 2010
1.	pH	--	8.4	6.5-8.5
2.	Color	TCU	2	≤15
3.	Taste & Odour	--	Acceptable	Non objectionable/Acceptable
4.	Turbidity	NTU	2	<5
5.	Total Hardness as CaCO <sub>3</sub>	mg/l	54	<500
6.	E Coli	Number/100ml	N.D.	0/100ml
7.	F Coli	Number/100ml	N.D.	0/100ml
8.	Total Coli	Number/100ml	N.D.	0/100ml
9.	Total Dissolved Solids (TDS)	mg/l	380	<1000
10.	Aluminum	mg/l	0.06	≤0.2
11.	Antimony	mg/l	N.D.	≤0.005
12.	Arsenic	mg/l	N.D.	≤0.05
13.	Barium	mg/l	0.2	0.7
14.	Cadmium	mg/l	N.D.	0.01
15.	Chloride	mg/l	31	<250
16.	Chromium	mg/l	N.D.	≤0.05
17.	Copper	mg/l	N.D.	2
18.	Cyanide	mg/l	N.D.	≤0.05
19.	Fluoride	mg/l	N.D.	≤1.5
20.	Lead	mg/l	N.D.	≤0.05
21.	Manganese	mg/l	0.06	≤0.5
22.	Mercury	mg/l	N.D.	≤0.001
23.	Nickel	mg/l	0.002	≤0.02
24.	Nitrate	mg/l	3	≤50
25.	Nitrite	mg/l	0.04	≤3
26.	Selenium	mg/l	N.D.	0.01
27.	Residual Chloride	mg/l	0.03	1.5
28.	Zinc	mg/l	0.02	5

**N.D. = Not Detected**

**Source:** Motor Pump

**Manager (Laboratory)**

**Countersigned by:**

(Dr. Muhammad Hanif)

Ph.D. –Analytical chemistry; Post Doctorate – Analytical chemistry Advisor Laboratory  
 Director General (R), PCSIR Laboratories Complex, Lahore  
 Director General (ex) Ministry of Environment,  
 Government of Pakistan

**Laboratory Analyst**



## LABORATORY TEST REPORT

**Reference:** 917/AEL/AAAPL  
**Client:** Asif Ali & Associates Private Limited.  
**Date of issue of report:** 21-09-16  
**Date of sampling:** 08-09-16  
**Nature/source of sample(s):** Nalla Bhair (Waste Water)  
**Testing specifications:** APHA-USA

Sr. No.	Parameter	Unit	Result	NEQS Limiting Value
1.	Temperature	°C	26	= < 3 °C
2.	pH	--	8.3	6-9
3.	Color	TCU	8	<15
4.	Biochemical Oxygen Demand (BOD)	mg/l	28	80
5.	Chemical Oxygen Demand (COD)	mg/l	67	<150
6.	Total Dissolved Solids (TDS)	mg/l	248	<3500
7.	Total Suspended Solid (TSS)	mg/l	63	<200
8.	Grease and Oil	mg/l	1	10
9.	Phenolic Compounds	mg/l	N.D.	0.1
10.	Chlorides	mg/l	154	1000
11.	Fluorides	mg/l	1	10
12.	Cyanide	mg/l	N.D.	1.0
13.	An-ionic Detergents	mg/l	N.D.	20
14.	Sulphate	mg/l	92	600
15.	Sulphides	mg/l	0.2	1.0
16.	Ammonia	mg/l	28	40
17.	Calcium	mg/l	N.D.	--
18.	Cadmium	mg/l	0.01	0.1
19.	Chromium	mg/l	0.03	1.0
20.	Copper	mg/l	0.22	1.0
21.	Lead	mg/l	0.06	0.5
22.	Mercury	mg/l	N.D.	0.01
23.	Selenium	mg/l	N.D.	0.5
24.	Nickel	mg/l	0.03	1.0
25.	Silver	mg/l	0.4	1.0
26.	Zinc	mg/l	0.07	5.0
27.	Arsenic	mg/l	0.25	1.0
28.	Barium	mg/l	0.01	1.5
29.	Iron	mg/l	0.4	8.0
30.	Manganese	mg/l	0.8	1.5
31.	Boron	mg/l	0.3	6.0
32.	Total Chlorine	mg/l	0.02	1.0
33.	Pesticides	mg/l	N.D.	0.15

N.D. = Not Detected  
 Source: Sewage Channel

**Manager (Laboratory)**

**Countersigned by:**  
 (Dr. Muhammad Hanif)

**Laboratory Analyst**

Ph.D. – Analytical chemistry; Post Doctorate – Analytical chemistry Advisor Laboratory;  
 Director General (R), PCSIR Laboratories Complex, Lahore  
 Director General (ex) Ministry of Environment,  
 Government of Pakistan.



**COORDINATES OF VARIOUS POINTS INDICATED IN PROJECT SITE WHILE TAKING:**

➤ **AMBIENT AIR AND NOISE LEVEL MONITORING.**

POINT NO.	COORDINATES	
1- Near Lakhodair Interchange	31°36'44.9"N	074°24'25.0"E
2- Near Kala Khatai Road	31°40'37.8"N	074°19'35.5"E
3- Near Kala Shah Kakoo Interchange	35°07'53.2"N	043°11'51.5"E

➤ **DRINKING WATER SAMPLE.**

POINT NO.	COORDINATES	
1- From Chak 40	35°06'97.4"N	043°41'2.2"E
2- From Kala Khatai road near Usmania Masjid	31°40'21.3"N	074°19'18.6"E

➤ **WASTE WATER SAMPLE.**

POINT NO.	COORDINATES	
1- Naala Bhair (Chak 40)	35°06'78.2"N	043°41'3.6"E

*Sujid*



## **ANNEXURE - IV**

*Sujid*

## VILLAGE PROFILES

### Name of village

Lakshudhel / Mahmood Booti  
\_\_\_\_\_ is situated on \_\_\_\_\_ side of ROW at a distance of about 0.000 kilometres from start point of the Project Area. It consists of about approx. 1000 households having a total population of approximately 5000 persons. Electricity and cell phone facility is available in the village. Piped water supply and ground water are the available sources for drinking water. Health care facility (BHU) is available in the village. There is government primary school(s) for both boys and girls in the village. The nearest health care and post office facilities are available in Shadipula and a commercial bank facility at Shadipula. Nearest town/urban centre is Shadipula on which people depend for their basic supplies. The village is located in a plain terrain.

*Sujid*

AAA ENGINEERING SERVICES (PVT) LIMITED  
LAHORE EASTERN BYPASS  
ENVIRONMENTAL IMPACT ASSESSMENT

Public Consultation

Name of Conductor: Osman

Date: 27/10/16

Village Name: Lakhudher

Venue: Lakhudher Darbar  
(Maddi Shah di Khoi)

1) Information Disseminated

- Project Introduction
- Needs, priorities and reactions of the people

2) Major Issues Raised And Their Suggestions By The Participants

- Max. houses must be saved.
- Insecurity about payment and resettlement
- Masjid and Shrine (Darbar) should be <sup>saved</sup> ~~sett~~. (Maddi Shah di Khoi)
- Labour occupation is major. Not sure if they get any house ever after or not.
- Alignment may be shifted ahead of Saifian wala Darbar
- Not much trees. 10-15. But they must be grown after project.
- No gas facility at service road. After project gas facility must be provided.
- Service Road must be provided frontage to Ring Road

Syed

3) Name of Participants

- Dr. Shahid
- Muhammad Akram (0300-4694801)
- Muhammad Tahir (0323-4378190)
- M. Nawaz (0331-4201033)
- Haji Amanullah
- Sheikh (Transport/Ady wala)

Syed

## VILLAGE PROFILES

### Name of village

Jabbu is situated on left side of ROW at a distance of about 5+000 kilometres from start point of the Project Area. It consists of about 150 households having a total population of approximately 700 persons. Electricity and cell phone facility is available in the village. Piped water supply and ground water are the available sources for drinking water. Health care facility (BHU) is available in the village. There is government primary school(s) for both boys and girls in the village. The nearest health care and post office facilities are available in / and a commercial bank facility at /. Nearest town/urban centre is / on which people depend for their basic supplies. The village is located in a plain terrain.

'Mehmood Booti

Syed

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ENVIRONMENTAL IMPACT ASSESSMENT

Public Consultation

Name of Conductor: Usman

Date: 27/10/16

Village Name: Jabbu

Venue: Jabbu Village Chowk

1) Information Disseminated

- Project Introduction
- Needs, priorities and reactions of the people

2) Major Issues Raised And Their Suggestions By The Participants

- School, Bank, post office should be constructed with the project. (Gas facilities available)
- Patwari(s) have visited the site and told about area / compensation, land.
- Mostly farmers, some have started working in cities.
- No house is coming.
- Rate of Acre area must be increased.
- Exact amount according to land value should be payed.
- No small roads are present here, Approach roads.
- Injustice is done by govt in such projects. Not exact amount is payed to affectees.
- MNA and MPA should not be appointed as no justice is provided to poor people.

Sujid

3) Name of Participants

- Ashraf 03064141217
- Abbas
- Munir
- Muhammad Ilyas
- Muhammad Munir

Syid

## VILLAGE PROFILES

### Name of village

Karol is situated on eight side of ROW at a distance of about 4.500 kilometres from start point of the Project Area. It consists of about 25,30 thousand households having a total population of approximately 120,000 persons. Electricity and cell phone facility is available in the village. Piped water supply and ground water are the available sources for drinking water. Health care facility (BHU) is available in the village. There is government primary school(s) for both boys and girls in the village. The nearest health care and post office facilities are available in baghbanpura (2 schools) and a commercial bank facility at baghbanpura / Ring Road. Nearest town/urban centre is baghbanpura on which people depend for their basic supplies. The village is located in a plain terrain.

440019

3500141

Sujid



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Public Consultation

Name of Conductor: Usman

Date: 27/10/16

Village Name: Karol

Venue: Aster Malik Pann Shop

1) Information Disseminated

- Project Introduction
- Needs, priorities and reactions of the people

2) Major Issues Raised And Their Suggestions By The Participants

- Rate of land is low.
- Road is shifted on downstream. All the water is will be transferred to villages.
- Drainage condition in the village is not good.
- In case of flood, all the village will be drowned as village is located on upstream.
- There is no problem of trees as there is min to none in ROW.

Syed

3) Name of Participants

• Muhammad Jahangir

• Usman

• Ayaz

• Nayyer

Syid

## VILLAGE PROFILES

Name of village Nathokel

\_\_\_\_\_ is situated on left side of ROW at a distance of about 8+800 kilometres from start point of the Project Area. It consists of about 200 households having a total population of approximately 1500 persons. Electricity and cell phone facility is available in the village. Piped water supply and ground water are the available sources for drinking water. Health care facility (BHU) is available in the village. There is government primary school(s) for both boys and girls in the village. The nearest health care and post office facilities are available in Shahdara and a commercial bank facility at /. Nearest town/urban centre is Shahdara station on which people depend for their basic supplies. The village is located in a plain terrain.

Shahdara Teaching Hospital  
Shahdara station

Syed

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ENVIRONMENTAL IMPACT ASSESSMENT

Public Consultation

Name of Conductor: Usqman

Date: 27/10/16

Village Name: Nathokot

Venue: Govt. Boys Primary School

1) Information Disseminated

- Project Introduction
- Needs, priorities and reactions of the people

2) Major Issues Raised And Their Suggestions By The Participants

- Not sure about alignment/locations of Interchange
- Crossing should be widened for trolleys etc. movement.
- Bifurcation problem can happen
- 2 main crossings are here. Widened crossing should be in this village.
- people will have more benefit rather than disadvantage.
- No access of trolleys on the Eastern bypass!

Syed

3) Name of Participants

- Mujeeb Alam
- Ibrahim
- Kashif Ali
- Wajid

Wajid

## VILLAGE PROFILES

### Name of village

Balknap / Beeth is situated on right side of ROW at a distance of about 11+000 kilometres from start point of the Project Area. It consists of about 1500 approx. households having a total population of approximately 7500 persons. Electricity and cell phone facility is available in the village. Piped water supply and ground water are the available sources for drinking water. Health care facility (BHU) is available in the village. There is government primary school(s) for both boys and girls in the village. The nearest health care and post office facilities are available in Shahdara / Babukawal and a commercial bank facility at Babukawal. Nearest town/urban centre is Shahdara on which people depend for their basic supplies. The village is located in a plain terrain.

Syed

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ENVIRONMENTAL IMPACT ASSESSMENT

Public Consultation

Name of Conductor: Dsman

Date: 27/10/16

Village Name: Beth (Baith)

Venue: Munir Mugh Chanay

1) Information Disseminated

- Project Introduction
- Needs, priorities and reactions of the people

2) Major Issues Raised And Their Suggestions By The Participants

- It will transform our village into city.
- crossings should be provided for residents.
- Road will increase our village value
- Water access should be provided.
- Schools are already there.
- Trees are not present.
- Rate should be according to value.
- Services roads should also be improved.

Sujid

3) Name of Participants

• Shanbaz Ahmed (0302-4535005)

• Hafiz Tanvir (0345-4226498)

• Saifaz (0344-4700795)

• Rafeed

• Ejaz

Sujid



## VILLAGE PROFILES

### Name of village

KOT Mulchand

13+665

\_\_\_\_\_ is situated on right side of ROW at a distance of about \_\_\_\_\_ kilometres from start point of the Project Area. It consists of about 6-7 households having a total population of approximately 50 persons. Electricity and cell phone facility is available in the village. Piped water supply and ground water are the available sources for drinking water. Health care facility (BHU) is available in the village. There is government primary school(s) for both boys and girls in the village. The nearest health care and post office facilities are available in Shahdolca and a commercial bank facility at Shahdra. Nearest town/urban centre is Shahdra on which people depend for their basic supplies. The village is located in a plain terrain.

Cable from railway station

Teaching  
Hospital  
Shahdra.

• Mostly worker, deas / not houses

Syed

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ENVIRONMENTAL IMPACT ASSESSMENT

Public Consultation

Name of Conductor: Usman

Date: 27/10/16

Village Name: DIG DERA / DANYA / BALKHAY / KOT  
MULCHAND

Venue: DIG DERA

1) Information Disseminated

- Project Introduction.
- Needs, priorities and reactions of the people

2) Major Issues Raised And Their Suggestions By The Participants

- Drainage
- Land will be divided in ~~three~~ parts.
- Crossing of canal water? Is there any crossing for canal water
- 2+550, 3+200
- All the villages nearby will have access <sup>villages</sup>
- At this point, all the points meet
- Service road should be provided.
- Culverts should be provided at these locations. nullahs are there.
- No trees in this area.

Syjad

3) Name of Participants

Zumar Ameer

Malik Mubashir

Samad

Azhar Hameed Khojha DIG Lahore

Syed

## VILLAGE PROFILES

Name of village CHAK 42

\_\_\_\_\_ is situated on left side of ROW at a distance of about ~~37500~~ 14+500 approx kilometres from start point of the Project Area. It consists of about 300 households having a total population of approximately 2500 persons. Electricity and cell phone facility is available in the village. Piped water supply and ground water are the available sources for drinking water. Health care facility (BHU) is available in the village. There is government primary school(s) for both boys and girls in the village. The nearest health care and post office facilities are available in Rachna town / Shandara and a commercial bank facility at Rachna town. Nearest town/urban centre is Rachna town on which people depend for their basic supplies. The village is located in a plain terrain. (2)

Sujid

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ENVIRONMENTAL IMPACT ASSESSMENT

Public Consultation

Name of Conductor: Usman

Date: 27/10/16

Village Name: Chak 42

Venue: Nauman Kayana  
store

1) Information Disseminated

- Project Introduction
- Needs, priorities and reactions of the people

2) Major Issues Raised And Their Suggestions By The Participants

- Land will be acquired / Restellement cost?
- Access will be provided
- Very useful
- Must be completed as soon as possible
- Approach roads should be constructed
- Environmental conditions are worse. They could be better after the project.

Sujid

3) Name of Participants

- Nauman (0340-5650220)
- Sohny
- Nabeel
- Sohail

Syid

## VILLAGE PROFILES

### Name of village

Chak 40 is situated on right side of ROW at a distance of about 13.5 kilometres from start point of the Project Area. It consists of about 500 approx. households having a total population of approximately 3200 persons. Electricity and cell phone facility is available in the village. Piped water supply and ground water are the available sources for drinking water. Health care facility (BHU) is available in the village. There is government primary school(s) for both boys and girls in the village. The nearest health care and post office facilities are available in Imamia colony and a commercial bank facility at Imamia colony bank. Nearest town/urban centre is Imamia colony / Rana town on which people depend for their basic supplies. The village is located in a plain terrain.

Syed

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ENVIRONMENTAL IMPACT ASSESSMENT

Public Consultation

Name of Conductor: Usman

Date: 17/10/16

Village Name: Chak 40

Venue: Rao Feroz Dera

1) Information Disseminated

- Project Introduction
- Needs, priorities and reactions of the people

2) Major Issues Raised And Their Suggestions By The Participants

- Very beneficial.
- It will increase economical condition of village
- Access will be provided to our village
- Should be started quickly.
- Roads here are not good. Transportation should be better
- Access roads should be developed
- Rate of Resettlement should be proper

Syed



3) Name of Participants

Khushi Muhammad  
Rao Feroz  
Kai Faiz ( )  
Ahmed Tanvir

Syid

## **ANNEXURE - V**

*Sujid*

## LIST OF LAND ACQUISITION AREAS

Sr. No		Chainage	Area (square meters)	Development type	Side
1	Main Link	0+787	233.611	House	L
2	Main Link	1+200	16460.084	Farm	R
3	Main Link	1+750	851.992	House	R
4	Main Link	2+050	22.165	Tubewell Building	R
5	Main Link	4+400	747.708	Garden	L
6	Main Link	4+420	346.69	House	R
7	Main Link	5+510	1545.866	House	R
8	Main Link	5+650	1081.076	House	L
9	Main Link	10+100	332.895	Dera	L
10	Main Link	11+200	600.602	Factory	R
11	Main Link	11+300	2468.95	Factory	R
12	Main Link	12+200	2475.15	House	R
13	Main Link	12+200	295.32	Masjid	L
14	Main Link	12+300	473.456	Poultry Form	L
15	Main Link	12+300	550.495	House	R
16	Main Link	12+500	1763.957	House	R
17	Main Link	13+900	1069.758	House	L
18	Main Link	14+000	256.956	House	L
19	Main Link	15+200	196.529	Poultry Form	L
20	Main Link	15+700	419.041	Poultry Form	L
21	SL-1	1+550	215.44	Dera	R
22	SL-1	1+970	108.485	Masjid	R
23	SL-1	2+600	318.625	Factory	R
24	SL-2	1+220	257.59	House	L
25	SL-3	0+750	117.59	House	L
26	SL-4	2+700	257.59	Masjid	R
27	SL-7	N/A	168.741	Dera House	R
28	SL-7	N/A	551.873	House	R
29	SL-8	N/A	437.455	Houses	L
30	SL-8	N/A	1071.94	Houses	L
31	SL-8	N/A	5946.292	Houses	L
32	SL-8	N/A	72.513	Houses	L
33	SL-8	N/A	1801.795	Houses	L
34	SL-8	N/A	1537.143	Houses	L
35	SL-8	N/A	736.501	Houses	R
36	SL-8	N/A	10547.241	Factory	L
37	SL-8	N/A	349.685	Shops	R
38	SL-8	N/A	147.775	Houses	R
39	SL-8	N/A	468.32	Factory	R
Total (Square Meters)			57304.895		
Total (Marlas)			2265.7		
Total (acres)			14.16		

*Sujid*

## LIST OF UTILITIES TO BE RELOCATED

Sr. No.	Chainage	Side	Details of Structure
<b>Lahore Eastern Bypass Main Alignment</b>			
1	0+040	R	ELECTRIC POLE
2	0+695	R	ELECTRIC POLE
3	0+755	L	ELECTRIC POLE
4	0+755	R	ELECTRIC POLE
5	0+860	R	ELECTRIC POLE
6	2+050	R	TUBE WELL
7	2+060	R	ELECTRIC POLE
8	2+350	R	ELECTRIC POLE
9	2+400	L	ELECTRIC POLE
10	2+750	R	ELECTRIC POLE
11	4+050	R	TUBE WELL
12	4+360	L	ELECTRIC POLE
13	4+440	R	TUBE WELL
14	5+300	R	TUBE WELL
15	5+610	R	ELECTRIC POLE
16	5+665	L	ELECTRIC POLE
17	5+670	L	TUBE WELL
18	5+695	L	ELECTRIC POLE
19	5+720	L	ELECTRIC POLE
20	5+770	R	ELECTRIC POLE
21	6+020	R	TUBE WELL
22	8+110	R	TUBE WELL
23	8+280	L	HAND PUMP
24	9+080	R	TUBE WELL
25	9+580	R	TUBE WELL
26	10+070	L	ELECTRIC POLE
27	10+170	L	TUBE WELL
28	10+250	R	TUBE WELL
29	10+910	L	TUBE WELL
30	11+150	L	ELECTRIC POLE
31	11+200	R	ELECTRIC POLE
32	11+200	R	ELECTRIC POLE
33	11+695	R	TUBE WELL
34	12+175	L	ELECTRIC POLE
35	12+175	L	ELECTRIC POLE
36	12+205	R	ELECTRIC POLE
37	12+305	L	ELECTRIC POLE
38	12+760	L	ELECTRIC POLE
39	12+760	L	ELECTRIC POLE
40	12+785	L	ELECTRIC POLE
41	14+010	R	ELECTRIC POLE
42	14+715	R	ELECTRIC POLE

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## LIST OF UTILITIES TO BE RELOCATED

Sr. No.	Chainage	Side	Details of Structure
<b>SL-1</b>			
1	0+120	L	ELECTRIC POLE
2	0+210	L	ELECTRIC POLE
3	0+500	L	ELECTRIC POLE
4	0+580	R	6 ELECTRIC POLES
5	0+600	R	2 ELECTRIC POLES
6	0+640	R	2 ELECTRIC POLES
7	0+650	R	ELECTRIC POLE
8	0+660	R	2 ELECTRIC POLES
9	0+690	R	2 ELECTRIC POLES
10	0+710	R	2 ELECTRIC POLES
11	0+720	R	ELECTRIC POLE
12	0+750	L	3 ELECTRIC POLES
13	0+775	L	4 ELECTRIC POLES
14	2+630	L	ELECTRIC POLE
15	2+630	R	2 ELECTRIC POLES
16	3+445	R	ELECTRIC POLE
<b>SL-2</b>			
1	1+180	L	ELECTRIC POLE
<b>SL-3</b>			
1	1+475	L	ELECTRIC POLE
<b>SL-4</b>			
1	1+290	L	ELECTRIC POLE
2	1+420	R	ELECTRIC POLE
3	1+560	R	ELECTRIC POLE
4	2+090	R	ELECTRIC POLE
<b>SL-5</b>			
1	1+150	R	ELECTRIC POLE
2	1+230	L	ELECTRIC POLE
<b>SL-6</b>			
1	N/A	Both	62 ELECTRIC POLE
<b>SL-7</b>			
1	N/A	Both	2 ELECTRIC POLES
<b>SL-8</b>			
1	N/A	Both	22 ELECTRIC POLES
2	N/A	Both	2 TELEPHONE POLES
3	N/A	Both	2 LIGHT POLES
4	N/A	Both	6 SEWERAGE MANHOELS

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## **ANNEXURE - VI**

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## Tree Plantation Plan

Tree plantation plan has been prepared for the proposed project keeping in view the design and length of the project. This plan is based on best possible estimations and can be modified accordingly at the execution stage. A total number of 4500 trees are to be planted in linear pattern, keeping the distance from plant to plant as 4 meters and also 4 meters between 2 rows of plants for 18 km length of the proposed project.

### **Trees Recommended**

Following tree species are recommended, in general, for planting to create aesthetic as well as shade effect along the roadside. It is also recommended that 4 to 5 years old plants should be procured for the purpose.

### **Trees Recommended for Linear Planting**

<b>Sr. No.</b>	<b>Local Name</b>	<b>Scientific Name</b>
1.	Neem	Azadirachta indica
2.	Kikar	Acacia Nilotica
3.	Sheesham	Dalbergiasisso

### **Cost**

The cost of raising 500 plants has been estimated as Rs. 839,000/- including price of plants, earthwork, procurement of manures, continued supply of water to young plants throughout the year and its maintenance for five (5) years. Break-up of expenditure of 500 plants @ Rs. 500/- per diem is as follows.

### **1<sup>st</sup> Year:**

<b>Sr. No.</b>	<b>Item</b>	<b>Quantity</b>	<b>Rate</b>	<b>Amount (Rs.)</b>
1.	Layout	1 km	2 MD/Av.km	1000.00
2.	Digging of Pits 2.5 ft. each 2.5x500 =1500 cft.	1500 cft.	10 MD/Av.km	5000.00
3.	Cost of plants including	500 No.	Rs.750/- plant	3,75,000.00
4.	Cost of planting of plants	500 No.	Rs. 10/- plant	5,000.00
5.	Carriage of plants from private nursery to site including loading/unloading	500 No.	Rs. 5/- plant	2500.00

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Sr. No.	Item	Quantity	Rate	Amount (Rs.)
6.	Cost of Manure and Bhall (silt) including carriage	500 plants	Lump Sum	5,000.00
7.	H/watering 50 times 500x50 with water bowser, one driver and one coolie	25,000 no.	5 MD/per 1000	62,500
8.	Weeding twice 500x2	1000 no.	5 MD	2,500.00
9.	Reopening of Pits twice (500x2)/cft/pit	1000 cft.	5 MD	2,500.00
10.	Unforeseen	---	---	1000.00
<b>Total</b>				<b>456,000/-</b>

### 2<sup>nd</sup> Year:

Sr. No.	Item	Quantity	Rate	Amount (Rs.)
1.	Cost of Plants 20% Restocking	100 No.	Rs.750/- plant	75,000.00
2.	Cost of planting	100 No.	Rs. 10/- plant	1000.00
3.	Carriage of plants	100 No.	Rs. 5/- plant	500.00
4.	H/watering 50 times with water bowser, one driver and one coolie	25,000 no.	5 MD/per %	62500
5.	Reopening of Pits twice (500x2)	1000 cft.	5 MD	2,500.00
6.	Weeding twice 500x2	1000 no.	5 MD	2,500.00
7.	Unforeseen	---	---	1000.00
<b>Total</b>				<b>145,000/-</b>

### 3<sup>rd</sup> Year:

Sr. No.	Item	Quantity	Rate	Amount (Rs.)
1.	Cost of Plants 10% Restocking 100 No.	100 No.	Rs.750- plant	75,000.00
2.	Cost of planting	100 No.	Rs. 10/- plant	1000.00
3.	Carriage of plants	100 No.	Rs. 5/- plant	500.00
4.	H/watering 40 times	20,000 no.	5 MD/1000	50,000
5.	Reopening of Pits twice (500x2)	1000	5 MD	2,500.00
6.	Unforeseen	---	---	1000.00
<b>Total</b>				<b>130,000/-</b>



**4<sup>th</sup> Year:**

<b>Sr. No.</b>	<b>Item</b>	<b>Quantity</b>	<b>Rate</b>	<b>Amount (Rs.)</b>
1.	H/watering 40 times	20,000 no.	5 MD/1000	50.000
2.	Pruning and cleaning of plants	500 no.	5 MD	2,500.00
3.	Unforeseen	---	---	1500.00
<b>Total</b>				<b>54,000/-</b>

**5<sup>th</sup> Year:**

<b>Sr. No.</b>	<b>Item</b>	<b>Quantity</b>	<b>Rate</b>	<b>Amount (Rs.)</b>
1.	H/watering 40 times	20,000 no.	5 MD/1000	50.000
2.	Pruning and cleaning of plants	500 no.	5 MD	2,500.00
3.	Unforeseen	---	---	1500.00
<b>Total</b>				<b>54,000/-</b>

Cost for raising 1 plant and its maintenance for 5 years = Rs. 1,678/-

Total cost for raising 500 plants and Maintenance for 5 years = Rs. 839,000/-

Total cost for raising 4500plants including maintenance for 5 years = **Rs. 7,551,000/-**

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**Break-up for Health Safety & Environment Cost**

Items	Quantity	Cost / Item (Rs.)	Total Cost (Rs.)
<b>(A) Personal Protective Equipments PPEs</b>			
Dust masks	9600	20	192,000
Safety Shoes	400	1200	480,000
Gloves	4800	200	960,000
First Aid Box	2	2000	4,000
Ear Plugs	2400	30	72,000
Safety Helmets	200	800	160,000
Safety Jackets (Hi Vis)	400	400	160,000
<b>Sub-Total (A)</b>			<b>2,028,000</b>
<b>(B) Others</b>			
Provision of Dust Bins	36	1000	36,000
Warning Tape	50	500	25,000
Safety Cones	40	1000	40,000
Safety Sign Boards	20	1200	24,000
Water Sprinkling	2 times/day	15000	5,475,000
Rain Coat	200	2000	400,000
Gum Boots	200	1000	200,000
<b>Sub-Total (B)</b>			<b>6,200,000</b>
<b>Total (A) + (B)</b>			<b>82,280,000</b>

**Time required for Construction = 24 months**

**No. of labour required during construction = 100**

**(A) Personal Protective Equipments PPEs**

Dust mask	1 dust mask to be used in a week by each laborer
Safety Shoes	1 safety shoe for six months for each laborer
Gloves	2 pair of gloves for each laborer for a month
First Aid Box	1 first aid box for every 50 laborers
Ear Plug	1 set of ear plug to be used for 1 month for each laborer
Safety Helmet	1 safety helmet for each laborer for 12 months
Safety Jackets (Hi Vis)	2 safety Jackets (Hi Vis) for each laborer for 12 months

**(B) Others**

Dust Bin	1 after every 500 m
Water Sprinkling	for the whole construction period (12 months)
Rain Coat	1 rain coat for each laborer for 12 months
Gum Boots	1 gum boot for each laborer for 12 months



## **ANNEXURE VII**

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## **ANNEXURE - VIII**

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